CITY OF NOVI CITY COUNCIL
APRIL 22, 2024

SUBJECT: Adoption of Oakland County Hazard Mitigation Plan

SUBMITTING DEPARTMENT: Public Safety – Fire Department

BACKGROUND INFORMATION:

Oakland County Emergency Management and Homeland Security in conjunction with the participating cities, villages and townships completed the 5-year update to the County Hazard Mitigation Plan (HMP). The HMP was originally prepared in 2005 and adopted by the City of Novi by way Council Resolution on July 10, 2006, June 3, 2013, and again on September 24, 2018.

The intent of this plan is to enhance awareness of and provide mitigation strategies for elected officials, agencies, and the public and develop actions that will minimize negative outcomes to Oakland County's citizens, the economy, and the environment due to potential natural and manmade hazard threats. The well-being of the county and local communities rests on reducing risks to life and property in the event of a hazard event or emergency/disaster.

Now that the HMP has been adopted by Oakland County, each city, village, and township residing within Oakland County is required to adopt it within one year. The adoption of this plan ensures Oakland County, Michigan and the participating municipalities qualify for federal funding, before and after a disaster occurs.

RECOMMENDED ACTION: Adoption of Oakland County Hazard Mitigation Plan

MEMORANDUM

TO: ERICK W. ZINSER, DIRECTOR OF PUBLIC SAFETY/CHIEF OF POLICE

FROM: JOHN B. MARTIN, FIRE CHIEF JBM

SUBJECT: OAKLAND COUNTY HAZARD MITIGATION PLAN

DATE: ADOPTION APRIL 10, 2024

Oakland County Emergency Management and Homeland Security in conjunction with the participating cities, villages and townships completed the 5-year update to the County Hazard Mitigation Plan (HMP). The HMP was originally prepared in 2005 and adopted by the City of Novi by way Council Resolution on July 10, 2006, June 3, 2013, and again on September 24, 2018.

The HMP was created with the goal of sustainably and permanently reducing the county's vulnerability to hazards through sound public policy. By increasing public awareness of potential harm, documenting resources for risk reduction and loss prevention, and indemnifying activities to guide the development of less vulnerable and more sustainable communities, this plan aims to protect citizens, critical facilities, infrastructure, private property, and the natural environment.

This plan exists to identify natural and manmade hazard threats to the community, prepare mitigation management strategies to address those threats, develop short-term and long-term goals and objectives for mitigation planning, and to fulfill federal, state, and local hazard mitigation planning obligations.

The intent of this plan is to enhance awareness of and provide mitigation strategies for elected officials, agencies, and the public and develop actions that will minimize negative outcomes to Oakland County's citizens, the economy, and the environment due to potential natural and manmade hazard threats. The well-being of the county and local community's rests on reducing risks to life and property in the event of a hazard event or emergency/disaster.

Now that the HMP has been adopted by Oakland County, each city, village, and township residing within Oakland County is required to adopt it within one year. The adoption of this plan ensures Oakland County, Michigan and the participating municipalities qualify for federal funding, before and after a disaster occurs.

c: Scott Baetens, Assistant Chief of Police
Todd Seog, Assistant Fire Chief
Scott Berkseth, Emergency Management Coordinator

CITY OF NOVI

COUNTY OF OAKLAND, MICHIGAN

RESOLUTION AUTHORIZING THE ADOPTION OF THE OAKLAND COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

Minutes of a Meeting of the City Council of the City of Novi, County of Oakland, Michigan, held in the City Hall of said City on April 22, 2024, at 7 o'clock P.M. Prevailing Eastern Time.

PRESENT: Councilmembers_____

ABSENT: Councilmembers_____

The following preamble and Resolution were offered by Councilmember _____and supported by Councilmember _____.

WHEREAS, the mission of Oakland County and the participating jurisdiction of City of Novi include the charge to protect the health, safety, and the general welfare of the people of the County and municipalities; and

WHEREAS, Oakland County, Michigan, is subject to flooding, tornadoes, winter storms, and other natural, technological, and human-caused hazards; and

WHEREAS, pro-active mitigation of known hazards before and after a disaster event can reduce or eliminate long-term risk to life and property; and

WHEREAS, The Disaster Mitigation Act of 2000 (Public Law 106-390) established new requirements for pre- and post-disaster hazard mitigation programs; and

WHEREAS, to remain eligible to receive mitigation monies, Oakland County prepared a Hazard Mitigation Plan (the "PLAN") for the County and all communities in the County; and

WHEREAS, Oakland County and the City of Novi have participated in and completed a planning process that engages the public, assesses the risk and vulnerability to the impacts of hazards, develops a mitigation strategy consistent with a set of uniform goals, and creates a plan for implementing, evaluating, and revising this strategy.

NOW THEREFORE, IT IS THEREFORE RESOLVED that the City of Novi:

1. Adopts in its entirety the Oakland County Multi-Jurisdictional Hazard Mitigation Plan, and specifically Volume II of the Plan as it pertains to this jurisdiction.

2. Will use the adopted and approved portions of the Plan to guide pre- and post-disaster mitigation of the hazards identified.

3. Will coordinate the strategies identified in the Plan with other planning programs and mechanisms under its jurisdictional authority.

4. Will continue its support of the Hazard Mitigation Steering Committee and continue to participate in the planning partnership as described by the Plan.

5. Will help to promote and support the mitigation successes of all planning partners.

AYES:

NAYS:

RESOLUTION DECLARED ADOPTED.

_____
Cortney Hanson, City Clerk

CERTIFICATION

I hereby certify that the foregoing is a true and complete copy of a resolution adopted by the City Council of the City of Novi, County of Oakland, and State of Michigan, at a regular meeting held this 22nd day of April, 2024, and that public notice of said meeting was given pursuant to and in full compliance with Act No. 267, Public Acts of Michigan, 1976, and that the minutes of said meeting have been kept and made available to the public as required by said Act.

_____
Cortney Hanson, City Clerk
City of Novi

OAKLAND COUNTY MICHIGAN

MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN
2023

FEMA Approved - Public Version

OAKLAND COUNTY MICHIGAN
All ways, MOVING FORWARD

U.S. Department of Homeland Security
FEMA Region 5
536 S. Clark St. 6th Floor
Chicago, IL 60605

FEMA

February 26, 2024

Mr. Matt Schnepp
State Hazard Mitigation Officer
Michigan State Police
Emergency Management and Homeland Security Division
P.O. Box 30634
Lansing, MI 48909

Dear Mr. Schnepp:

The 2023 Oakland County Multi-Jurisdictional Hazard Mitigation Plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. The 2023 Oakland County Multi-Jurisdictional Hazard Mitigation Plan met the required criteria for a multi-jurisdictional hazard mitigation plan and the plan is now approved for Oakland County.

Please submit adoption resolutions for any remaining jurisdictions who participated in the planning process.

The expiration date of the 2023 Oakland County Multi-Jurisdictional Hazard Mitigation Plan is five years from the date of this letter.

An approved local mitigation plan, including adoption by the local government, is one of the conditions for applying for and/or receiving FEMA mitigation grants from the following programs:

- Hazard Mitigation Grant Program (HMGP)
- HMGP Post-Fire
- Building Resilient Infrastructure and Communities
- Flood Mitigation Assistance

Having an approved mitigation plan does not mean that mitigation grant funding will be awarded. Specific application and eligibility requirements for the programs listed above can be found in each FEMA grant program's respective policies and annual Notice of Funding Opportunities, as applicable.

To avoid a lapsed plan, the next plan update must be approved before the end of the approval period, including adoption by the participating jurisdiction(s). Before the end of the approval period, please allow sufficient time to secure funding for the update, including the review and approval process. Please include time for any revisions, if needed, and for your jurisdiction to formally adopt the plan after the review, if not adopted prior to submission. This will enable you to remain eligible to apply for and receive funding from FEMA's mitigation grant programs with a mitigation plan requirement. Local governments, including special districts, with a plan status of "Approvable Pending Adoption" are not eligible for FEMA's mitigation grant programs with a mitigation plan requirement.

www.fema.gov

We look forward to discussing options for implementing this mitigation plan. If there are any questions from either you or the communities, please contact Meghan Cuneo, at (202) 615-5294 or email at Meghan.Cuneo@fema.dhs.gov.

Sincerely,

JOHN A WETHINGTON

Digitally signed by JOHN A WETHINGTON
Date: 2024.02.26 16:25:17 -06'00'

John Wethington
Chief, Risk Analysis Branch
Mitigation Division

OAKLAND COUNTY MICHIGAN
BOARD OF COMMISSIONERS

AGENDA ITEM: Oakland County Hazard Mitigation Plan
DEPARTMENT: Emergency Management & Homeland Security
MEETING: Board of Commissioners
DATE: Thursday, December 7, 2023 6:00 PM - Click to View Agenda

ITEM SUMMARY SHEET

COMMITTEE REPORT TO BOARD

Resolution #2023-3506
Motion to adopt the Hazard Mitigation Plan as an official Plan of Oakland County and authorize the Oakland County Emergency Management and Homeland Security Department to supervise and implement the Plan's recommendations within the funding limitations as provided by Oakland County and other sources.

ITEM CATEGORY	SPONSORED BY
Resolution	Penny Luebs

INTRODUCTION AND BACKGROUND

FEMA requires each county to update their Hazard Mitigation Plan every 5 years. Using grant funds provided by FEMA, Emergency Management worked with a contractor to update the county's plan.

Oakland County, Michigan, is subject to flooding, tornadoes, winter storms, and other natural, technological, and human hazards. The Robert T. Stafford Disaster Relief and Emergency Assistance Hazard Mitigation Grant Program administered by the Federal Emergency Management Agency provides grants to implement long-term hazard mitigation measures before and after a disaster. VIA MR #2023-2815, grant funding in an amount up to $162,000 was accepted from the State of Michigan to complete this plan. To remain eligible to receive mitigation monies, Oakland County prepared a Hazard Mitigation Plan for the County and all communities in the County. The Plan is a tool for reducing the risks from natural and man-made hazards and for providing a guide to commit resources that will reduce the effects of the hazards. The Oakland County Emergency Management and Homeland Security Department and Local Emergency Planning Committee (LEPC) comprised of representatives from the County, cities, townships, villages, and stakeholder organizations, along with community residents, business owners, and local agencies has prepared and reviewed a Hazard Mitigation Plan which contains therein options to protect people and reduce damages from hazards. The Plan is an official document of the County and the communities therein. The LEPC has been established as the County Hazard Mitigation Steering Committee, pursuant to the Disaster Mitigation Act of 2000 (PL-106-390) and associated regulations (44CFR 210.6).

Adoption by Oakland County demonstrates its commitment to hazard mitigation and achieving the goals outlined in the Plan.

BUDGET AMENDMENT REQUIRED: No

Committee members can contact Michael Andrews, Policy and Fiscal Analysis Supervisor at 248.425.5572 or andrewsmb@oakgov.com, or the department contact persons listed for additional information.

CONTACT

Thom Hardesty, Director Emergency Management & Homeland Security

ITEM REVIEW TRACKING

Aaron Snover, Board of Commissioners — Created/Initiated - 12/7/2023

AGENDA DEADLINE: 12/07/2023 6:00 PM

ATTACHMENTS

1. OaklandCounty2023.HMP.Volume I
2. OaklandCounty2023.HMP.Volume II

COMMITTEE TRACKING

2023-11-28 Public Health & Safety - Recommend to Board
2023-12-07 Full Board - Adopt

Motioned by: Commissioner Charles Cavell
Seconded by: Commissioner Ajay Raman

Yes: David Woodward, Michael Spisz, Michael Gingell, Penny Luebs, Karen Joliat, Kristen Nelson, Christine Long, Robert Hoffman, Philip Weipert, Gwen Markham, Angela Powell, Marcia Gershenson, William Miller III, Yolanda Smith Charles, Charles Cavell, Brendan Johnson, Ajay Raman, Ann Erickson Gault (18)
No: None (0)
Abstain: None (0)
Absent: (0)
Passed

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Chapter 1: Introduction

Oakland County, Michigan is subject to natural and man-made hazards that can threaten life, health, property and the environment. The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and 44 CFR Part 201, require local governments to develop a Hazard Mitigation Plan (Plan or HMP) that identifies strategies to minimize the impact of these hazards in order to be eligible for pre- or post-disaster mitigation funding. In response, Oakland County prepared a multi-jurisdictional Hazard Mitigation Plan, dated January 17, 2005, and completed the first update in 2012 to better understand Oakland County hazards, their impacts and to identify ways to mitigate those risks. The second update took place in 2017. This Plan represents the fourth iteration of the hazard mitigation plan for the county.

The following communities are participating in this plan.

2023 Participating Jurisdictions	Participated in 2017/2018 Plan?
Oakland County	Yes
Addison, Township of	Yes
Auburn Hills, City of	Yes
Berkley, City of	Yes
Beverly Hills, Village of	Yes
Bingham Farms, Village of	Yes
Birmingham, City of	Yes
Bloomfield Hills, City of	Yes
Bloomfield, Township of	Bloomfield Township and Bloomfield Village maintained their own Mitigation Plan in 2017/18. Bloomfield Village is a nonpolitical entity within Bloomfield Township.
Brandon, Township of	Yes
Clarkston, City of	Yes
Clawson, City of	Yes
Commerce, Township of	Yes
Farmington, City of	Yes
Farmington Hills, City of	Yes
Ferndale, City of	Yes
Franklin, Village of	Yes
Groveland, Township of	Yes
Hazel Park, City of	Yes
Highland, Township of	Yes
Holly, Township of	Yes
Holly, Village of	Yes
Huntington Woods, City of	Yes
Independence, Township of	Yes
Keego Harbor, City of	Yes
Lake Angelus, City of	Yes
Lake Orion, Village of	Yes
Lathrup Village, City of	Yes

Leonard, Village of	Yes
Lyon, Township of	Yes
Madison Heights, City of	Yes
Milford, Township of	Yes
Milford, Village of	Yes
Northville, City of	Yes
Novi, City of	Yes
Novi, Township of	Yes
Oakland, Township of	Yes
Oak Park, City of	Yes
Orchard Lake, City of	Yes
Orion, Township of	Yes
Ortonville, Village of	Yes
Oxford, Township of	Yes
Oxford, Village	Yes
Pleasant Ridge, City of	Yes
Pontiac, City of	Yes
Rochester, City of	Yes
Rochester Hills, City of	Yes
Rose, Township of	Yes
Royal Oak, City of	Developed and maintained their own plan in 2017/2018. Joined the County's plan in 2023.
Royal Oak, Township of	Yes
Southfield, City of	Yes
South Lyon, City of	Yes
Southfield, Township of	Yes
Springfield, Township	Yes
Sylvan Lake, City of	Yes
Troy, City	Yes
Walled Lake, City	Yes
Waterford, Township of	Yes
West Bloomfield, Township of	Yes
White Lake, Township of	Yes
Wixom, City of	Yes
Wolverine, Village of	Yes

This is a multi-jurisdictional hazard mitigation plan, and seeks to identify the county's and individual communities' hazards and understand their impact on vulnerable assets, including residents and property. With that understanding, the plan sets forth solutions that, if implemented, have the potential to significantly reduce threat to life and property. The plan is based on the premise that hazard mitigation works. With increased attention to managing natural, technological, and manmade hazards, communities can reduce the threats to citizens and through proper land use and emergency planning can avoid creating new problems in the future. Many solutions can be implemented at minimal cost and social impact.

This is not an emergency response or management plan. Certainly, the plan can be used to identify weaknesses and refocus emergency response planning. Enhanced emergency response planning is an important mitigation strategy. However, the focus of this plan is to support better decision-making directed toward avoidance of future risk and the implementation of activities or projects that will eliminate or reduce the risk for those that may already have exposure to a hazard threat.

The Oakland County Hazard Mitigation Plan was also created with the goal of substantially and permanently reducing the county's vulnerability to hazards through sound public policy. By increasing public awareness of potential harm, documenting resources for risk reduction and loss prevention, and identifying activities to guide the development of less vulnerable and more sustainable communities, this plan aims to protect citizens, critical facilities, infrastructure, private property, and the natural environment.

1.1 Purpose

This plan exists to identify natural and manmade hazard threats to the community, prepare mitigation management strategies to address those threats, develop short-term and long-term goals and objectives for mitigation planning, and to fulfill federal, state, and local hazard mitigation planning obligations. The intent of this plan is to enhance awareness of and provide mitigation strategies for elected officials, agencies, and the public and develop actions that will minimize negative outcomes to Oakland County's citizens, the economy, and the environment due to potential natural and manmade hazard threats. The well-being of the county and local communities rests on reducing risks to life and property in the event of a hazard event or emergency/disaster.

1.2 Hazard Mitigation and Hazards

1.2.1 Hazard Mitigation

Hazard mitigation is defined as cost-effective actions that have the effect of reducing, limiting, or preventing the vulnerability of people, culture, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life, culture, and property, fall into three categories:

1. Those that keep the hazard away from people, property, and structures;
2. Those that keep people, property, or structures away from the hazard; and
3. Those that reduce the impact of the hazard on victims, e.g., insurance.

Hazard mitigation measures must be practical, cost effective, and culturally, environmentally, and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not, in themselves, be costlier than the anticipated damages.

Hazard mitigation planning must be based on vulnerabilities and its primary focus must be on the point where capital investment and land use decisions are made. The placement of capital

investments, whether for homes, roads, public utilities, pipelines, or public works, determine to a large extent, the nature and degree of a community's hazard vulnerability. Once a capital facility is in place, there is little opportunity to reduce hazard vulnerability through correction of errors in location or construction. It is for this reason that often the most effective mitigation tools are zoning and other ordinances that manage development in high-vulnerability areas and building codes that ensure new buildings are constructed to withstand the damaging forces of anticipated hazards.

1.2.1 Hazards

The hazards analyzed in this plan include the following:

Natural Hazards

- Drought
- Earthquake
- Extreme Heat
- Flooding – Riverine and Urban/Depressional
- Fog
- Invasive Species
- High Hazard Dams
- Severe Summer Storms
    - Thunderstorms
    - Lightning
    - Microbursts/High Winds
    - Hailstorms
- Severe Winter Storms
    - Extreme Cold
    - Ice and Sleet Storms
    - Snowstorm/Blizzard
- Subsidence
    - Natural
    - Mining
- Tornadoes
- Wildfires

Manmade/Technological Hazards

Although non-natural hazards are not required by FEMA for inclusion in a hazard mitigation plan, Oakland County wishes to rank and mitigate against a comprehensive list of hazard events that could impact the county. Due to both the nature of non-natural hazards and the discretionary status regarding their inclusion, the following hazards of interest have been briefly and qualitatively assessed for the sake of public education and informing their inclusion within the hazard ranking and mitigation process.

- Active Shooter/Active Assailant

- Cybersecurity
- Fire (Structural)
- Gas/Oil Shortages or Supply Disruptions
    - Petroleum and Natural Gas Pipeline Accidents
- HAZMAT Incidents
    - Fixed Site
    - Transportation/Rail
- Infrastructure Failure
    - Bridges, Roads, Overpasses
    - Communications
    - Electrical Systems
    - Invasive Species
    - Sewer System
    - Storm Water System
    - Water System
- Nuclear Incidents
    - Power Plant Accidents
- Sociopolitical Hazards (Civil Disturbance, Social Unrest)
- Terrorism and Sabotage
- Transportation Accidents
    - Air
    - Highway
    - Marine
    - Rail
- Weapons of Mass Destruction

Other Hazards of Concern

- Public Health Emergencies

References

Federal Emergency Management Agency (FEMA). (2022, April 19). *Local Mitigation Planning Policy Guide.* Retrieved on March 28, 2023. Retrieved from: https://www.fema.gov/sites/default/files/documents/fOEM_local-mitigation-planning-policy-guide_042022.pdf

Chapter 2: Plan Process

The Plan was prepared to provide a basis for identifying and managing natural hazards and to meet federal, state, and local requirements for hazard mitigation and FEMA mitigation grant funding. This Plan is designed to comply with requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities and 44 CFR Part 201, which states that local governments, to be eligible for pre-disaster and/or post-disaster mitigation funds, must have an approved Hazard Mitigation Plan in place. The Plan is also designed to comply with the Federal Emergency Management Act, Federal Emergency Management Agency (FEMA) and Michigan State Police Emergency Management and Homeland Security Division Mitigation Recovery Section (EMHSD) guidance documents (particularly the Local Multi-Hazard Mitigation Planning Guidebook and Local Mitigation Planning Policy Guide) and other applicable federal, state and local regulations. This was accomplished by evaluating the impacts of known natural and man-made hazards, prioritizing mitigation alternatives and coordinating hazard mitigation with other Oakland County programs and policies.

Updating the Plan began with an initial kickoff meeting with the Oakland County Emergency Management and Homeland Security Planning Team, which was held on April 25th, 2023. Following this meeting, the planning process involved a review of the existing Plan; updating Oakland County's hazard history and risk assessment; gathering information on local hazards from individual communities; gathering input on hazard priorities; identifying specific vulnerabilities, impacts, and desired mitigation strategies; evaluating the previous Plan goals, and mitigation strategies; determining the status of previous mitigation strategies and Action Plans; identifying repetitive loss properties; facilitating the activities of the steering committee and conducting multiple stakeholder and public meetings, including outreach activities.

Information regarding hazards in the county and applicable mitigation strategies were obtained from four webinars held on June 9th, 2023, June 15th, 2023 (morning and afternoon session), and June 16th, 2023, and three workshops held in the county on July 17th, July 19th, and July 20th. An Oakland County Hazard Mitigation Plan – A Draft Review meeting was held on September 27, 2023.

In summary, the planning process consisted of the following key tasks:

Task 1: Organize Resources

The Oakland County Emergency Management and Homeland Security created a planning team to attend meetings, gather data and historical information, review drafts, and participate in mitigation brainstorming sessions. In addition to the core planning team, a steering committee was formed to provide overall guidance and direction throughout the mitigation planning process (see Steering Committee).

Task 2: Risk Assessment

The planning team identified the hazards to include in this Plan, as well as hazard profiles to address the probability, extent, vulnerabilities, and impacts associated with each hazard. The team then used local resources to inventory the county's assets and estimate losses. The core planning team, steering committee, and jurisdictional representatives provided input and subject-matter expertise throughout this process.

Task 3: Public Involvement

A comprehensive public survey was conducted and reached 933 residents. As part of this survey, steering committee members, community representatives, and the general public were asked to rate each of the hazards in terms of perceived risk. They were also asked to rate "mitigation importance" for each of the identified hazards in the Plan. Local jurisdictions shared the meeting information on their websites, Facebook pages, X (formerly Twitter) accounts, and community newsletters. Information from this survey was used to inform the hazard risk prioritization process and to ensure the Plan adequately addressed the public's concerns and priorities. A public forum was advertised and was held in the county on July 19th, 2023, which provided local residents with an opportunity to provide input into the Plan. A draft of the Plan was made available on the County web site for review and comment. The September 27, 2023, draft review meeting was made available for stakeholders and the public to attend. A video of the meeting was also posted for those not able to attend.

Task 4: Develop Mitigation Strategies

The planning team met with representatives of each participating community to develop and prioritize mitigation strategies and action items that would reduce the costs of disaster response and recovery, protect people and infrastructure, and minimize overall disruption to the county in the event of a disaster (see Chapter 7: Mitigation Strategies and Actions).

Task 5: Complete the Plan

The core planning team compiled all of the relevant sections of the Plan to produce a draft plan for review. The Plan was submitted to the Michigan State Police, Emergency Management and Homeland Security Division's (MSP/EMHSD) Mitigation Program and to the Federal Emergency Management Agency for review.

Task 6: Plan Adoption

The Oakland County Emergency Management and Homeland Security coordinated the effort to ensure the Plan was formally adopted by each participating jurisdiction.

Oakland County Hazard Mitigation Plan History

This multi-jurisdictional Hazard Mitigation Plan (the Plan or HMP) was originally created in 2005. It was updated in 2011/2012 for Oakland County, and the communities within Oakland County, to better understand natural and man-made hazards and their impacts and to identify ways to mitigate those hazards to protect the health, safety and economic interests of its residents. The

plan was again updated in 2017/2018. The current 2023 update includes each of the 62 communities within Oakland County, and builds on the previous updates.

2.1 Defining the Planning Area

The planning area is defined as all incorporated and unincorporated areas of Oakland County, as well as the incorporated areas that cross county boundaries. As such, Oakland County, which includes the unincorporated areas in the County, and 62 participating jurisdictions intend to adopt and implement the Plan. All partners to this Plan have jurisdictional authority within this planning area.

2.2 Establishment of the Planning Partnership

Each jurisdiction participating in the Plan was asked to provide a designated point of contact for the jurisdiction and confirmed the jurisdiction's commitment to the process and understanding of expectations. A list of the participating jurisdictions is provided in **Chapter 1: Introduction.**

2.3 Plan Participation

2.3.1 Core Planning Team

The core planning team consisted of key members of Oakland County Emergency Management and Homeland Security and Integrated Solutions Consulting. The Oakland County Oakland County Emergency Management and Homeland Security provided contract administration, participation on the Steering Committee, local matching funds for the development of this Plan (in the form of staff salaries and direct expenses), Geographic Information System (GIS) data, technical and regional information, meeting facilities and printing and duplication services. Oakland County continued to be instrumental in assisting in the preparation of county maps and data, providing a meeting location for the workshops, and coordinating various Oakland County departments. Oakland County is responsible for utilization, updating and oversight of the Plan and supporting local units of government with grant funding.

Meetings were held bi-weekly throughout the planning process. Key members of the core planning team are provided below.

Table 2-1. Core Planning Team

Name	Title	Organization
Thom Hardesty	Director	Oakland County Emergency Management and Homeland Security
Michael Kamenec	Emergency Management Specialist	Oakland County Emergency Management and Homeland Security
Robert Seeley	Chief	Oakland County Emergency Management and Homeland Security

2.3.2 Steering Committee

Hazard mitigation planning enhances collaboration and support among diverse parties whose interests can be affected by hazard losses.

During the 2023 update of the Plan, the steering committee agreed to meet as often as needed throughout the course of the plan's development. The core planning team facilitated each steering committee meeting, which addressed a set of objectives based on the work plan established for the Plan.

The steering committee was responsible for:

- The updating and prioritizing of hazards that impact Oakland County.
- Updating the plan's goals and priorities.
- The overall planning area's capability assessment and consideration of mitigation alternatives.
- The identification of new mitigation actions and the update of past countywide mitigation action items.
- Coordination and outreach with key stakeholders and planning partners.
- Ensure the needs of underserved populations are met through the planning process.
- Review the draft of the Plan.

The steering committee that supported the 2023 Oakland County NHMP update is detailed in the following table:

Table 2-2. Steering Committee

Name	Title	Organization
Thom Hardesty	Director	Oakland County Emergency Management and Homeland Security
Michael Kamenec	Emergency Management Specialist	Oakland County Emergency Management and Homeland Security
Robert Seeley	Chief	Oakland County Emergency Management and Homeland Security
James Schafer	Senior Planner	Oakland County Economic Development Department
Erin Quetell	Chief	Oakland County Office of Sustainability
Debbie Sedam	Quality and Safety Coordinator	Oakland County Water Resources Commissioner
Melanie Grund	Community Liaison	Oakland County Neighborhood and Housing Development
Dave DeBoer	Deputy Fire Marshal	West Bloomfield Fire Dept. / Local Emergency Planning Committee

2.3.3 Local Jurisdiction Participation

The following local jurisdictions participated in the 2023 NHMP (see Table 2-3). Local representatives, participation activities, and planning documents to facilitate the planning process are provided in Appendix A: Plan Participation and Documentation and Appendix D: Jurisdiction Participation & Sign-in Sheets.

Table 2-3. Participating Jurisdictions

Jurisdiction	At least 1 Resident from Community Completed Public Survey	Webinars	Hazard Mitigation Plan Workshop	Other Participating Activities (i.e., Meeting with Planning Team, Online Planning System)	Hazard Analysis	Identified New Mitigation Action(s)	Reviewed/ Updated Past Mitigation Project(s), if applicable
Oakland County	Yes	X	X	X	X	X	X
Addison Township	Yes	X	X	X	X	X	X
City of Auburn Hills	Yes		X	X	X	X	X
City of Berkley	Yes	X	X	X	X	X	X
Village of Beverly Hills	Yes	-	X	X	X	X	X
Village of Bingham Farms	Yes	X	X	X	X	X	X
City of Birmingham	Yes	X	-	X	X	X	X
Bloomfield Township	Yes	-	-	X	X	X	X
City of Bloomfield Hills	Yes	-	-	X	X	X	X
Brandon Township	Yes	X	X	X	X	X	X
City of Clarkston	Yes	-	-	X	X	X	X
City of Clawson	Yes	-	-	X	X	X	X
Commerce Township	Yes	-	-	X	X	X	X
City of Farmington	Yes	X	-	X	X	X	X
City of Farmington Hills	Yes	X	X	X	X	X	X
City of Ferndale	Yes	-	-	X	X	X	X
Village of Franklin	Yes	X	X	X	X	X	X

Jurisdiction	At least 1 Resident from Community Completed Public Survey	Webinars	Hazard Mitigation Plan Workshop	Other Participating Activities (i.e., Meeting with Planning Team, Online Planning System)	Hazard Analysis	Identified New Mitigation Action(s)	Reviewed/ Updated Past Mitigation Project(s), if applicable
Groveland Township	Yes	-	-	X	X	X	X
City of Hazel Park	Yes	X	X	X	X	X	X
Highland Township	Yes	-	X	X	X	X	X
Holly Township	Yes	-	-	X	X	X	X
Village of Holly	Yes	-	-	X	X	X	X
City of Huntington Woods	Yes	X	X	X	X	X	X
Independence Township	Yes	-	-	X	X	X	X
City of Kego Harbor	Yes	-	-	X	X	X	X
City of Lake Angelus	Yes	-	-	X	X	X	X
Village of Lake Orion	Yes	-	-	X	X	X	X
City of Lathrup Village	Yes	X	-	X	X	X	X
Village of Leonard	Yes	X	X	X	X	X	X
Lyon Township	Yes		X	X	X	X	X
City of Madison Heights	Yes	-	X	X	X	X	X
Milford Township	Yes	X	X	X	X	X	X
Village of Milford	Yes	X	X	X	X	X	X
City of Northville	Yes	X	-	X	X	X	X
City of Novi	Yes	X	X	X	X	X	X
Novi Township	Yes	-	-	X	X	X	X
City of Oak Park	Yes	-	X	X	X	X	X
Oakland Township	Yes	-	-	X	X	X	X
City of Orchard Lake	Yes	-	-	X	X	X	X

Jurisdiction	At least 1 Resident from Community Completed Public Survey	Webinars	Hazard Mitigation Plan Workshop	Other Participating Activities (i.e., Meeting with Planning Team, Online Planning System)	Hazard Analysis	Identified New Mitigation Action(s)	Reviewed/ Updated Past Mitigation Project(s), if applicable
Orion Township	Yes	-	X	X	X	X	X
Village of Ortonville	Yes	X	X	X	X	X	X
Oxford Township	Yes	X	X	X	X	X	X
Village of Oxford	Yes	X	X	X	X	X	X
City of Pleasant Ridge	Yes	X	-	X	X	X	X
City of Pontiac	Yes	-	-	X	X	X	X
City of Rochester	Yes	X	X	X	X	X	X
City of Rochester Hills	Yes	X	X	X	X	X	X
Rose Township	Yes	-	-	X	X	X	X
City of Royal Oak	Yes	X	X	X	X	X	X
Royal Oak Township	Yes	-	-	X	X	X	X
City of South Lyon	Yes	X	X	X	X	X	X
City of Southfield	Yes	X	-	X	X	X	X
Southfield Township	Yes	X	X	X	X	X	NA
Springfield Township	Yes	-	X	X	X	X	X
City of Sylvan Lake	Yes	-	X	X	X	X	X
City of Troy	Yes	-	-	X	X	X	X
City of Walled Lake	Yes	-	-	X	X	X	X
Waterford Township	Yes	X	X	X	X	X	X
West Bloomfield Township	Yes	X	X	X	X	X	X
White Lake Township	Yes	X	X	X	X	X	X
City of Wixom	Yes	X	X	X	X	X	X

Jurisdiction	At least 1 Resident from Community Completed Public Survey	Webinars	Hazard Mitigation Plan Workshop	Other Participating Activities (i.e., Meeting with Planning Team, Online Planning System)	Hazard Analysis	Identified New Mitigation Action(s)	Reviewed/ Updated Past Mitigation Project(s), if applicable
Village of Wolverine Lake	**Yes**	**X**	-	**X**	**X**	**X**	**X**

The focus of the 2023 Oakland County HMP Update was a series of structured discussions with, and opportunities for feedback from, Oakland County officials, municipal officials, affected stakeholders and the general public. An online planning system enabled the planning team to keep in contact with the affected parties and supply information to a broad audience. In particular, these included the following opportunities for outreach and input:

- A project online planning system (https://mi-oakland-hs.isc-cemp.com/)
- Creation and distribution of online forms so county, municipal, and stakeholders could easily submit local hazard risk concerns and mitigation strategies.
    - Hazard Form: https://integratedsolutions.wufoo.com/forms/khx8k751tbt3wg/
    - New Mitigation Action Projects Form: https://integratedsolutions.wufoo.com/forms/qo0ndg617ys5lw/
- Meetings, email, and phone communication with leaders and representatives from each of the communities.

Table 2-4. Jurisdictions NOT Participating

Jurisdiction	Have Not Received Letter Declining Participation	Have Received Letter Declining Participation
None	X	

The following sections explain, in greater detail, the key activities and supporting documentation. More information about each of these activities is also provided in Appendix A: Plan Participation and Documentation and Appendix D: Jurisdiction Participation & Sign-in Sheets.

2.3.4 Mitigation Workshop

Three workshops were held on July 17, 2023, July 19, 2023, and July 20, 2023, in Oakland County to identify hazards and update and consider new mitigation strategies. In addition, individual meetings were held with jurisdictions who were unable to bring their local planning teams to these workshops or needed additional guidance and support. Prior to the workshops, four webinars were held to provide information to prepare the jurisdictions for the workshop. Webinars were held June 9, 2023, June 15, 2023 (morning and afternoon session), and June 16, 2023. See Appendix A: Plan Participation and Documentation for a list of the individuals who attended the Workshops and for copies of the sign-in sheets.

The purpose of the workshop was to ensure local jurisdictions had the opportunity to identify their communities' risks and to identify/update their mitigation strategies and priorities. These workshops included local planning members from each of the communities. Participants validated the county's risk assessment findings, described specific hazard risks and concerns for their own communities, updated existing mitigation actions/strategies from the 2017/18 Plan, and worked with their local planning team to identify new mitigation initiatives.

2.3.5 Other Stakeholders and Organizations

Throughout the planning process, key stakeholders, departments, and community organizations were involved in providing key input, data, disseminating information about the Plan, meetings, and reviewing the draft of the plan.

Table 2-5. Stakeholders and Organizations

Stakeholder and Organization	Contribution
Michigan State University Extension	Agriculture, agribusiness, natural resources data, climate change
University of Michigan Transportation Research Institute	Traffic information and data
Oakland County Water Resources Commissioner's Office	Flood information
Road Commission for Oakland County	Road and traffic information
Oakland County Planning and Economic Development Services	Plan integration, general plan, community data, and development trends, meetings
Oakland County Health Division	Public health hazard information, meetings
Oakland County Sheriff's Office	Capability and crime data, meetings
Oakland County Office of Sustainability	Meetings, sustainability
Oakland County Neighborhood and Housing Development	Meetings, outreach
Oakland County Parks and Recreation	Meeting
Clinton River Watershed Council	Greenspace and new mitigation actions, meetings
U.S. Geological Survey	Geologic information, earthquake information
U.S. Army Corps of Engineers	Dam and levee data
National Weather Service	Natural hazard history and information
Southeast Michigan Council of Governments (SEMCOG)	Future development trends, demographic information, traffic information
Michigan State Police Emergency Management and Homeland Security Division	2019 Michigan Hazard Mitigation plan, mitigation guidance, plan review
Michigan DNR	Wildfire data, natural resources
DHS: FEMA	Mitigation policy, National Risk Index

2.3.6 Neighboring Jurisdictions

The neighboring counties were invited to review and comment on the draft plan.

Table 2-6. Neighboring Jurisdictions

Neighboring Jurisdiction	Participation Description
Genesee County LEPC	Invited to review and comment on the draft plan.
Lapeer County LEPC	Invited to review and comment on the draft plan.

Livingston County LEPC	Invited to review and comment on the draft plan.
Macomb County LEPC	Invited to review and comment on the draft plan.
St. Clair County LEPC	Invited to review and comment on the draft plan.
Washtenaw County LEPC	Invited to review and comment on the draft plan.
Wayne County LEPC	Invited to review and comment on the draft plan.

A number of individuals outside the planning area participated in the *Oakland County Hazard Mitigation Plan – A Draft Review/Planners Gathering* meeting on September 27, 2023. Appendix D includes the full list of participants. Notable attendees from outside the planning area include:

- City of Hesperia
- City of New Baltimore
- Hillsdale City Planning Commission
- Macomb County Public Works
- Michigan Association of Planning
- Tulare County
- Washington Township

2.4 Public Involvement and Participation

Broad public participation in the planning process helps ensure that diverse points of view about the planning area's needs are considered and addressed. The public must have opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval (44 CFR, Section 201.6(b)(1)). As such, a number of public outreach activities were organized to ensure public participation and input were obtained. The following sections explain, in greater detail, the key activities and supporting documentation. More information about each of these activities is also provided in Appendix B: Public Involvement Activities and Documentation.

2.4.1 Community Preparedness and Mitigation Survey

Surveys were distributed through a variety of methods beginning on June 1, 2023, including e-mail blasts and social media platforms, such as Facebook and X (formerly Twitter). The survey was available to the community until September 30, 2023. Community organizations were critical in connecting county and municipal residents with the survey, and Oakland County utilized their broad-based distribution lists of community stakeholders and partners to disseminate the survey to residents and leaders of underserved communities and organizations. In total, 933 residents participated in the 30-question survey. Results helped to validate the hazards included in the plan, the hazard ranking process, and areas where the

county and municipalities could further improve outreach and education efforts. See Appendix C for questionnaire results.

2.4.2 Public Forum & Outreach

The public was invited to attend a public forum held on July 19th, 2023. The public meeting was advertised locally prior to the meeting.

The purpose of the meeting was to provide an overview of the project, share and validate the hazard risk findings, and receive public input on important mitigation initiatives. Attendees were given access to important information regarding the Plan, and an opportunity to provide input regarding the Plan and planning process.

2.4.3 Public Plan Review and Feedback on Draft of the Plan

At the conclusion of the planning process, the public was offered an opportunity to provide feedback to the draft Plan. The public version of the plan was made available at the following dedicated hazard mitigation plan site: https://www.oakgov.com/community/emergency-management/need-to-know/disaster-planning/hazard-mitigation-plan

The draft Plan was made available on the web page until the Plan was formally approved and adopted. To further facilitate continued public involvement in the planning process, the public will have an opportunity to provide continual feedback and input. As future needs and concerns arise, or if the public would like to provide feedback regarding the latest version of the Oakland County Hazard Mitigation Plan, the public is invited to use the form below (which is provided on the web site) to provide comments.

- **Link to Plan Comment Form:** https://integratedsolutions.wufoo.com/forms/comment-form-oakland-county-mitigation-plan/

The *Oakland County Hazard Mitigation Plan – A Draft Review/Planners Gathering* meeting was held on September 27, 2023. For those that were not able to attend, a link to the video was made available.

Link to Video of Public Meeting/Planners Gathering Meeting:

- https://www.youtube.com/watch?v=5uDj68aYD7M

2.4.4 How Public Input was Incorporated into the Plan

Information and feedback gained from the survey and public forum provided valuable data to validate and confirm the risk assessment findings and potential mitigation strategies. Specifically, feedback from the public offered during the public forum on July 19, 2023, offered greater insights to the public's concerns regarding specific hazards and their impacts. The public also offered specific initiatives they felt would create greater resiliency for the county and its residents.

Survey results helped to validate the hazards included in the plan, the hazard ranking process, and areas where the county and municipalities could further improve outreach and education efforts. Open-ended responses, specifically regarding their experience with damages from past hazards, helped to validate hazard-specific impact data in Chapter 4: Risk Assessment. These, and related findings, helped the planning team determine meaningful mitigation projects.

2.5 Equity Considerations for Underserved Communities and Socially Vulnerable Populations

Some disasters occur on larger scales and are more impacted by built environments and are most likely to continually impact those most at risk because of existing health conditions, lack of resources, being underserved by past mitigation planning work, facing historical disinvestment in their communities, or other factors. In this case, people in widely different locations can be the most harmed by repeating disaster cycles, so mitigation strategies should also work to break cycles of loss caused by social and economic disparities. Hazard mitigation strategies can reduce existing risk by, for example, relocating a building out of an area that frequently floods. In each case, an attempt has been made to lessen the harm of a future flood before the event happens. Strategies may also seek to make future development less vulnerable to hazards at the time it is built. Examples would be requiring new structures to be elevated above predicted flood levels or by building structures to better withstand future hazards. Hazard mitigation plans are designed to involve the input of stakeholders from different perspectives to ensure plans use the best available data, are aligned with the needs of the entire community, and are in alignment with other plans, such as comprehensive plans, capital improvement plans, and climate action plans.

This Plan continues to recognize that all members of the community are not impacted in the same way by natural disasters. Some community members are at more risk, for a number of possible reasons. A mitigation strategy that uses a ‘one size fits all’ approach, and does not recognize different levels of risk, will not adequately or efficiently support historically underserved populations; and can actually make inequalities worse after a disaster.

This version of the Plan highlights equity as a key part of the overall plan vision. This Plan update seeks to continue to develop a shared understanding among participants of how hazard mitigation can be made more inclusive and be proactive in creating strategies that reduce existing disparities in risk and hazard recovery. Addressing the whole community requires an understanding that while a single solution for all seems fair, it does not address historical inequalities and current differences in age, financial resources, housing stability, neighborhood investment, health or ability, and access to government services. In mitigation planning, this means that successfully reducing risk in the most meaningful and efficient way requires understanding how the distribution of resources will actually reduce risk and for whom.

Equitable mitigation success should be measured by assessing who was most impacted in loss of life or financial harm by past and future disasters, quantifiable reductions of vulnerability to

those most at risk, and increasing engagement with historically underserved populations and community organizations to better understand how plans and processes and natural hazard events are affecting different communities.

Chapter 3: Community Profile describes different demographic and economic factors in Oakland County. This section includes FEMA's National Risk Index scores for Oakland County for social vulnerability and community resilience. Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood (FEMA, 2023). Community resilience is defined as the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions (FEMA, 2023).

The Community Profile section also included an analysis of the census tracts in Oakland County which are identified as "disadvantaged" by the U.S. Council on Environmental Quality (ACEQ). According to the U.S. Council on Environmental Quality (ACEQ), a community is identified as "disadvantaged" if it is located in a census tract that is at or above the threshold for one or more environmental, climate, or other burdens, and at or above the threshold for associated socioeconomic burdens, including poverty and language barriers (U.S. Council on Environmental Quality, 2022). The total population of these 21 census tracts is 112,641 which is 22% of the total Oakland County population. Each census tract is further identified in Appendix F, illustrating specific socioeconomic burdens to each census tract. This information was used as part of the hazard risk ranking process and to determine potential inequities and disparities regarding potential impacts from natural hazards.

Chapter 4: Risk Assessment includes a hazard ranking methodology that specifically assesses the impact of the hazard on underserved populations. Furthermore, each hazard profile included FEMA's Expected Annual Loss analysis and National Risk Index score for the county. The Risk Index score is based on the following components: Social Vulnerability, Community Resilience, and Estimate Annual Loss (EAL), with EAL based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors, for a total of five risk factors (FEMA, 2023).

Mitigation goals were updated to encourage greater participation and engagement from underserved populations and groups, and aligns with the county's Strategic Plan, which prioritizes diversity, inclusion, and equity. During stakeholder meetings, in which new and ongoing mitigation strategies were discussed, jurisdictional representatives were encouraged to consider how the mitigation actions directly and/or indirectly resulted in equitable outcomes.

During the plan update process, a comprehensive community preparedness questionnaire was developed and disseminated. The questionnaire was developed with a specific focus to better understand the challenges and concerns related to access and functional needs, access to information, ability to recover, and services needed, especially for those who may be underserved or lack access to key resources. The Oakland County Neighborhood and Housing Development and Office of Diversity, Equity & Inclusion played a key role in ensuring the questionnaire was inclusive. Melanie Grund, Community Liaison, and contact for "Welcoming

Oakland" provided important contributions to this effort. As a reflection of Oakland County's commitment to the goal of operationalizing equity by taking actions to integrate diversity, equity, and inclusion within county operations, "Welcoming Oakland" members include the following organizations: ACCESS, Arab American and Chaldean Council, Association of Chinese Americans, Inc., Centro Multicultural La Familia, Chaldean American Ladies of Charity (United Community Family Services), Chaldean Community Foundation, Council of Asian Pacific Islanders, FBI, Global Detroit, Global Troy, Jewish Community Relations Council, La Casa Amiga (Catholic Charities of Southeast Michigan), Michigan Immigrant Rights Council, Oakland County Board of Commissioners, Oakland County Community Corrections, Oakland County Executive Office, Oakland County Neighborhood & Housing Development, Oakland County Sheriff's Office, Oakland County Workforce Development, Oakland Literacy Council, Oakland Schools, Samaritas, Waterford Refugee Welcome Alliance, and Welcoming Michigan.

The county and participating jurisdictions have a responsibility to ensure equitable outcomes in the implementation of this Plan and to ensure that action is taken to reduce vulnerabilities to disasters experienced disproportionately by marginalized populations.

When conducting community engagement related to implementation of or update to this Plan, the county will ensure that the whole community has an opportunity to participate in the process and discussion. FEMA defines the "whole community" as "individuals and families, including those with access and functional needs, businesses, faith-based and community organizations, nonprofit groups, schools and academia, media outlets, and all levels of government, including state, local, tribal, territorial, and federal partners that have a shared responsibility in emergency preparedness and mitigation" (FEMA, 2011).

2.6 Existing Plans, Studies, and Reports

Hazard mitigation planning must include a review and incorporation, if appropriate, of existing plans, studies, reports, and technical information (44 CFR, Section 201.6(b)(3)). **Chapter 5: Capabilities and Integration of Mitigation Measures** provides a review of key studies, plans, laws, and ordinances in effect within the planning area that can affect hazard mitigation actions. All these documents were reviewed as part of the plan update process. Additionally, each chapter in this Plan includes its own reference section, which also acknowledges key plans, studies, and technical information utilized in this Plan.

2.7 Plan Adoption

Formal adoption of a Hazard Mitigation Plan is required for FEMA for approval. The Draft Plan was provided to members of the project Steering Committee. Copies of the Draft Plan were also provided to each municipality in Oakland County, to other stakeholders and the public via the Oakland County Emergency Management and Homeland Security website.

Upon completing the comment/review period, the plan was submitted to the Michigan State Police, Emergency Management and Homeland Security Division's (MSP/EMHSD) Mitigation Program and to the Federal Emergency Management Agency for review. Upon FEMA review and approval pending adoption, the Plan was presented to the Oakland County Board of Commissioners for adoption. The Oakland County Hazard Mitigation Plan was formally adopted by the Oakland County Board of Commissioners on December 7, 2023.

2.7.1 Community Adoption

FEMA and the Michigan State Police also require that all multi-jurisdictional Plans be adopted, in whole or in part, by individual municipalities within the planning area. Municipal officials were informed of this requirement. A sample resolution of adoption was provided to each community. Information regarding local hazard priorities and local hazard mitigation strategies is included in separate subsections of the Plan so that each community may readily reference and adopt sections specific to their municipality.

See **Volume II:**

- County Mitigation Actions (County Departments and Mitigation Actions that Apply to the County and All Participating Municipalities)
- Municipal Annexes (Cities, Townships, and Villages)

Table 2-7. Community Adoptions

Community	Items Adopted	Date Adopted
Addison, City of	Resolution to adopt Hazard Mitigation Plan	
Auburn Hills, City of	Resolution to adopt Hazard Mitigation Plan	
Berkley, City of	Resolution to adopt Hazard Mitigation Plan	
Beverly Hills, Village of	Resolution to adopt Hazard Mitigation Plan	
Bingham Farms, Village of	Resolution to adopt Hazard Mitigation Plan	
Birmingham, City of	Resolution to adopt Hazard Mitigation Plan	
Bloomfield Hills, City of	Resolution to adopt Hazard Mitigation Plan	
Bloomfield, Township of	Resolution to adopt Hazard Mitigation Plan	
Brandon, Township of	Resolution to adopt Hazard Mitigation Plan	
Clarkston, City of	Resolution to adopt Hazard Mitigation Plan	
Clawson, City of	Resolution to adopt Hazard Mitigation Plan	
Commerce, Township of	Resolution to adopt Hazard Mitigation Plan	
Farmington, City of	Resolution to adopt Hazard Mitigation Plan	
Farmington Hills, City of	Resolution to adopt Hazard Mitigation Plan	
Ferndale, City of	Resolution to adopt Hazard Mitigation Plan	
Franklin, Village of	Resolution to adopt Hazard Mitigation Plan	
Groveland, Township of	Resolution to adopt Hazard Mitigation Plan	
Hazel Park, City of	Resolution to adopt Hazard Mitigation Plan	
Highland, Township of	Resolution to adopt Hazard Mitigation Plan	
Holly, Township of	Resolution to adopt Hazard Mitigation Plan	
Holly, Village of	Resolution to adopt Hazard Mitigation Plan	
Huntington Woods, City of	Resolution to adopt Hazard Mitigation Plan	
Independence, Township of	Resolution to adopt Hazard Mitigation Plan	
Keego Harbor, City of	Resolution to adopt Hazard Mitigation Plan	
Lake Angelus, City of	Resolution to adopt Hazard Mitigation Plan	
Lake Orion, Village of	Resolution to adopt Hazard Mitigation Plan	

Lathrup Village, City of	Resolution to adopt Hazard Mitigation Plan	
Leonard, Village of	Resolution to adopt Hazard Mitigation Plan	
Lyon, Township of	Resolution to adopt Hazard Mitigation Plan	
Madison Heights, City of	Resolution to adopt Hazard Mitigation Plan	
Milford, Township of	Resolution to adopt Hazard Mitigation Plan	
Milford, Village of	Resolution to adopt Hazard Mitigation Plan	
Northville, City of	Resolution to adopt Hazard Mitigation Plan	
Novi, City of	Resolution to adopt Hazard Mitigation Plan	
Novi, Township of	Resolution to adopt Hazard Mitigation Plan	
Oakland, Township of	Resolution to adopt Hazard Mitigation Plan	
Oak Park, City of	Resolution to adopt Hazard Mitigation Plan	
Orchard Lake, City of	Resolution to adopt Hazard Mitigation Plan	
Orion, Township of	Resolution to adopt Hazard Mitigation Plan	
Ortonville, Village of	Resolution to adopt Hazard Mitigation Plan	
Oxford, Township of	Resolution to adopt Hazard Mitigation Plan	
Oxford, Village	Resolution to adopt Hazard Mitigation Plan	
Pleasant Ridge, City of	Resolution to adopt Hazard Mitigation Plan	
Pontiac, City of	Resolution to adopt Hazard Mitigation Plan	
Rochester, City of	Resolution to adopt Hazard Mitigation Plan	
Rochester Hills, City of	Resolution to adopt Hazard Mitigation Plan	
Rose, Township of	Resolution to adopt Hazard Mitigation Plan	
Royal Oak, City of	Resolution to adopt Hazard Mitigation Plan	
Royal Oak, Township of	Resolution to adopt Hazard Mitigation Plan	
Southfield, City of	Resolution to adopt Hazard Mitigation Plan	
South Lyon, City of	Resolution to adopt Hazard Mitigation Plan	
Southfield, Township of	Resolution to adopt Hazard Mitigation Plan	
Springfield, Township	Resolution to adopt Hazard Mitigation Plan	
Sylvan Lake, City of	Resolution to adopt Hazard Mitigation Plan	
Troy, City	Resolution to adopt Hazard Mitigation Plan	
Walled Lake, City	Resolution to adopt Hazard Mitigation Plan	
Waterford, Township of	Resolution to adopt Hazard Mitigation Plan	
West Bloomfield, Township of	Resolution to adopt Hazard Mitigation Plan	
White Lake, Township of	Resolution to adopt Hazard Mitigation Plan	
Wixom, City of	Resolution to adopt Hazard Mitigation Plan	
Wolverine, Village of	Resolution to adopt Hazard Mitigation Plan	

References

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Chapter 3: Community Profile

3.1 Historical Overview

The earliest inhabitants of the area were Native Americans of the Ottawa, Ojibwa, and Potawatomi Tribes. Many of Oakland County's main transportation routes originated from Native American trails such as the Saginaw Trail (Woodward Avenue), Shiawassee Trail (Orchard Lake Road) and Grand River Trail (Grand River Avenue).

Figure 3-1. Map of Michigan

In 1818, a group of men from Detroit and Macomb County formed the Pontiac Company with intent to purchase land and establish a town within Oakland County. Later that same year, a group of professionals and businessmen from Detroit surveyed the area and reported on Oakland County's abundant natural resources.

On January 12, 1819, Oakland County was officially organized by proclamation of Governor Lewis Cass. The Oakland County seat was established in Pontiac, with financial and property contributions from the Pontiac Company. Oakland County was divided into 2 townships, Oakland Township in the north and Bloomfield Township in the south. By 1827, Oakland County was further divided to encompass 5 townships with the addition of Farmington, Troy, and Pontiac Townships.

The first official census of Oakland County was conducted in 1820 and reported a population of 330 people. The population quickly grew within the next 10 years to include 4,911 people in 1830. By 1870, Oakland County, population 40,867, was the fifth largest in the state. The 2010 U.S. Census reported 1,202,362 residents, which is second in Michigan only to Wayne County. According to Census projections, Oakland County has an estimated population of 1,269,431 people in 2022 (U.S. Census Bureau, 2023).

3.2 Geography and Climate

Oakland County covers approximately 907 square miles and is located in southeast Michigan, north of Wayne County and west of Macomb County. The topography of Oakland County ranges from flat to gently rolling. Oakland County contains the headwaters for five major river systems/watersheds, illustrated in Figure 3-2.

Weather in Oakland County is consistent with non-coastal areas of southeastern Michigan. Table 3-1 provides average monthly weather conditions in Oakland County as recorded by the National Weather Service (NWS) and National Oceanic and Atmospheric Administration (NOAA) (NOAA, 2023).

Table 3-8: Oakland County Temperature and Precipitation Averages

OAKLAND COUNTY, MI NOAA - AVERAGE MONTHLY TEMPERATURE AND PRECIPITATION			
Month	**Average High Temperature (F)**	**Average Precipitation (inches)**	**Average Snowfall (inches)**
January	32.3	2.23	14.0
February	35.2	2.08	12.5
March	45.9	2.43	6.2
April	58.7	3.26	1.5
May	70.3	3.72	0.0
June	79.7	3.26	0.0
July	83.7	3.51	0.0
August	81.4	3.26	0.0
September	74.4	3.22	0.0
October	62.0	2.53	0.0
November	48.6	2.57	1.9
December	37.2	2.25	8.9
Annual/Ave Total	**59.12**	**2.86**	**3.75**
Source: NOAA (May 2021)			

3.3 Land Use Patterns

Although Oakland County's Planning and Economic Development Services Department provides a variety of planning tools and services, Oakland County does not exercise land use or zoning control. Instead, each of the individual cities, townships and villages in Oakland County are zoned and exercise their own control regarding land use planning and permitting. The exception is the Village of Bloomfield which is a subdivision within Bloomfield Township and not a separate political jurisdiction.

The largest portion of land use in Oakland County is single-family residential followed by agricultural/rural residential. Since 2015, mixed-use land use has exhibited the greatest acreage increase at a 6.30% increase, since the previous version of this Plan. In the 2021 American

Community Survey, 76% of Oakland County's housing units were reported as single-unit detached homes and 22.0% as multi-unit housing units.

The greatest decline in land use acreage has been in hospitality acreage with a (-12.50%) decrease since the previous version of this Plan. Detailed land use according to Southeast Michigan Council Governments (SEMCOG) is illustrated in Table 3-2.

Figure 3-1: Watersheds

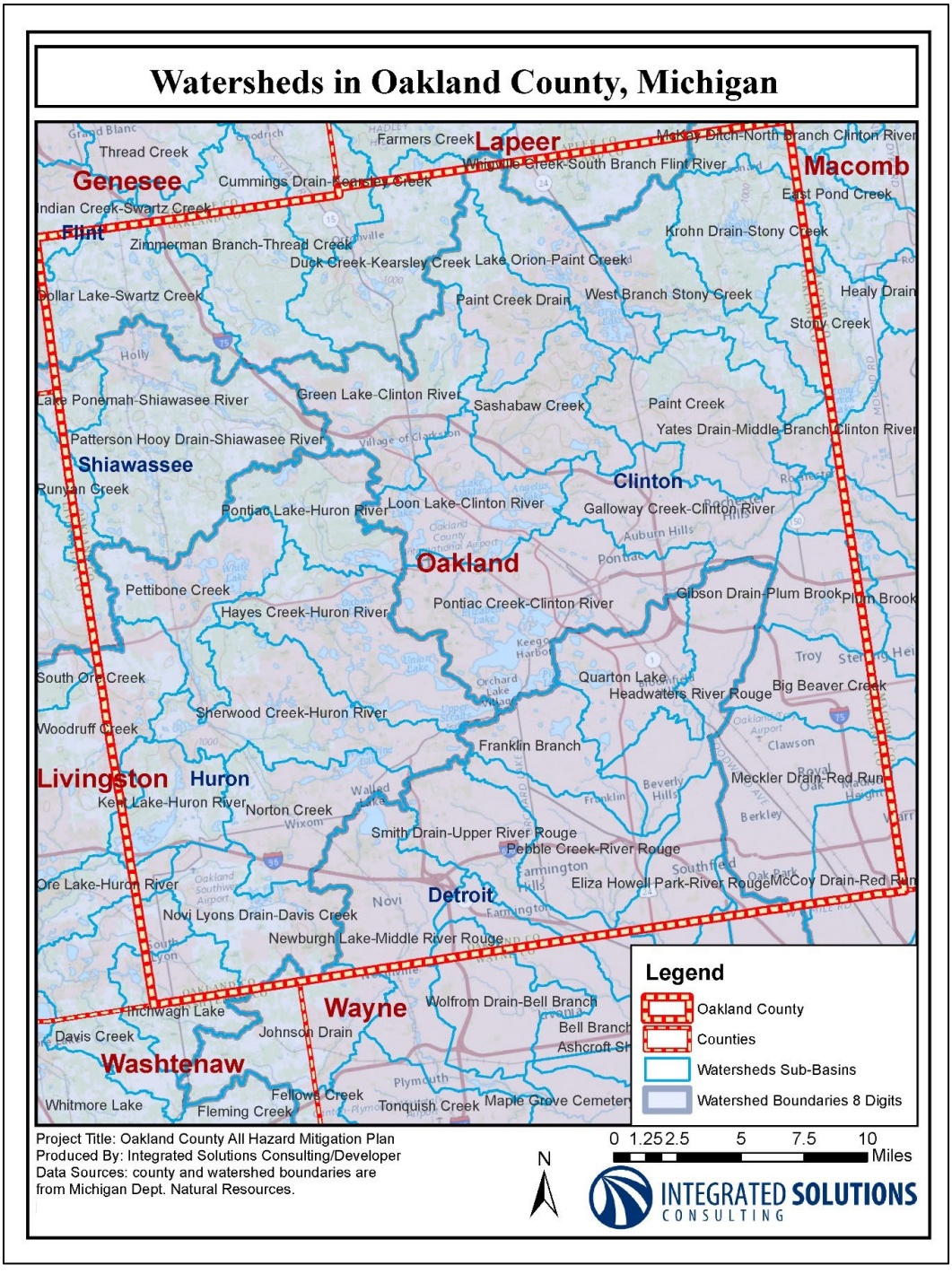


Table 3-9: 2020 Land Use Patterns & Trends

OAKLAND COUNTY, MI 2020 LAND USE				
Parcel Land Use	**Acres 2015**	**Acres 2020**	**Change 2015-2020**	**Pct Change 2015-2020**
Single-Family Residential	143,186.90	145,990.40	2,803.60	2%
Attached Condo Housing	7,475.70	7,306.50	-169.3	-2.30%
Multi-Family Housing	7,738.10	8,160.30	422.2	5.50%
Manufactured Home	3,442.60	3,445.70	3.1	0.10%
Agricultural/Rural Residential	130,543.40	129,630.80	-912.6	-0.70%
Mixed Use	166.9	177.5	10.6	6.30%
Retail	8,602.80	8,492.50	-110.4	-1.30%
Office	7,924	7,750.20	-173.8	-2.20%
Hospitality	2,072.30	1,813.80	-258.4	-12.50%
Medical	2,916.40	2,864.60	-51.9	-1.80%
Institutional	16,768.90	15,368	-1,400.90	-8.40%
Industrial	14,885	14,389.10	-495.9	-3.30%
Recreational/Open Space	60,029	61,352.10	1,323.10	2.20%
Cemetery	2,529.50	2,529.50	0	0%
Golf Course	11,903.40	11,528.30	-375.1	-3.20%
Parking	1,114.20	1,182.80	68.7	6.20%
Extractive	5,734.20	5,786.70	52.5	0.90%
TCU	8,360.50	8,508.40	147.9	1.80%
Vacant	61,211.10	61,762.10	551	0.90%
Water	28,731.40	28,851.30	119.9	0.40%
Not Parceled	55,200.50	53,646.20	-1,554.30	-2.80%
Total	**580,536.60**	**580,536.60**	**0**	**0%**
Source: SEMCOG (2020)				

3.4 Housing Trends

The median home value of owner-occupied housing units in Oakland County is approximately $299,800 while approximately 5% of all housing units in Oakland County are vacant (Census Reporter, 2023) in 2021.

Table 3-10: 2020 Oakland County Housing Trends

OAKLAND COUNTY, MI SEMCOG - HOUSING TYPE TRENDS				
Housing Type	**ACS 2010**	**ACS 2020**	**Change 2010-2020**	**New Units Permitted Since 2019**
Single Unit	359,718	370,652	10,934	6,530
Multi-Unit	151,100	155,464	4,364	7,204
Manufactured Homes or Other	15,875	15,978	103	0
Total	**526,693**	**542,094**	**15,401**	**13,734**
Units Demolished				(-1,484)
NET = Total Permitted - Demolished				**12,250**
Source: SEMCOG (2020)				

Table 3-11: 2020 Oakland County Building Permits

OAKLAND COUNTY, MI | SEMCOG – BUILDING PERMITS							
Year	**Single Family**	**Two Family**	**Attach Condo**	**Multi Family**	**Total Units**	**Total Demos**	**Net Total**
2000	4,285	120	633	346	5,384	390	4,994
2001	3,377	130	819	519	4,845	480	4,365
2002	3,234	116	1,284	644	5,278	428	4,850
2003	3,838	16	1,181	574	5,609	405	5,204
2004	3,829	90	2,241	331	6,491	548	5,943
2005	3,199	124	1,043	138	4,504	503	4,001
2006	1,607	72	438	185	2,302	400	1,902
2007	876	12	182	32	1,102	277	825
2008	543	8	79	139	769	324	445
2009	401	8	10	42	461	378	83
2010	794	4	39	37	874	290	584
2011	1,134	2	90	36	1,262	306	956
2012	1,707	30	150	84	1,971	502	1,469
2013	2,210	2	123	655	2,990	448	2,542
2014	2,022	4	89	294	2,409	487	1,922
2015	2,035	18	151	797	3,001	532	2,469
2016	1,928	2	201	946	3,077	524	2,553
2017	2,330	2	346	1,427	4,105	521	3,584
2018	1,989	38	367	860	3,254	508	2,746
2019	1,665	0	197	2,109	3,971	389	3,582
2020	1,618	0	305	1,365	3,288	355	2,933
2021	1,615	2	406	1,525	3,548	360	3,188
2022	1,497	14	214	927	2,652	359	2,293
2023	135	0	10	130	275	21	254

2000 to 2023 totals	**47,868**	**814**	**10,598**	**14,142**	**73,422**	**9,735**	**63,687**
Source: SEMCOG (2023)							

3.5 Transportation Network

There are approximately 6,152 miles of public roads within Oakland County (SEMCOG, 2023). Oakland County roads are maintained by the Road Commission for Oakland County. This Road Commission is charged with maintaining over 2,700 miles of county roads, 230 miles of state highway and approximately 1,500 county, city, and state traffic signals in Oakland County (OCRC, 2023). Portions of the County road system are also maintained by the Michigan Department of Transportation and some municipalities.

The Suburban Mobility Authority for Regional Transportation (SMART) provides bus service to 54 fixed routes throughout Oakland, Wayne, and Macomb Counties. SMART buses run seven days per week, 22 hours per day and provide 12 million rides per day. SMART also provides specialized services to the elderly and handicapped (Smartbus, 2023).

Oakland County is proud to manage three airports, including Oakland County International Airport (PTK), which ranks as the 97th busiest airport in the nation with 126,240 takeoffs and landings. PTK is ranked as the nation's sixteenth busiest general aviation airport and second to Detroit Metro in Michigan (2021 data). Over ½ million passengers and pilots pass through the airport every year. More than 624 private and corporate aircraft are based here. In the course of a year, virtually all the Fortune 500 companies use the airport. The airport contributes over $1 billion to the County's economy each year. The aggregate tax contribution of airport businesses ranks the OCIA community as the second-highest taxpayer in Waterford Township (Oakland County, 2023).

Passenger rail service is provided by Amtrak with stations located in Pontiac, Birmingham, and Royal Oak. The rail service connects to Detroit, which further connects passengers to numerous cities throughout the country. Freight rail lines are located throughout Oakland County and are operated by Canadian National Railway and CSX Transportation (Access Oakland, 2023).

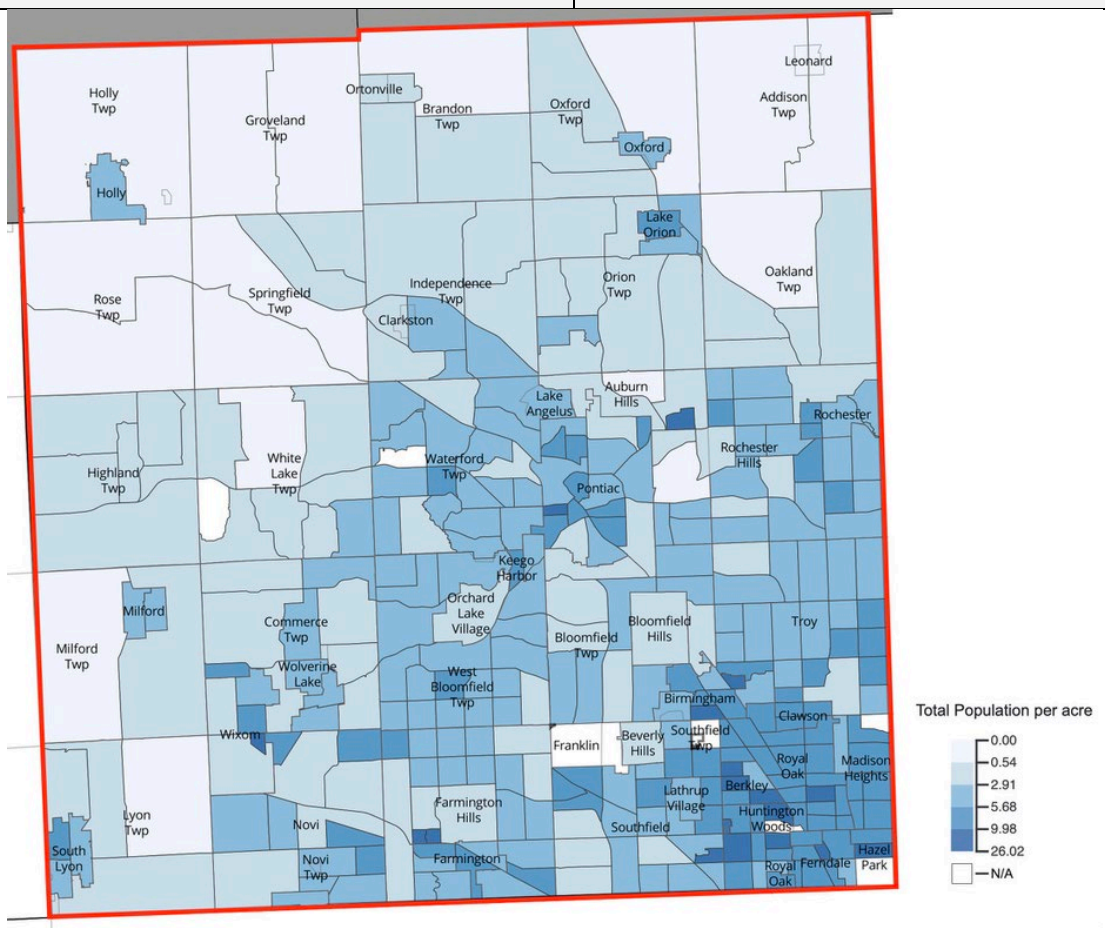
3.6 Population and Demographic Characteristics

Oakland County is the second most populous county in Michigan with a total population of 1,274,395 as of the 2020 Census (U.S. Census Bureau, 2023). Population projections estimate that by 2050 the population will be 1,387,838 which is an increase of 193,682 since year 2000 (SEMCOG, 2023).

Figure 3-3 illustrates the Oakland County population forecasted by SEMCOG while Table 3-5 illustrates household characteristics.

Figure 3-2: Oakland County Total Population By Census Tract

OAKLAND COUNTY, MI	
TOTAL POPULATION BY CENSUS TRACT	
TOTAL POPULATION	**TOTAL NUMBER OF CENSUS TRACTS**
1,274,395	360



Source: U.S. Census Bureau – Population of Oakland County, MI (2023)

Figure 3-3: Oakland County Population Forecast

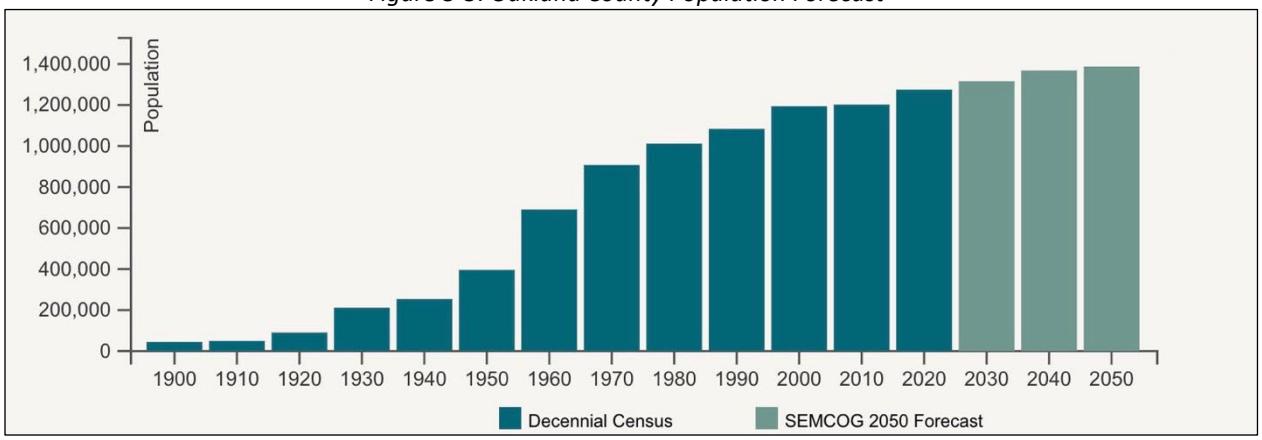


Table 3-12: 2020 Oakland County Household Characteristics

OAKLAND COUNTY, MI SEMCOG – HOUSEHOLD CHARACTERISTICS						
Households	**Census 2020**	**Census 2010**	**Change 2010-2020**	**Pct Change 2010-2020**	**SEMCOG Jul-22**	**SEMCOG 2050**
Housing Units	554,403	527,255	27,148	5.10%	560,986	-
Households (Occupied Units)	524,047	483,698	40,349	8.30%	523,973	573,614
Residential Vacancy Rate	5.50%	8.30%	-2.80%	-	6.60%	-
Average Household Size	2.4	2.46	-0.06	-	2.39	2.38
Source: SEMCOG (2023)						

Table 3-13: 2020 Oakland County Population Change By Age

OAKLAND COUNTY, MI U.S. CENSUS BUREAU – POPULATION CHANGE BY AGE				
Age Group	**Census 2010**	**Change 2000-2010**	**ACS 2020**	**Change 2010-2020**
Under 5	68,506	-11,861	67,888	-618
9-May	77,140	-9,186	68,943	-8,197
14-Oct	83,450	-2,048	77,253	-6,197
15-19	81,049	6,777	76,537	-4,512
20-24	63,344	2,753	74,263	10,919
25-29	71,670	-10,445	85,384	13,714
30-34	71,717	-22,355	80,780	9,063
35-39	80,354	-23,680	80,540	186
40-44	89,478	-17,543	76,184	-13,294
45-49	98,381	2,494	86,686	-11,695
50-54	99,877	15,948	89,969	-9,908

55-59	86,571	24,161	93,697	7,126
60-64	71,701	29,026	85,826	14,125
65-69	50,320	14,989	71,400	21,080
70-74	33,783	-1,157	53,604	19,821
75-79	27,347	-2,063	35,251	7,904
80-84	23,917	4,848	22,118	-1,799
85+	23,757	7,548	29,017	5,260
Total	1,202,362	8,206	1,255,340	52,978
Median Age	**40.2**	**3.5**	**41**	**0.8**
Source: SEMCOG (2023)				

Table 3-14: 2020 Oakland County Race and Demographic Information

OAKLAND COUNTY, MI SEMCOG – RACE AND DEMOGRAPHIC INFORMATION					
Race and Hispanic Origin	**Census 2010**	**Percent of Population 2010**	**Census 2020**	**Percent of Population 2020**	**Percentage Point Change 2010-2020**
Non-Hispanic	4,521,773	96.1%	4,587,818	95%	-1.1%
White	3,223,281	68.5%	3,108,251	64.3%	-4.2%
Black	1,018,089	21.6%	997,657	20.7%	-1%
Asian	168,092	3.6%	245,417	5.1%	1.5%
Multi-Racial	92,100	2%	205,178	4.2%	2.3%
Other	20,211	0.4%	31,315	0.6%	0.2%
Hispanic	182,970	3.9%	242,671	5%	1.1%
Total	4,704,743	100%	4,830,489	100%	0%
Source: SEMCOG (2023)					

Table 3-15: 2020 Oakland County Educational Attainment

OAKLAND COUNTY, MI SEMCOG – EDUCATIONAL ATTAINMENT			
Highest Level of Education*	**ACS 2010**	**ACS 2020**	**Percentage Point Change 2010-2020**
Did Not Graduate High School	7.8%	5.6%	-2.1%
High School Graduate	21.4%	18.4%	-3%
Some College, No Degree	21.3%	19.8%	-1.4%
Associate Degree	7.4%	8.2%	0.8%
Bachelor's Degree	24.6%	27.3%	2.7%
Graduate / Professional Degree	17.6%	20.7%	3.1%
Did Not Graduate High School	7.8%	5.6%	-2.1%
** Population age 25 and over*			
Source: SEMCOG (2023)			

Table 3-16: 2020 Oakland County School Enrollment

OAKLAND COUNTY, MI SEMCOG / U.S. CENSUS BUREAU – SCHOOL ENROLLMENT		
Grade Level	**Population**	**Percent of Population**
Nursery School, Preschool	19,047	6.5%
Kindergarten to 12th Grade	197,102	67.0%
College/Undergraduate	57,165	19.4%
Graduate, Professional	20,696	7.0%
Source: U.S. Census Bureau (2023)		

3.7 Economic Characteristics

According to the SEMCOG, there will be approximately 1,145,081 jobs within Oakland County in the year 2050. Based off U.S. Census Bureau estimates, approximately 82.9% of the Oakland County population is over 16 years of age with 65.8% of the overall population in the civilian labor force (SEMCOG, 2023).

Table 3-17: Oakland County Employment Industries

OAKLAND COUNTY, MI SEMCOG – FORECASTED JOBS BY INDUSTRY SEDCTOR										
Forecasted Jobs By Industry Sector	**2019**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**Change 2019-2050**	**Pct Change 2019-2050**
Natural Resources, Mining, & Construction	43,362	42,214	56,173	56,161	55,696	54,655	54,256	54,230	10,868	25.1%
Manufacturing	73,645	66,786	78,307	78,333	76,488	73,509	71,752	71,543	-2,102	-2.9%
Wholesale Trade	44,294	41,669	45,153	47,036	48,345	48,166	48,060	48,236	3,942	8.9%
Retail Trade	94,466	83,552	87,883	84,611	79,721	76,288	73,649	71,201	-23,265	-24.6%
Transportation, Warehousing, & Utilities	27,506	27,347	33,999	35,150	35,635	35,936	36,373	36,985	9,479	34.5%
Information & Financial Activities	165,073	153,531	168,567	173,975	176,495	178,217	180,511	183,383	18,310	11.1%
Professional and Technical Services & Corporate HQ	162,271	153,216	171,861	179,934	185,696	191,124	197,635	205,551	43,280	26.7%
Administrative, Support, & Waste Services	80,060	68,503	76,738	80,453	83,566	85,956	88,767	92,098	12,038	15%
Education Services	50,011	46,515	49,733	51,170	52,243	52,717	53,036	53,514	3,503	7%

Healthcare Services	124,583	115,065	126,182	133,841	139,873	144,973	150,410	157,088	32,505	26.1%
Leisure & Hospitality	88,685	65,209	87,787	92,927	94,297	94,746	95,146	95,610	6,925	7.8%
Other Services	50,769	44,079	50,635	53,373	54,488	55,014	55,513	56,072	5,303	10.4%
Public Administration	19,040	18,183	19,177	19,418	19,624	19,608	19,566	19,570	530	2.8%
Total Employment Numbers	1,023,765	925,869	1,052,195	1,086,382	1,102,167	1,110,909	1,124,674	1,145,081	121,316	11.8%
Source: SEMCOG (2023)										

Table 3-18: Oakland County Household Income

OAKLAND COUNTY, MI SEMCOG – HOUSEHOLD INCOME				
Income (in 2020 dollars)	**ACS 2010**	**ACS 2020**	**Change 2010-2020**	**Percent Change 2010-2020**
Median Household Income	$78,798	$81,587	$2,789	3.5%
Per Capita Income	$42,892	$46,075	$3,183	7.4%
Source: SEMCOG (2023)				

3.8 FEMA Community Risk Index

According to FEMA, Oakland County has a Community Risk Index Rating of **"Relatively High"** and a Community Risk Index Score of **"96.09"** (FEMA National Risk Index, 2023)**.**

The Risk Index score is based on the following components: Social Vulnerability, Community Resilience, and Estimate Annual Loss (EAL), with EAL based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors, for a total of five risk factors (FEMA National Risk Index, 2023)**.**

Each risk factor contributes to either the likelihood or consequence aspect of risk and can be classified as one of two risk types: risk based on geographic location or risk based on the nature and historical occurrences of natural hazards. The five risk factors are summarized in Table 3-12. (FEMA National Risk Index, 2023)**.**

Table 3-19: FEMA National Risk Index: Risk Components & Factors

FEMA NATIONAL RISK INDEX				
RISK COMPONENTS & FACTORS				
Risk Component	***Risk Factors***	***Risk Factor Description***	***Risk Contribution***	***Risk Type Assignment***
Social Vulnerability	Social Vulnerability	Consequence Enhancer	Consequence	Geographic Risk
Community Resilience	Community Resilience	Consequence Reducer	Consequence	Geographic Risk
Expected Annual Loss	Exposure	Expected Consequence	Consequence	Natural Hazard Risk
Expected Annual Loss	Annualized Frequency	Probability of Occurrence	Likelihood	Natural Hazard Risk

Expected Annual Loss	Historic Loss Ratio	Expected Consequence	Consequence	Natural Hazard Risk

3.9 Community Resilience

According to FEMA, Oakland County has a Community Resilience Rating of **"Very High"** and a Community Resilience Score of **"89.59"** (FEMA National Risk Index, 2023)**.**

Community resilience is defined as the ability of a community to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions (FEMA National Risk Index, 2023)**.**

The "Community Resilience Score" and "Community Resilience Rating" represent the relative level of a community's resilience compared to all other communities at the same level. The Community Resilience Score is inversely proportional to a community's risk. A higher Community Resilience Score results in a lower Risk Index Score (FEMA National Risk Index, 2023)**.**

3.10 Social Vulnerability and Underserved Populations

According to FEMA, Oakland County has a Social Vulnerability Rating of **"Very Low"** and a Social Vulnerability Score of "**14.64"** (FEMA National Risk Index, 2023)**.**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood (FEMA National Risk Index, 2023)**.**

The "Social Vulnerability Score" and "Rating" represent the relative level of a community's social vulnerability compared to all other communities at the same level. A community's Social Vulnerability Score is proportional to a community's risk. A higher Social Vulnerability Score results in a higher Risk Index Score (FEMA National Risk Index, 2023)**.**

Social vulnerability is one of five components included in the formulation of the "National Risk Index Score" in addition to Community Resilience, Estimated Annual Loss (EAL) based on Exposure, Annualized Frequency, and Historic Loss Ratio (HLR) factors (FEMA National Risk Index, 2023)**.**

Table 3-13 illustrates at-risk populations in Oakland County as compared to U.S. percentages and the differences thereof. As seen in Table 3-13, Oakland County demonstrates lower percentages of at-risk/disadvantaged individuals compared to average U.S. population percentages.

Table 3-20: Oakland County Neighborhoods At-Risk Table (2017-2021)

NEIGHBORHOODS AT-RISK TABLE				
OAKLAND COUNTY, MI (2017–2021)				
Indicators 2021*	**Oakland County Population**	**Oakland County Percentage**	**U.S. Percentage**	**Percent Difference (Oakland County vs. U.S.)**
People under 5 years	67,659	5.3%	5.9%	(-0.6%)
People over 65 years	215,043	16.9%	16.0%	0.9%
People of color (including Hispanic)	374,326	29.4%	40.6%	(-11.2%)
People who don't speak English well	21,025	1.7%	4.1%	(-2.4%)
People without a high school degree	48,382	5.4%	11.1%	(-5.7%)
Families in poverty	15,479	4.7%	8.9%	(-4.2%)
Housing units that are rentals	147,099	28.3%	35.4%	(-7.1%)
Households with no car	28,381	5.5%	8.3%	(-2.8%)
People with disabilities	144,275	11.4%	12.6%	(-1.2%)
People without health insurance	52,204	4.1%	8.5%	(-4.4%)

High Reliability: Data with coefficients of variation (CVs) < 12% are in black to show that the sampling error is small.
Medium Reliability: Data with CVs between 12 & 40% are in orange. These values should be interpreted with caution.
Low Reliability: Data with CVs > 40% are displayed in red to indicate that the estimate is considered very unreliable.

*** ACS 5-year estimates: 2021 represents average characteristics from 2017-2021.**
CITATION: U.S. Department of Commerce. 2022. Census Bureau, American Community Survey Office, Washington D.C., reported by Headwaters Economics' Neighborhoods at Risk, headwaterseconomics.org/par.

Source: Neighborhoods At Risk (2021), U.S. Census Bureau (2021)

Table 3-14 illustrates 34 (out of 338) census tracts in Oakland County that are identified as "disadvantaged". According to the Council on Environmental Quality (ACEQ), a community is identified as "disadvantaged" if it is located in a census tract that is at or above the threshold for one or more environmental, climate, or other burdens *and* at or above the threshold for associated socioeconomic burdens, including poverty and language barriers.

The total population of these 34 census tracts is 123,692, which is 0.09% of the total Oakland County population (US Census Bureau, 2021). Each census tract is further identified in (Appendix F – Disadvantaged Communities), illustrating the specific socioeconomic burdens of each census tract.

Table 3-21: Oakland County Disadvantaged Census Tracts

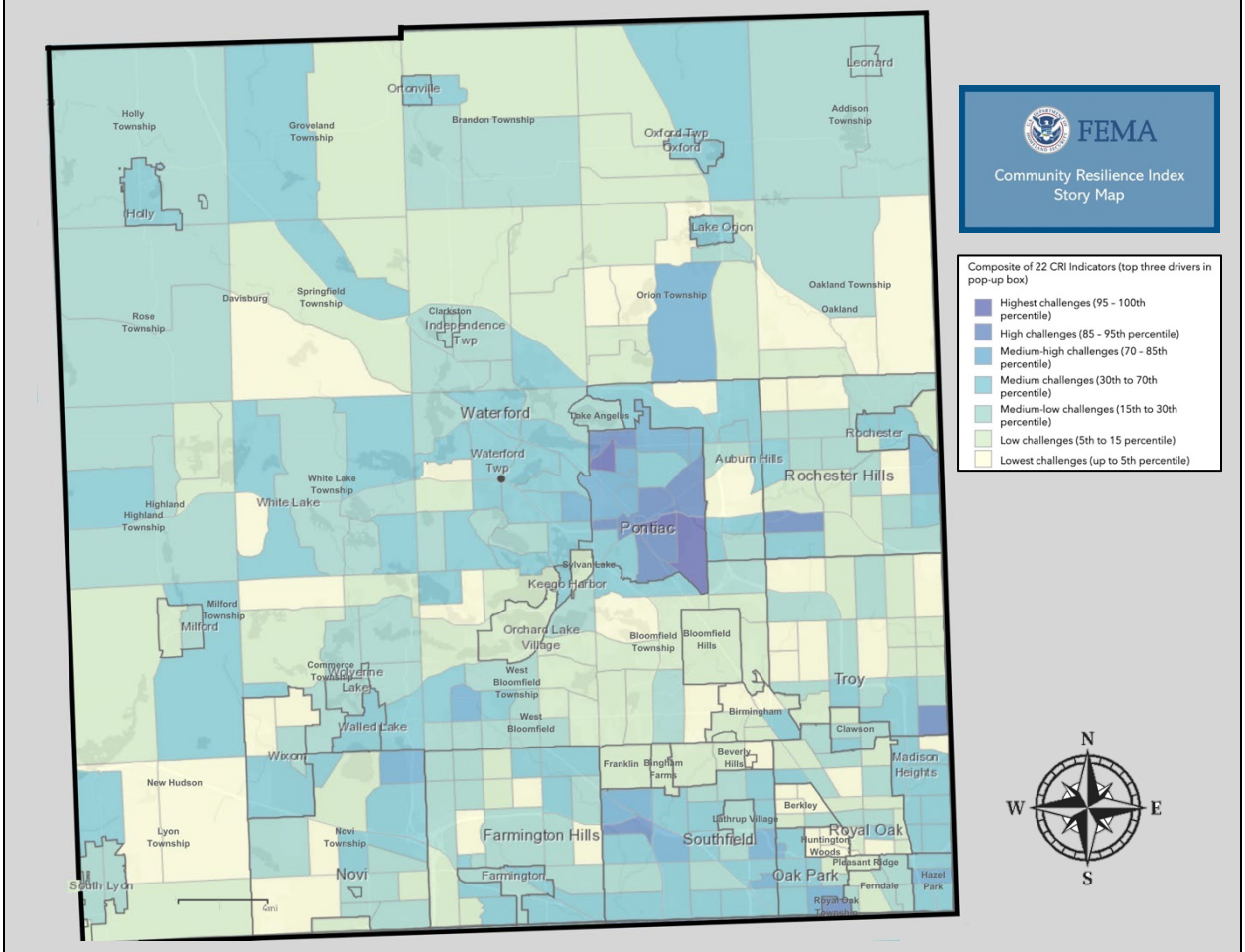
OAKLAND COUNTY, MI CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACTS		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125135000	3,842	TRUE
26125140900	5,419	TRUE
26125141000	5,225	TRUE
26125141100	2,984	TRUE
26125141200	3,136	TRUE
26125141300	3,719	TRUE
26125141400	4,626	TRUE
26125141500	6,378	TRUE
26125141600	4,485	TRUE
26125141700	2,268	TRUE
26125142000	2,348	TRUE
26125142100	1,584	TRUE
26125142200	2,764	TRUE
26125142300	2,307	TRUE
26125142400	3,428	TRUE
26125142600	3,539	TRUE
26125142700	3,797	TRUE
26125144701	3,830	TRUE
26125160300	3,001	TRUE
26125160400	2,816	TRUE
26125161400	4,032	TRUE
26125162400	2,289	TRUE
26125171300	3,356	FALSE
26125171500	5,194	TRUE
26125171600	2,061	TRUE
26125172400	1,651	TRUE
26125172500	2,411	TRUE
26125175100	5,169	TRUE
26125175200	3,910	TRUE
26125175300	4,314	TRUE
26125181000	3,875	TRUE
26125181300	6,002	TRUE
26125181600	5,236	TRUE
26125198100	2,696	FALSE
Total Population in Disadvantaged Census Tracts: 123,692		
The Climate and Economic Justice Screening Tool (CEJST) highlights disadvantaged census tracts across all 50 states, the District of Columbia, and the U.S. territories. Communities are considered disadvantaged: • If they are in census tracts that meet the thresholds for at least one of the tool's categories of burden, or • If they are on land within the boundaries of Federally Recognized Tribes. The CEJST tool uses datasets as indicators of burdens. The burdens are organized into categories. A community is highlighted as disadvantaged if it is located in a census tract that is: 1. At or above the threshold for one or more environmental, climate, or other burdens, and, 2. At or above the threshold for an associated socioeconomic burden. In addition, a census tract that is completely surrounded by disadvantaged communities and is at or above the 50% percentile for low income is also considered disadvantaged.		
Source: U.S. Council on Environmental Quality - Climate & Economic Justice Screening Tool (2023)		

Figure 3-5 illustrates the Oakland County Community Resilience Index Story Map. This map shows each participating jurisdiction with density mapping used to identify community areas that are overburdened by the 22 challenges identified by the FEMA Community Resilience Challenges Index.

Figure 3-4: Oakland County Community Resilience Index Story Map

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



22 CHALLENGE VARIABLES

Population, Household, Housing Characteristics	Economic	Healthcare	Connection to Community
Population without a High School Diploma Population 65 and Older Population with a Disability Households without a Vehicle Households with Limited English Single-parent Households Households without a Smartphone Mobile Homes as Percentage of Housing Owner-Occupied Housing	Population Below Poverty Level Median Household Income Unemployed Labor Force Unemployed Women Labor Force Income Inequality Workforce in Predominant Sector	Number of Hospitals Medical Professional Capacity Population without Health Insurance	Presence of Civic and Social Organizations Population without Religious Affiliation Percent of Inactive Voters Population Change

Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2023

3.11 Community Services/Organizations

Natural gas service is provided to Oakland County customers by Consumers Energy, DTE Gas, and SEMCO. Those outside of natural gas service areas and those using other heating fuels are serviced by AmeriGas, Ferrellgas, Hamilton's Propane, Northwest Energy and Oakland Fuels. Electrical service is provided by Consumers Energy and DTE Electric. The primary telephone service providers are AT&T, CenturyTel Midwest, Frontier and Verizon North. Water and sewer services for a large portion of Oakland County are overseen by the Water Resources Commissioner's Office.

Oakland County provides a number of services to residents through various agencies and departments, including the Office of the Water Resources Commissioner, Emergency Management and Homeland Security, Equalization, Health Division, Parks and Recreation, Planning and Economic Development Services and the Oakland County Sheriff's Office. Many of the County's services operate from the Oakland County government campus at 1200 North Telegraph Road in Pontiac, Michigan.

Oakland County is served by 28 school districts. Also within Oakland County are multiple colleges and universities. Additional learning resources are provided through public library services throughout the County.

Oakland County has an extensive Parks and Recreation Department which maintains a number of County parks. The County is also home to numerous festivals such as the annual Arts, Beats and Eats; Renaissance Festival and the Woodward Dream Cruise. Major shopping and entertainment venues within the County include the Great Lakes Crossing Outlets, the Somerset Collection, Twelve Oaks Mall, the Suburban Collection Showplace, and the Pine Knob Music Theatre.

3.12 Critical Assets

The following list of the top critical assets was developed based on current and future land use in Oakland County, the nature of hazards which may affect the County and the results of community input. The following facilities and infrastructure were identified as critical to providing essential products and services to the general public, preserving the welfare and quality of life of the community, and assuring public safety, emergency response and disaster recovery. Changes to the critical assets list from the original 2005 Plan included adding "other response facilities" to hospitals and removing natural areas from the list. Natural areas are included under open spaces.

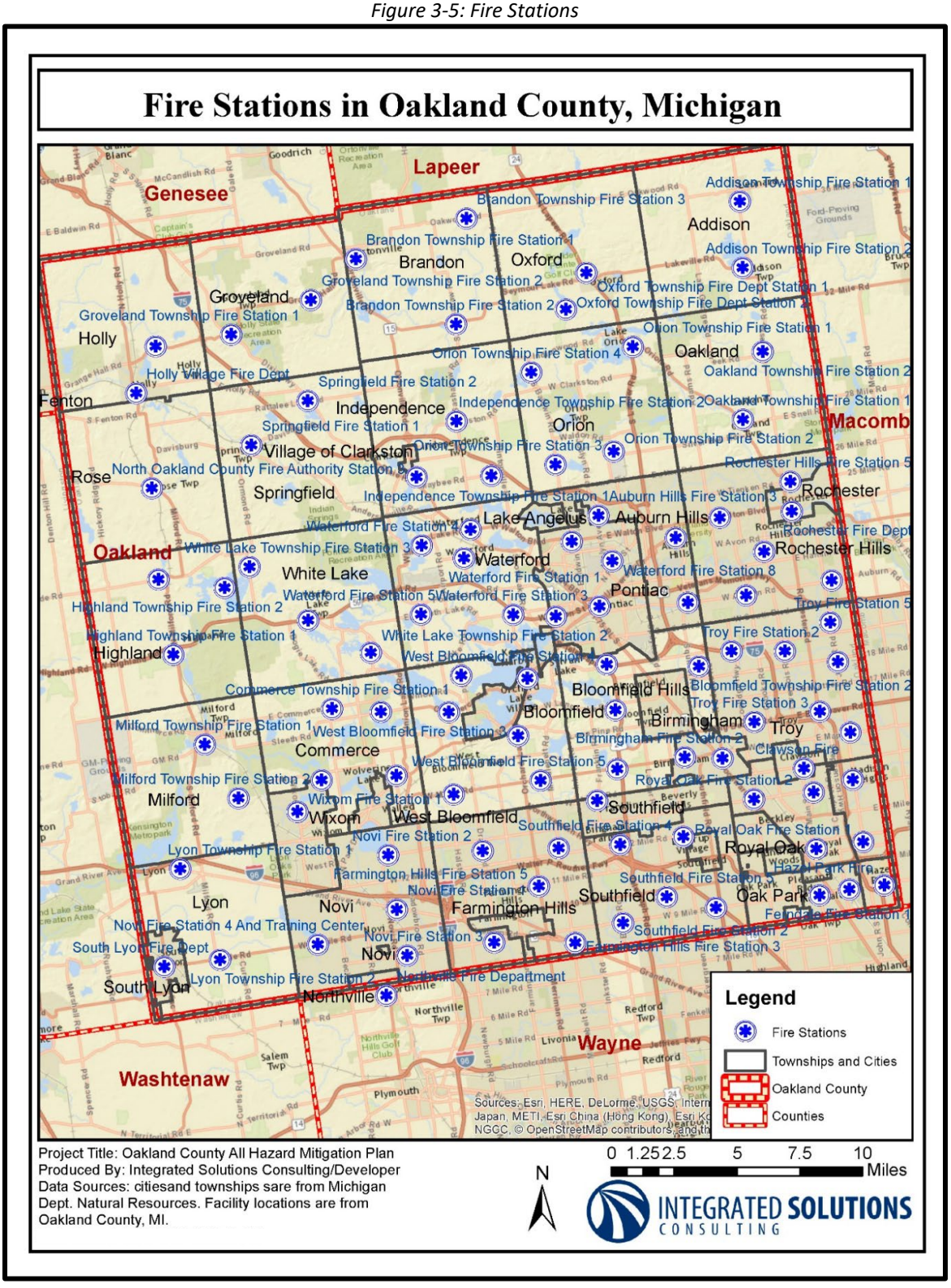
- Central business districts.
- Commercial sites.
- Hospitals/other response facilities.
- Industrial sites.
- Open spaces.
- Public facilities.
- Residential areas.
- Roads, railroads, and bridges.
- Schools and churches.
- Sports and entertainment venues.
- Utility facilities.

Natural features are highly valued assets in Oakland County. Oakland County Planning and Economic Development Services has established a priority ranking for all natural features to preserve the remainder of the County's natural heritage. The purpose of establishing priority areas is to maintain the economic, environmental, educational, and recreational benefits that natural areas provide.

Additional assets, because of their increased vulnerability and/or importance to the community, are noted in this section of the plan. They include:

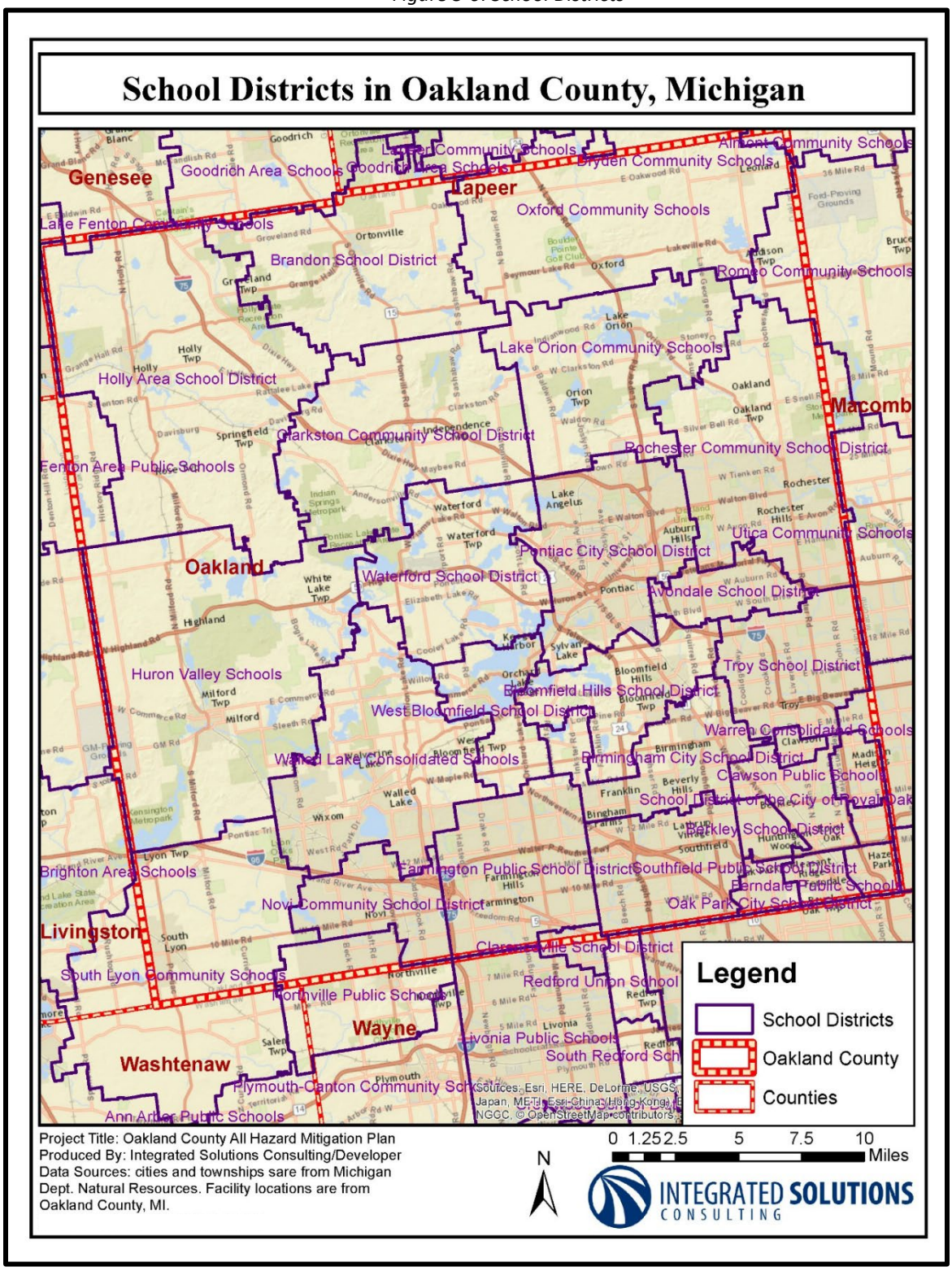
- Fire Stations
- Schools Districts
- Administration-related Buildings
- Historical Sites and Districts
- Historical Designations
- Manufactured Home Communities

Figure 3-5: Fire Stations



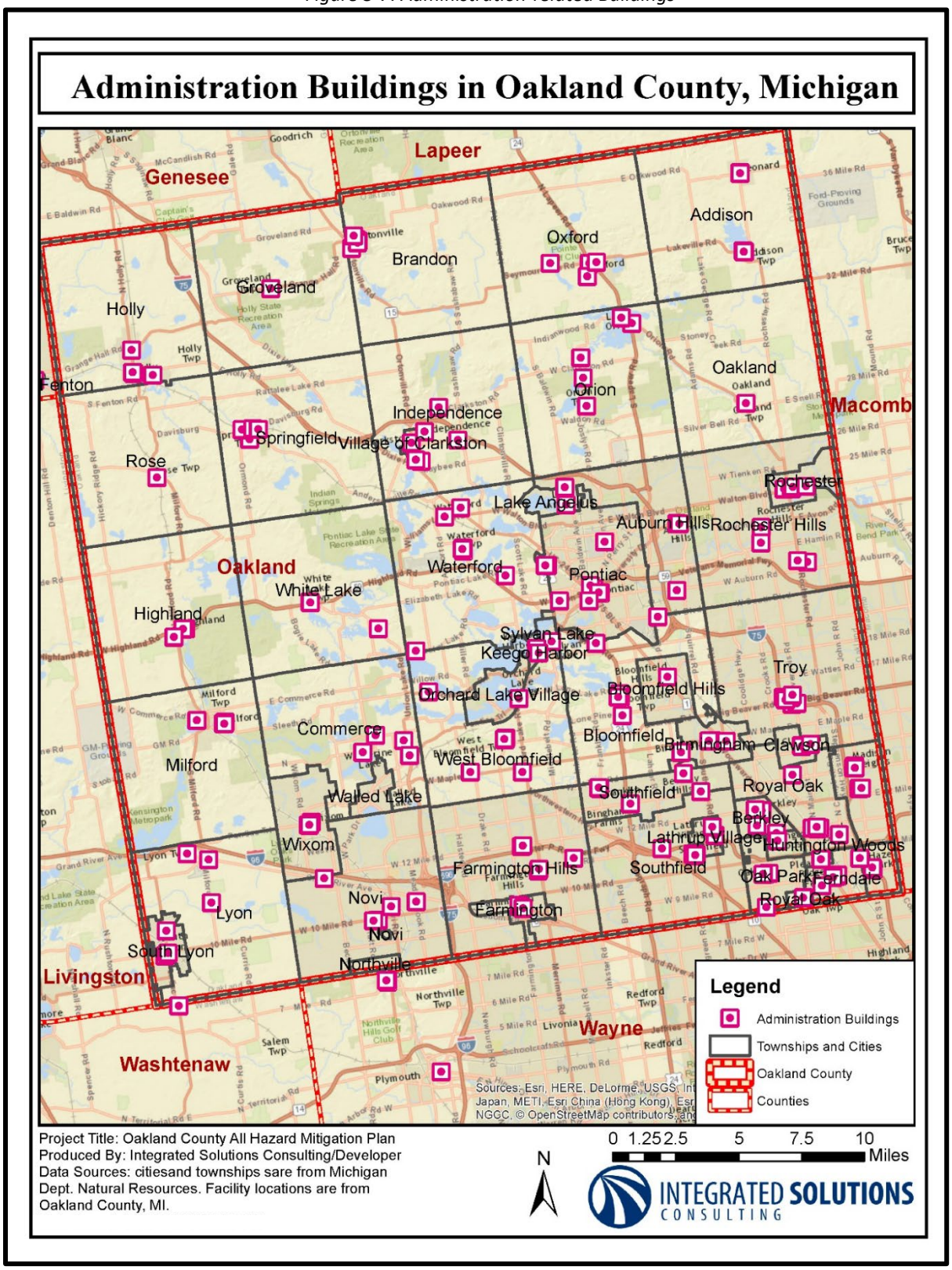
Source: Oakland County, MI

Figure 3-6: School Districts



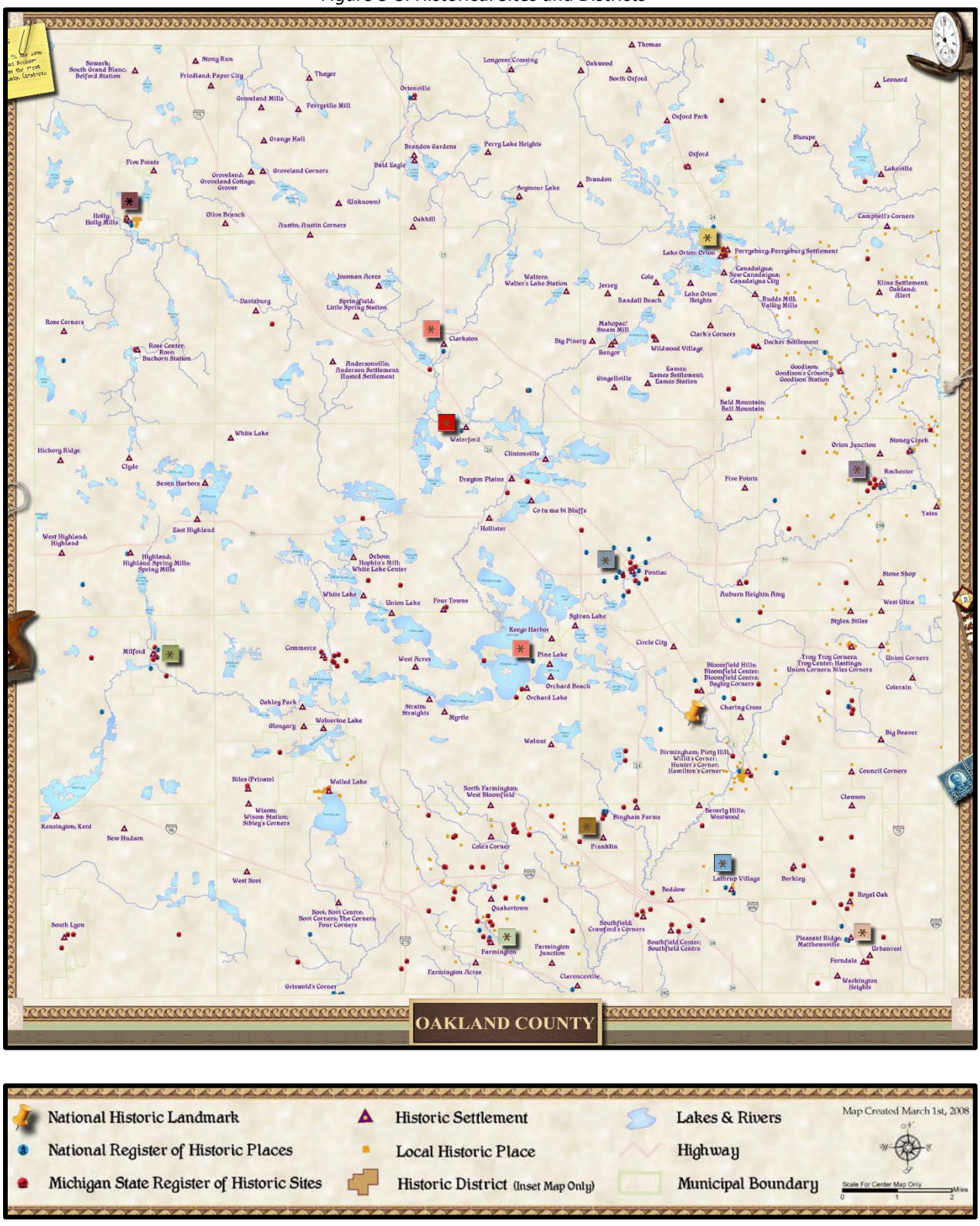
Source: Oakland County, MI

Figure 3-7: Administration-related Buildings



Source: Oakland County, MI

Figure 3-8: Historical Sites and Districts



Source: Oakland County, MI

Table 3-22: Historical Designations

Oakland County
Historic Designations

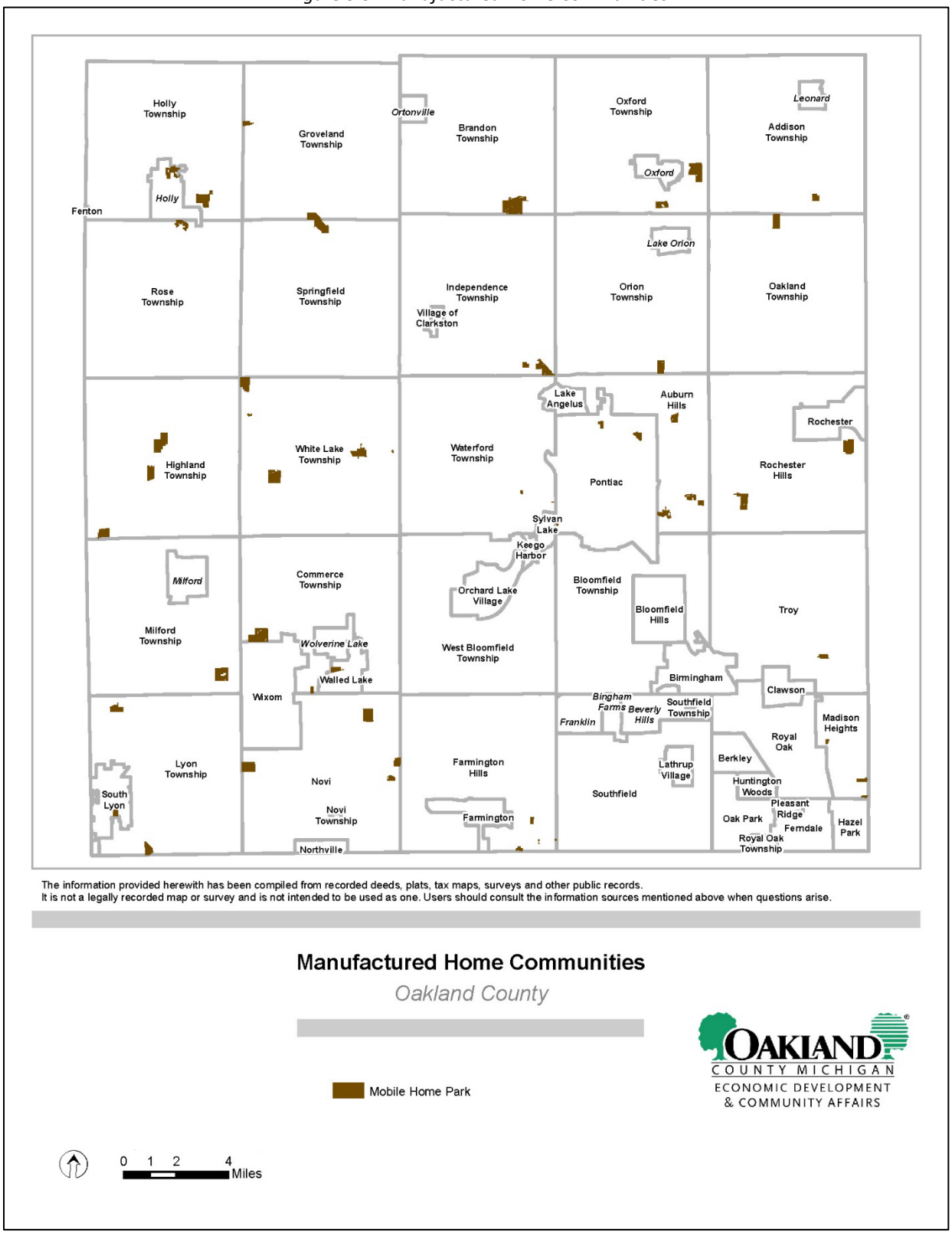
Community	CVT Type	National Historic Landmarks	National Register of Historic Places	Michigan State Register of Historic Sites	Local Historic District
Addison	Township	No	No	2	
Auburn Hills	City	No	No	2	
Berkley	City	No	No	2	
Beverly Hills	Village	No	No	1	
Bingham Farms	Village	No	No	No	
Birmingham	City	No	3	2	Yes
Bloomfield Hills	City	1	2	1	
Bloomfield	Township	No	2	4	
Brandon	Township	No	No	1	
Clarkston	City	No	1	No	Yes
Hazel Park	City	No	No	No	
Commerce	Township	No	1	8	
Farmington Hills	City	No	3	29	Yes
Leonard	Village	No	No	No	
Fenton		No	No	No	
Oak Park	City	No	No	No	
Waterford	Township	No	1	5	Yes
Groveland	Township	No	No	No	
Holly	Township	No	2	No	
Lathrup Village	City	No	2	No	Yes
Wixom	City	No	No	3	
Clawson	City	No	No	No	
Huntington Woods	City	No	No	1	Yes
Independence	Township	No	1	2	
Keego Harbor	City	No	No	No	
Lake Angelus	City	No	No	No	
Farmington	City	No	1	2	Yes
Ferndale	City	No	No	2	
Franklin	Village	No	2	4	Yes
Lyon	Township	No	No	1	
Madison Heights	City	No	No	No	
Milford	Township	No	1	1	
Milford	Village	No	3	6	Yes
Northville	City	No	1	No	
Novi	City	No	1	1	
Novi	Township	No	No	No	
Holly	Village	No	3	3	Yes
Oakland	Township	No	3	2	Yes
Orchard Lake	City	No	1	3	Yes
Orion	Township	No	No	3	
Lake Orion	Village	No	No	6	Yes
Oxford	Township	No	1	1	
Ortonville	Village	No	1	1	
Pleasant Ridge	City	No	2	No	Yes

Oakland County
Historic Designations

Community	CVT Type	National Historic Landmarks	National Register of Historic Places	Michigan State Register of Historic Sites	Local Historic District
Oxford	Village	No	No	3	
Rochester Hills	City	No	3	5	Yes
Pontiac	City	No	15	11	Yes
Rose	Township	No	1	1	
Royal Oak	City	No	1	7	Yes
Royal Oak	Township	No	No	1	
South Lyon	City	No	No	3	
Southfield	City	No	No	8	Yes
Southfield	Township	No	No	No	
Springfield	Township	No	No	1	
Sylvan Lake	City	No	No	No	
Troy	City	No	2	10	Yes
Rochester	City	No	2	7	
Highland	Township	No	2	No	
West Bloomfield	Township	No	No	No	
White Lake	Township	No	No	2	
Walled Lake	City	No	No	1	Yes
Wolverine Lake	Village	No	No	No	
Total		**1**	**64**	**159**	

Source: Oakland County, MI

Figure 3-9: Manufactured Home Communities



Source: Oakland County, MI

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Chapter 4: Hazard Profile & Risk Assessment

4.1 Overview

This Plan evaluated over 40 hazards during the 2023 Oakland County HMP Update. Risks were identified using a combination of historical research, surveys, workshops, community, and public meetings, and the 2017 Plan. Based on this evaluation, specific hazards were identified as requiring additional consideration and therefore are the focus of this Mitigation Plan. These hazards were selected to represent both County-wide and local community concerns. Evaluation of these hazards does not reduce the significance of a hazard event from any of the hazards evaluated but provides a method for Oakland County to focus mitigation activities and resources.

Some hazards were consolidated into similar groupings (e.g., all forms of infrastructure failure were ultimately combined). Per FEMA's mandate to address all natural hazards, the following natural hazards were not included because these hazards do not directly impact the County. They are:

- Hurricanes
- Sea Level Rise
- Storm Surge
- Tsunami

While this section provides a detailed description and profile of each hazard, the analysis is provided at the county level. **Specific hazard risks and concerns for the municipalities and school districts are addressed in Volume II and Volume III of this Plan.** The hazards that are addressed in this section are:

Natural Hazards

- Drought
- Earthquake
- Extreme Heat
- Flooding – Riverine and Urban/Depressional
- Fog
- Invasive Species
- High Hazard Dams
- Severe Summer Storms
    - Thunderstorms
    - Lightning
    - Microbursts/High Winds
    - Hailstorms
- Severe Winter Storms
    - Extreme Cold
    - Ice and Sleet Storms
    - Snowstorm/Blizzard
- Subsidence
    - Natural
    - Mining
- Tornadoes
- Wildfires

4.1.1 Presidential Disaster (DR) and Emergency Declarations (EM) in Oakland County

Table 4-1 lists all disaster and emergency declarations in Oakland County according to FEMA. This list shows the foundation for identifying what hazards pose the most significant risk within Oakland County.

While severe storms have been the most significant natural hazard Oakland has experienced, flooding and snowstorms have also created damage that have received a federal disaster declaration over the past years. The table below lists the county's presidential or federal disaster declarations since 1953.

Table 4-23. State and Federal Disaster Declarations for Oakland County

Incident Type	Declaration Title	Declaration Date	FEMA Disaster Number	Location	Declaration Type
Flood	Severe Storms, High Winds, & Flooding	4/26/75	465	MI	DR
Severe Storm	Severe Storms, Tornadoes, Icing & Flooding	3/19/76	495	MI	DR
Snowstorm	Blizzards & Snowstorms	1/27/78	3057	MI	EM
Severe Storm	Severe Storms, Tornadoes, and Flooding	7/11/97	1181	MI	DR
Snowstorm	MI – Severe Weather 1/2 /99	1/27/99	3137	MI	EM
Severe Storm	Severe Storms, and Flooding	10/17/00	1346	MI	DR
Snowstorm	Snow	1/10/01	3160	MI	EM
Other	Power Outage	9/23/03	3189	MI	EM
Severe Storm	Severe Storms, Tornadoes, and Flooding	6/30/04	1527	MI	DR
Hurricane	Hurricane Katrina Evacuation	9/7/05	3225	MI	EM
Flood	Severe Storms, and Flooding	9/25/14	4195	MI	DR
Biological	COVID-19	3/13/20	3455	MI	EM
Biological	COVID-19 Pandemic	3/27/20	4494	MI	DR
Severe Storms	Severe Storms, Flooding, and Tornadoes	7/15/2021	4607	MI	DR (IA only)

4.2 Risk Assessment Methodology

4.2.1 Probability of Occurrence

The probability of occurrence of a hazard is indicated by a probability factor based on the likelihood of annual occurrence:

- **High**: Significant hazard event is likely to occur annually (Probability Factor = 3)
- **Medium**: Significant hazard event is likely to occur within 25 years (Probability Factor = 2)
- **Low**: Significant hazard event is likely to occur within 100 years (Probability Factor = 1)

- **Unlikely**: There is little to no probability of significant occurrence, or the recurrence interval is greater than every 100 years (Probability Factor = 0)

The assessment of hazard frequency is generally based on past hazard events in the area.

4.2.2 Extent

Extent was assessed in two categories: extent/intensity and catastrophic potential of the hazard. Numerical impact factors were assigned as follows:

Extent/Intensity: Extent is the range of anticipated intensities of the identified hazards. Extent is most commonly expressed using various scientific scales, such as the Enhanced Fujita scale.

- **High**: Historical and/or probabilistic models/studies for this hazard indicate the possibility of a high-intensity incident (Extent Factor = 3)
- **Medium**: Historical and/or probabilistic models/studies for this hazard indicate the possibility of a medium-intensity incident (Extent Factor = 2)
- **Low**: Historical and/or probabilistic models/studies for this hazard indicate the possibility of a low-intensity incident (Extent Factor = 1)
- **Unlikely**: Historical and/or probabilistic models/studies for this hazard indicate the possibility of little to no intensity (Extent Factor = 0)

Catastrophic Factor: The potential that an occurrence of this hazard could be catastrophic.

- **High**: High potential that this hazard could be catastrophic (Extent Factor = 3)
- **Medium**: Medium potential that this hazard could be catastrophic (Extent Factor = 2)
- **Low**: Low potential that this hazard could be catastrophic (Extent Factor = 1)
- **Unlikely**: Virtually no potential that this hazard could be catastrophic (Extent Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *Extent/Intensity* and its potential for *Catastrophe*.

4.2.3 Vulnerability

Vulnerabilities were assessed in three categories: population exposure, property exposure, and exposure based on changes in development. Numerical impact factors were assigned as follows:

People: Values were assigned based on the percentage of the total population exposed to the hazard event.

- **High**: 30% or more of the population is exposed to this hazard (Vulnerability Factor = 3)

- **Medium**: 15% to 29% of the population is exposed to this hazard (Vulnerability Factor = 2)
- **Low**: 14% or less of the population is exposed to this hazard (Vulnerability Factor = 1)
- **No Vulnerability**: None of the population is exposed to this hazard (Vulnerability Factor = 0)

Property Exposed: Values were assigned based on the percentage of the total property value exposed to the hazard event.

- **High**: 25% or more of the total assessed property value is exposed to the hazard (Vulnerability Factor = 3)
- **Medium**: 10% to 24% of the total assessed property value is exposed to the hazard (Vulnerability Factor = 2)
- **Low**: 9% or less of the total assessed property value is exposed to the hazard (Vulnerability Factor = 1)
- **No Vulnerability**: None of the total assessed property value is exposed to the hazard (Vulnerability Factor = 0)

Changes in Development Factor: Changes in development since the previous Plan was approved have increased or decreased the community's vulnerability/exposure to this hazard.

- **High**: Changes in development have significantly increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 3)
- **Medium**: Changes in development have increased the vulnerability/exposure of the community to this hazard, but not significantly (Vulnerability Factor = 2)
- **Low**: Changes in development have minimally increased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 1)
- **No Vulnerability**: Changes in development have had no effect and/or have decreased the vulnerability/exposure of the community to this hazard (Vulnerability Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *People*, and a weighting factor of 1 was assigned for *Property Exposed* and *Changes in Development*.

4.2.4 Impact

Hazard impacts were assessed in eight categories: population and life/safety, underserved/equity, property damages, economic, environmental, essential operations, future development, and climate change. Numerical impact factors were assigned as follows:

Population and Life/Safety: Values were assigned based on (1) best available historical and probabilistic data for individuals vulnerable to the hazard event and (2) the likelihood to experience adverse impacts in the event of its occurrence.

- **High**: Populations exposed to this hazard are likely to experience significant adverse impacts (Impact Factor = 3)
- **Medium**: Populations exposed to this hazard are likely to experience some adverse impacts (Impact Factor = 2)
- **Low**: Populations exposed to this hazard are likely to experience minimal adverse impacts (Impact Factor = 1)
- **No impact**: Populations exposed to this hazard are not likely to experience significant adverse impacts (Impact Factor = 0)

Underserved/Equity: Values were assigned based on the best available data for underserved populations vulnerable to the hazard event and likely to experience adverse or disproportionate impacts. As a result of the hazard incident, these populations may suffer from greater disparities in equity.

- **High**: Underserved populations exposed to this hazard are likely to experience significant adverse/disproportionate impacts (Impact Factor = 3)
- **Medium**: Underserved populations exposed to this hazard are likely to experience some adverse/disproportionate impacts (Impact Factor = 2)
- **Low**: Underserved populations exposed to this hazard are likely to experience minimal adverse/disproportionate impacts (Impact Factor = 1)
- **No impact**: Underserved populations exposed to this hazard are not likely to experience significant adverse/disproportionate impacts (Impact Factor = 0)

Property Damages: Values were assigned based on the expected total property damages incurred from a hazard incident. It is important to note that values represent estimates of the loss from a significant incident based on historical data or probabilistic models/studies.

- **High**: More than $5,000,000 in property damages is expected from a single major hazard event, or damages are expected to incur 15% or more of the property value within the jurisdiction (Impact Factor = 3)
- **Medium**: More than $500,000, but less than $5,000,000 in property damages is expected from a single major hazard event, or anticipated damages are expected to be more than 5% but less than 15% of the property value within the jurisdiction (Impact Factor = 2)
- **Low**: Less than $500,000 in property damages is expected from a single major hazard event or less than 15% of the property value within the jurisdiction (Impact Factor = 1)
- **No impact**: Little to no property damage is expected from a single major hazard event (Impact Factor = 0)

Economic Factor: An estimation of the impact (in USD) on the local economy is based on the projected loss of business revenue, crops, worker wages, and local tax revenues or the impact on the regional gross domestic product (GDP).

- **High**: Where the total economic impact is likely to be greater than $10 million (Impact Factor = 3)
- **Medium**: Where the total economic impact is likely to be greater than $100,000 but less than or equal to $10 million (Impact Factor = 2)
- **Low**: Where the total economic impact is not likely to be greater than $100,000 (Impact Factor = 1)
- **No Impact**: Where there is virtually no significant economic impact (Impact Factor = 0)

Environmental Factor: Environmental impact from a major hazard event requiring outside resources and support; and/or repair, clean-up, restoration, and/or preservation work.

- **High**: Environmental impact from a single major hazard event is likely to be significant, requiring extensive outside resources and support; and/or repair, clean-up, restoration, and/or preservation work (Impact Factor = 3)
- **Medium**: Environmental impact from a single major hazard event is likely to be localized, requiring some outside resources and support; and/or repair, clean-up, restoration, or preservation work (Impact Factor = 2)
- **Low**: Environmental impact from a single major hazard event is likely to be minimal, requiring little to no outside resources and support, and/or minimal repair, clean-up, restoration, or preservation work (Impact Factor = 1)
- **No impact**: No environmental impacts from a single major hazard event is likely (Impact Factor = 0)

Essential Operations Factor: Impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event.

- **High**: Significant impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 3)
- **Medium**: Some impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 2)
- **Low**: Minimal impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 1)
- **No Impact**: No impact on the ability of the jurisdiction to meet the essential day-to-day operational demands and needs of the community from a single major hazard event (Impact Factor = 0)

Future Development Factor: The potential that future development will have on increasing or decreasing the impact/consequence of this hazard.

- **High**: Future development trends will significantly increase the impact/consequence of this hazard (Impact Factor = 3)
- **Medium**: Future development trends will increase the impact/consequence of this hazard, but not significantly (Impact Factor = 2)
- **Low**: Future development trends will minimally increase the impact/consequence of this hazard (Impact Factor = 1)
- **No Impact**: Future development trends will not increase the impact/consequence of this hazard and/or may even decrease the impact/consequence of this hazard (Impact Factor = 0)

Climate Change Factor: The potential that Climate Change will increase the risk of this hazard (i.e., type, location, and range of anticipated intensities of the identified hazard and impacts).

- **High**: Climate Change trends will significantly increase the risk of this hazard and its impacts (Impact Factor = 3)
- **Medium**: Climate Change trends will increase the risk of this hazard and its impacts, but not significantly (Impact Factor = 2)
- **Low**: Climate Change trends will minimally increase the risk of this hazard and its impacts (Impact Factor = 1)
- **No Impact**: Climate Change trends will not increase the risk of this hazard and its impacts (Impact Factor = 0)

Each category was assigned a weighting factor to reflect its significance, consistent with those typically used for measuring the benefits of hazard mitigation actions: a weighting factor of 3 was assigned for *Population and Life Safety* and *Underserved/Equity*, and a weighting factor of 2 was assigned for *Property Damages. In addition, a* weighting factor of 1 was assigned for *Economic*, *Environmental, Essential Operations*, *Future Development,* and *Climate Change*.

4.3 FEMA NRI Risk Scores

The National Risk Index (NRI) is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather. Because not all hazards apply to the county, only those with a defined risk to the county are included.

The National Risk Index leverages available source data for Expected Annual Loss due to these 18 hazard types, Social Vulnerability and Community Resilience, to develop a baseline relative risk measurement for each United States county and census tract. These measurements are

calculated using average past conditions but cannot be used to predict future outcomes for a community. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision-makers as they develop risk reduction strategies.

4.3.1 FEMA National Risk Index Score

Table 4-24. Overall FEMA NRI Score

OAKLAND COUNTY, MI FEMA OVERALL NRI SCORE	
FEMA Overall NRI Score	**FEMA Overall NRI Rating**
96.1 / 100	Relatively High
Risk Index Scores are calculated using an equation that combines scores for Expected Annual Loss due to natural hazards, Social Vulnerability and Community Resilience. (Expected Annual Loss X Social Vulnerability / Community Resilience = Risk Index).	
Source: https://hazards.fema.gov/nri/report/viewer?dataLOD=Counties&dataIDs=C26125	

4.3.2 Social Vulnerability

Social Vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.

Per the FEMA National Risk Index, Oakland County has a Social Vulnerability Rating of **"Very Low"** and a Social Vulnerability Score of **"14.60"** out of 100 (FEMA, 2023).

The "Social Vulnerability Score" and "Rating" represent the relative level of a community's social vulnerability compared to all other communities at the same level. A community's Social Vulnerability Score is also proportional to a community's risk. A higher Social Vulnerability Score results in a higher Risk Index Score (FEMA, 2023).

Social vulnerability is one of five components included in the formulation of the "National Risk Index Score" in addition to community resilience, estimated annual loss (EAL) based on exposure, annualized frequency, and Historic Loss Ratio (HLR) factors (FEMA, 2023).

Table 4-25. Social Vulnerability FEMA NRI Score

OAKLAND COUNTY, MI FEMA NRI SOCIAL VULNERABILITY SCORE	
Social Vulnerability Score	**Social Vulnerability Rating**
14.6 / 100	Very Low
Social Vulnerability is measured using the Social Vulnerability Index (SoVI) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).	
Source: hazards.fema.gov/nri/social-vulnerability	

4.3.3 Community Resilience

Community Resilience measures a community's ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Table 4-26. Community Resilience FEMA NRI Score

OAKLAND COUNTY, MI FEMA NRI COMMUNITY RESILIENCE SCORE	
Community Resilience Score	**Community Resilience Rating**
89.6 / 100	Very High
Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).	
Source: hazards.fema.gov/nri/community-resilience	

4.3.4 Community Resilience Challenges Index (CCRI) Percentile

Table 4-27. FEMA Community Resilience Challenges Index (CRCI) Percentile

OAKLAND COUNTY, MI FEMA CRCI PERCENTILE
Community Resilience Challenges Index Percentile
7.0 / 100%
The FEMA CRCI index provides a relative composite value by county and by census tract, measured as an average of counts of standard deviations from the national mean for each indicator. The 2023 update to the FEMA CRCI uses the most currently available census data, the 2017-2021 ACS 5-year estimates, and is updated annually.
Source: https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6

4.3.5 Expected Annual Loss

Expected Annual Loss (EAL) represents the expected economic damage likely to occur yearly due to hazard events.

Table 4-28. Expected Annual Loss FEMA NRI Score (All Natural Hazards)

OAKLAND COUNTY, MI FEMA NRI EXPECTED ANNUAL LOSS SCORE	
Expected Annual Loss Score	**Expected Annual Loss Rating**
96.8 / 100	Relatively High
Expected Annual Loss scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio).	
Source: hazards.fema.gov/nri/expected-annual-loss	

4.4 Overall Risk Scores

The following tables represent the new overall risk scores for Oakland County based on the described methodology above. Following a data-driven quantitative assessment, the planning team utilized subject matter knowledge and expertise and further refined the scores. FEMA NRI Scores were used as appropriate and applicable to inform the analysis.

4.4.1 Oakland County Overall Risk Scores

Table 4-29. 2023 Hazard Risk Scores for Oakland County

	Probability	Consequence				Total Risk
Hazard Event	**Probability Factor**	**Sum of Weighted Extent Factors**	**Sum of Weighted Vulnerability Factors**	**Sum of Weighted Impact Factors**	**Consequence Score**	**Total Risk Score** (Probability x Consequence)
Flood (Flash Flooding)	3	15	11	22	48	68
Winter Storm and Blizzards	3	12	15	11	38	56
High Winds/Severe Winds	3	9	12	14	35	52
Flood (Riverine/Creek)	2	15	9	22	46	47
Public Health Emergencies: Pandemic/Epidemic	2	18	9	18	45	46
Tornadoes	2	15	5	24	44	45
Ice and/or Sleet Storms	2	12	12	19	43	44
Structural Fire	3	6	6	12	24	38
Extreme Cold	2	9	13	14	36	38
Transportation Accidents: Highway	3	6	5	11	22	35
Hazardous Materials Incidents: Fixed Site	2	12	5	15	32	34
Hail	2	9	10	11	30	32
Thunderstorm (Lightning)	3	6	5	9	20	32
Cybersecurity	2	12	8	9	29	32
Weapons of Mass Destruction	1	18	11	24	53	29
Hazardous Materials Incidents: Transportation Incident	2	6	5	15	26	29
Terrorism	1	18	5	23	46	26
Active Shooter/Active Assailant	2	6	5	11	22	25
Nuclear Power Plant Accidents	1	12	10	16	38	22
Invasive Species	2	6	5	8	19	22
Earthquake	1	6	15	12	33	20
Fog	2	6	3	7	16	19
Dam Failure	1	12	5	13	30	18
Extreme Heat	1	6	9	14	29	18
Transportation Accidents: Rail	1	12	5	12	29	18
Drought	1	6	9	10	25	15

Socio-Political Hazards (Civil Disturbance, Social Unrest)	1	6	5	12	23	14
Transportation Accidents: Air	1	6	5	11	22	14
Infrastructure Failure	1	6	6	9	21	13
Subsidence (Sinkhole)	1	6	5	9	20	13
Transportation Accidents: Marine	1	6	5	8	19	12
Oil and Gas Well Accidents	1	6	5	8	19	12
Wildfire	1	6	5	5	16	11

Table 4-30. Hazard Risk Scores Legend

Probability Factor		Sum of Weighted Extent Factors		Sum of Weighted Vulnerability Factors		Sum of Weighted Impact Factors		Consequence Score		Total Risk Score	
1	Low (L)	0–6	Low (L)	0–6	Low (L)	0–12	Low (L)	0–25	Low (L)	0–24	Low (L)
2	Medium (M)	7–12	Medium (M)	7–12	Medium (M)	13–26	Medium (M)	26–50	Medium (M)	25–59	Medium (M)
3	High (H)	13–18	High (H)	13–18	High (H)	27–39	High (H)	51–75	High (H)	60–100	High (H)

***** *The **Legend** – specifically the assignment of low, medium, and high—provides an additional means to qualitatively assess the probability factor, sum of weighted factors, and the total risk scores for each hazard.*

*The **Consequence Score** represents the sum of the Extent, Vulnerability, and Impact Factors.*

*The **Total Risk Score** is a measure of Probability and Consequence.*

Note: If you are accessing the Microsoft Word version of this Plan, double-click on the icon below to access the entire assessment. The first tab includes the assessment, and the second includes the final scores.

Oakland County MI HMP Hazard Rankin

4.5 Drought

Hazard Description

Drought is an extended period with significantly low precipitation levels that usually occurs during planting and growing seasons.

Hazard Location

Drought could occur anywhere in Oakland County, likely affecting the entire county.

Hazard Extent/Intensity

Figure 4-2 displays the precipitation conditions for the United States using the Palmer Drought Severity Index (PDSI), taken from the National Weather Service (NWS). The PDSI quantifies drought in terms of prolonged and abnormal moisture deficiency or excess. This index indicates general conditions and not local variations caused by isolated rain. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. In addition, it can help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires (NCAR, 2023).

The PDSI compares moisture deficiency and excess on a numerical scale that usually ranges from positive five to negative five. Positive values reflect excess moisture supplies, while negative values indicate moisture demands in excess of supplies.

Figure 4-10. Palmer Drought Severity Index (PDSI)

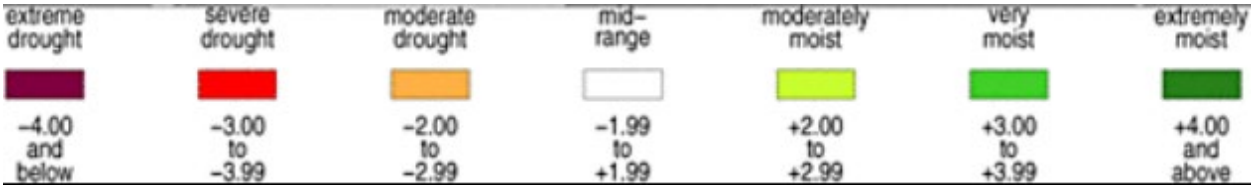
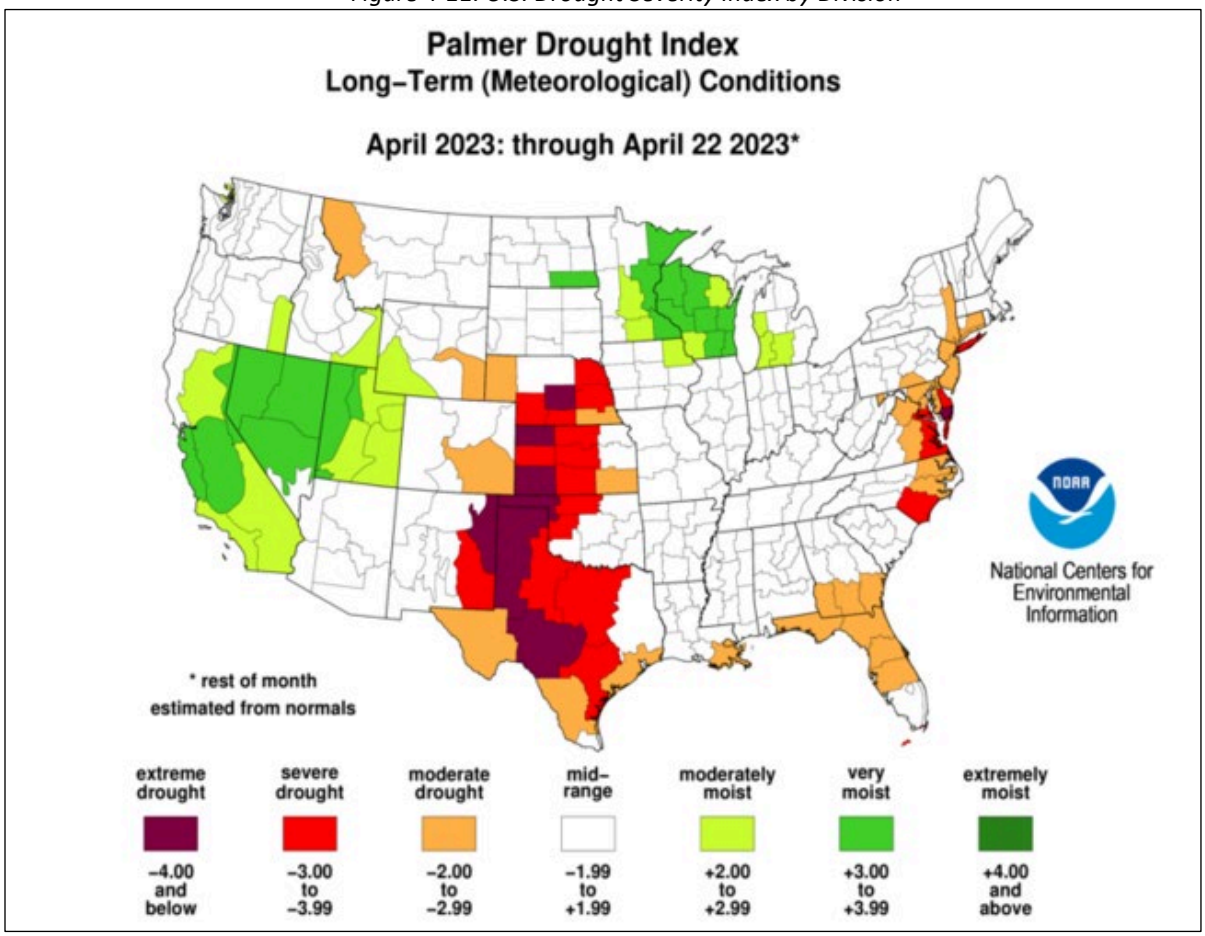
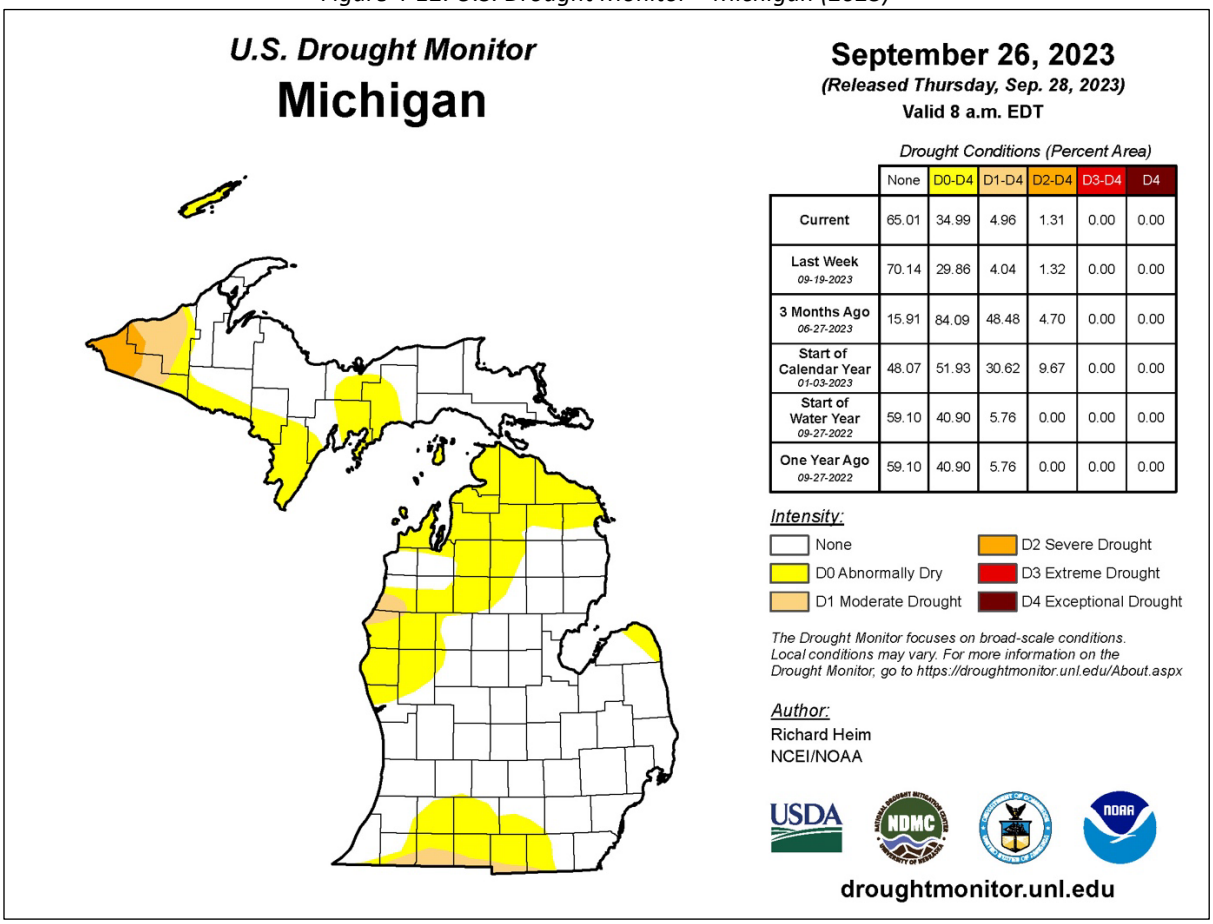


Figure 4-11. U.S. Drought Severity Index by Division



The National Drought Mitigation Center also rates drought nationwide by intensity using a D0 (Abnormally Dry) to D4 (Exceptional Drought) scale, as seen in the map of Michigan.

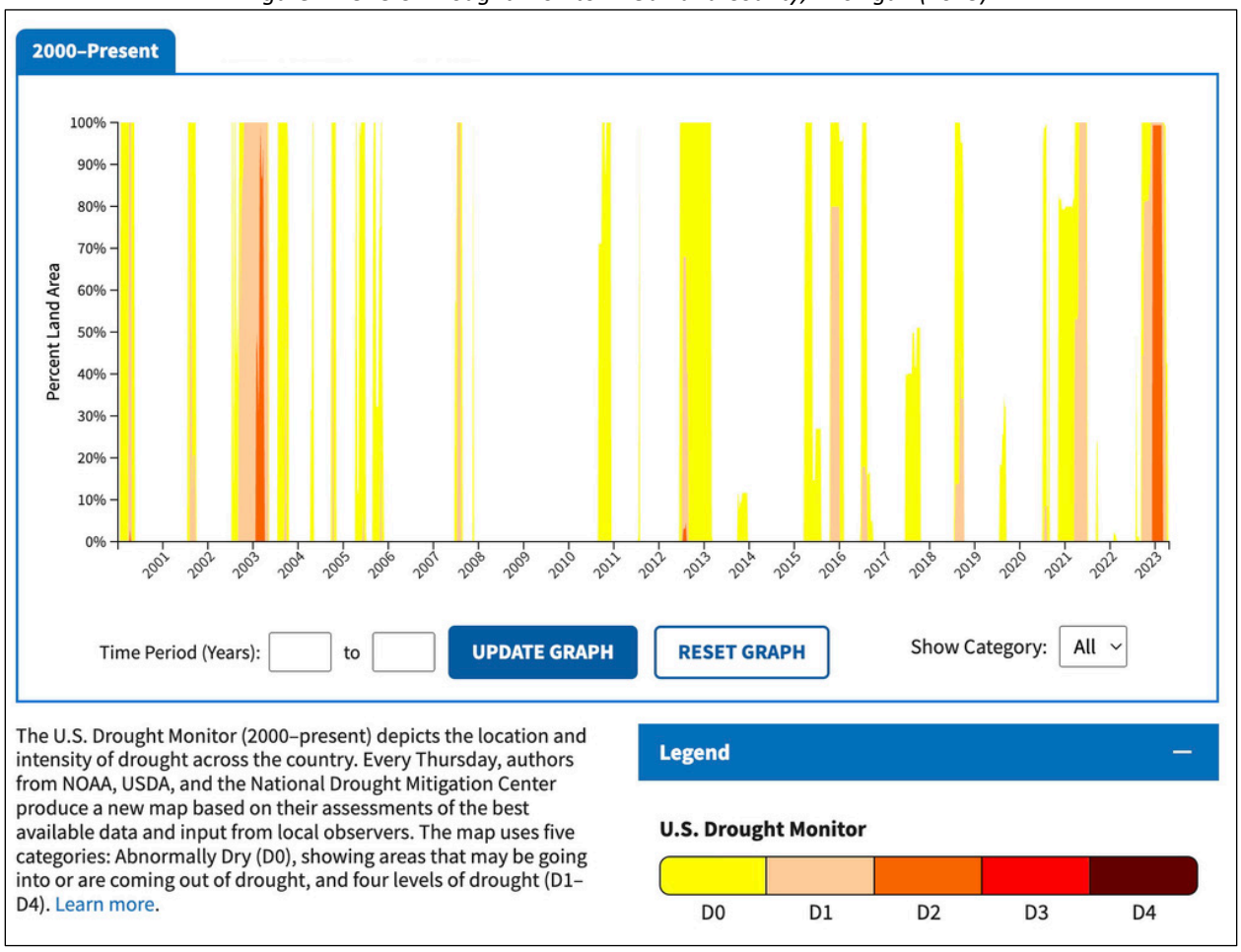
Figure 4-12. U.S. Drought Monitor – Michigan (2023)



Probability and Frequency

"Meteorological drought can begin and end rapidly, while hydrological drought takes much longer to develop and recover. Over the decades, many indices have been developed to measure drought in these various sectors. For example, the U.S. Drought Monitor depicts drought integrated across all time scales and differentiates between agricultural and hydrological impacts (NOAA, 2023)." The NOAA uses the PDSI to measure drought conditions, illustrated in Figure 4-1. Subsequently, Figure 4-4 shows the frequency of drought events in Oakland County between the year 2000 and the year 2023. It is estimated that there is an 5% annual probability of occurrence.

Figure 4-13. U.S. Drought Monitor – Oakland County, Michigan (2023)



Past Events

Extreme drought conditions in 1976-1977 contributed heavily to the large wildfire that struck the Seney area in Michigan's Upper Peninsula in July 1976 (Michigan Hazard Analysis, 2006).

During a drought in 1988, Michigan took several steps to combat the impacts of the drought on businesses, natural resources, and individual citizens. A statewide burning ban was enacted, and water use restrictions were implemented in many communities.

During a drought that struck Michigan from 1998-2003, one-third of the state's fruit, vegetable, and field crops were destroyed. This drought resulted in a U.S. Department of Agriculture Disaster Declaration for 82 state counties, including Oakland County. In addition, the drought led to water shortages in southeast Michigan, forcing local officials to issue water usage restrictions.

The Upper Peninsula of Michigan suffered drought conditions between 16 and 22 months starting in 2005. The hay crop in the Eastern U.P. was only 50 to 70 percent of normal, and the

resulting lack of feed led some farmers to downsize their cattle herds. In the northern tip of the Lower Peninsula, the proprietors of farms and golf courses suffered very high utility bills due to the need for near-constant irrigation. Corn and bean crops were severely impacted. A burning ban was also issued for most of the state (the first such ban since 1998) to reduce the risk of wildfires.

Table 4-9 shows the recorded drought events for Oakland County from 1950 to 2023, as recorded by NOAA's National Climate Data Center. From 1950 to 2023, Oakland County recorded two events with no associated injuries or deaths.

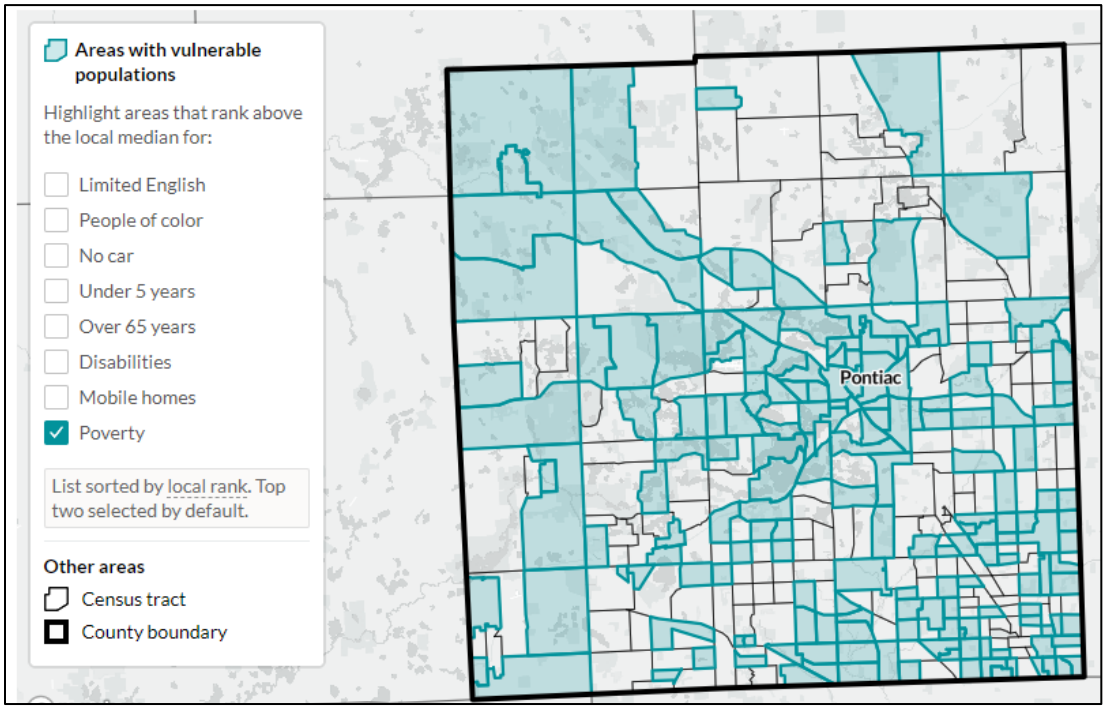
Table 4-31. Drought Activity in Oakland County, MI

Location	County/Zone	St.	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**0.00K**	**0.00K**
OAKLAND (ZONE)	OAKLAND	MI	07/01/2001	00:00	EST	Drought	0	0	0	0.00K
OAKLAND (ZONE)	OAKLAND	MI	09/01/2002	00:00	EST	Drought	0	0	0	0.00K
Totals:							**0**	**0**	**0.00K**	**0.00K**

Vulnerability and Impacts

Life Safety and Health: Droughts affect life safety and public health in several ways. Health problems can arise from poor water quality, poor food quality, and increased dust in the air. In addition, droughts make fires more likely, spread more quickly, and make them more challenging. In addition, poor air quality and a lack of water may reduce residents' engagement in recreational activities, reducing overall mental and physical well-being (NDMC, 2023).

Figure 4-14. Populations Vulnerable to Drought in Oakland County



Source: U.S. Census Bureau, American Community Survey

Property Damage and Critical Infrastructure: Drought has a negligible impact on buildings. Possible losses/impacts to critical facilities include the loss of essential functions due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be involved, the losses could total millions if outside water is shipped. Possible losses to infrastructure include the loss of potable water.

Economy: Although no data demonstrates the economic impact of past drought events on Oakland County, the most significant economic effect of drought is on agriculture, which is not an essential economic driver.

Changes in Development and Impact of Future Development: No data exists demonstrating the impact of drought on future development in Oakland County. Similarly, future development is not anticipated to increase the probability, magnitude, or vulnerability to this hazard besides greater exposure of people. However, excessive drought can result in water shortages and increased competition for limited water resources, which can limit the ability of developers to expand projects within the county.

Effects of Climate Change on Severity of Impacts: According to University Corporation for Atmospheric Research (UCAR), climate change is causing more extreme weather events, including severe drought. UCAR explains that warmer temperatures cause more evaporation, turning water into vapor in the air and causing drought in some areas of the world. Places prone to drought are expected to become even drier over the following century (UCAR, 2023).

Climate Change Impact on Drought in Oakland County: Higher temperatures, increasing variation in precipitation patterns, and changes in lake levels are likely to increase the vulnerability of cities to extreme events (including flooding, drought, heat waves, and more intense urban heat island effects), compounding already existing stressors.

Table 4-32. 25-Year Climate Projections for Oakland County

25-YEAR CLIMATE PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 164% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 7 more days that reach above 95°F (from 4 days to 11 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 112% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 4 more days that reach above 95°F (from 4 days to 7 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-33. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation							
Average Annual Total Precipitation	**32”**	**33”**	**33”**	**34”**	**34”**	**34”**	**35”**
	30-33	31-37	30-35	31-38	30-37	30-39	31-40
Days Per Year With Precipitation	**194 days**	**192 days**	**191 days**	**191 days**	**189 days**	**190 days**	**187 days**
	191-198	179-200	178-198	179-203	172-201	177-202	157-201
Days Per Year With No Precipitation	**172 days**	**173 days**	**174 days**	**174 days**	**176 days**	**175 days**	**178 days**
	167-175	165-186	167-187	162-186	164-193	163-188	164-208
Maximum Number Of Consecutive Dry Days	**11 days**	**11 days**	**11 days**	**11 days**	**12 days**	**12 days**	**12 days**
	10-12	10-13	10-13	10-13	10-14	10-13	10-16
Temperature Thresholds							
Annual days with Maximum temperature > 90°	**6 days**	**19 days**	**21 days**	**26 days**	**34 days**	**35 days**	**64 days**
	6-10	9-35	11-35	14-49	16-54	17-67	30-95
Annual days with Maximum temperature > 100°	**0 days**	**1 day**	**1 day**	**1 day**	**3 days**	**3 days**	**13 days**
	0-0	0-2	0-4	0-9	0-15	0-9	1-48
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates

Table 4-34. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI FEMA NRI EXPECTED ANNUAL LOSS TABLE FOR DROUGHT EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
0 events per year	N/A	N/A	N/A	N/A	$0	0.0	No Expected Annual Losses

Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*

Expected Annual Loss *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*
Source: FEMA National Risk Index (2023)

FEMA Hazard-Specific Risk Index Table

Table 4-35. Oakland County Hazard Specific Risk Index Table

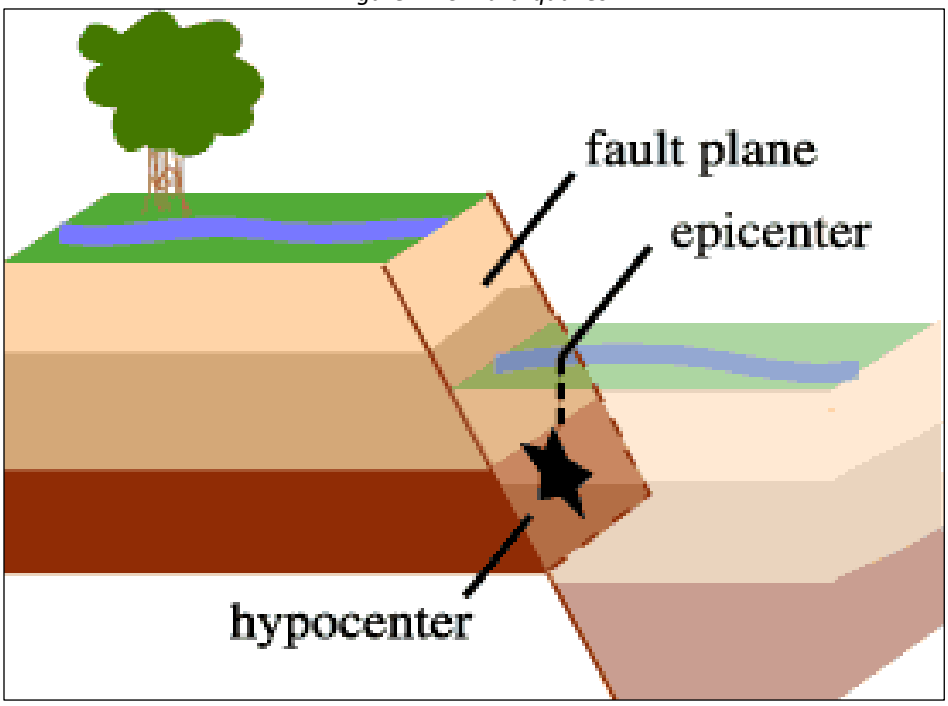
OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RATINGS - DROUGHT		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
0 / 100	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2023)		

4.6 Earthquake

Hazard Description

According to the U.S. Geological Survey (USGS), an earthquake happens when two earth blocks suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the area directly above it on the surface of the earth is called the epicenter (USGS, 2023). Figure 4-6 illustrates how this phenomenon occurs.

Figure 4-15. Earthquakes

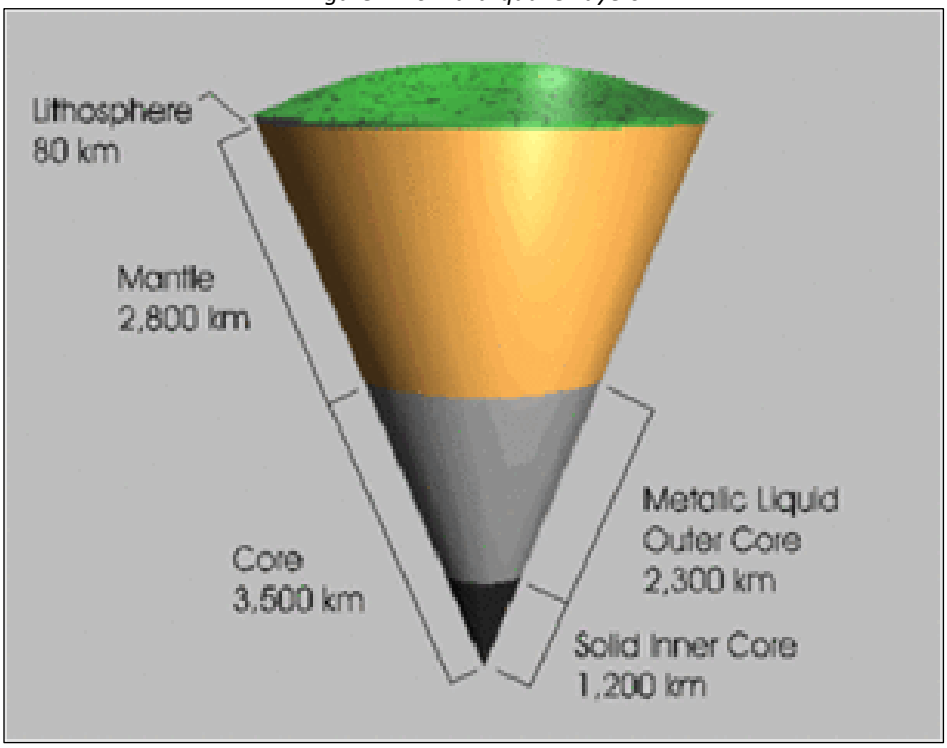


Sometimes an earthquake has foreshocks. These more minor earthquakes happen in the same place as the larger earthquake that follows. Scientists can't tell if an earthquake is a foreshock until a larger earthquake happens. The largest main earthquake is called the mainshock. Mainshocks always have aftershocks that follow. Aftershocks are smaller earthquakes that occur afterward in the same place as the mainshock. Depending on the size of the mainshock, aftershocks can continue for weeks, months, and even years after the mainshock occurs (USGS, 2023).

The Earth has four primary layers: the inner core, outer core, mantle, and crust (the lithosphere). The crust and the top portion of the mantle make up a thin skin on the surface of our planet. This skin comprises many pieces, like a puzzle covering the earth's surface. These puzzle pieces slowly and constantly move around, sliding past and bumping into each other. These puzzle pieces are called tectonic plates, and the edges of the plates are called the plate boundaries. The plate boundaries come together to make up fault lines. Most of the earthquakes around the world occur on these fault lines. Since the edges of the plates are

rough, some parts get caught on each other while the rest of the plate keeps moving. When the plate has moved far enough, the edges unstick on one of the faults, and the unsticking is what causes an earthquake (USGS, 2023). Figure 4-7 illustrates these layers.

Figure 4-16. Earthquake Layers

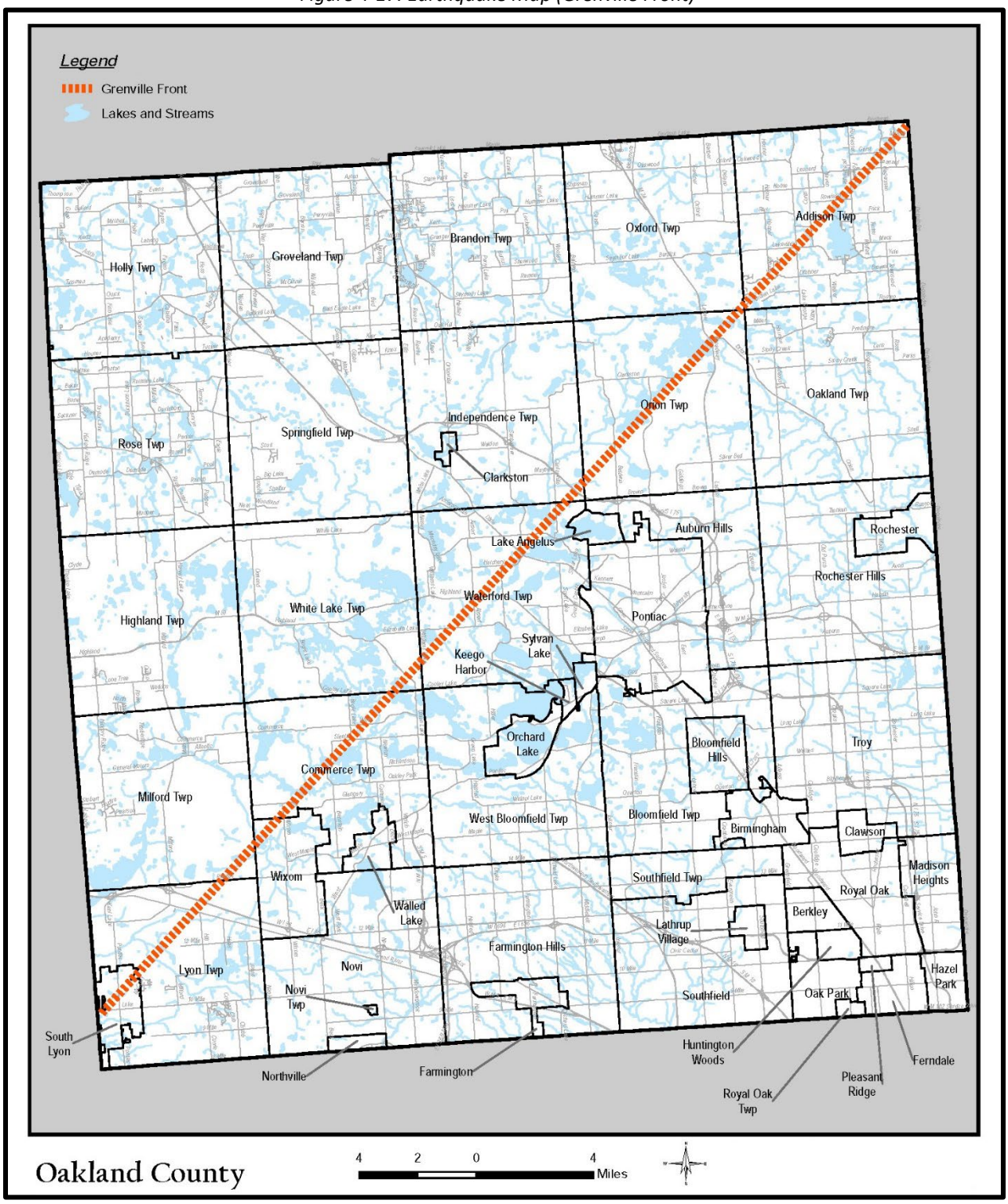


Hazard Location

Typically, an earthquake affects a large region, not a specific location. Because earthquakes typically have regional effects, the entire Oakland County population could be affected. However, given the historic severity, only a fraction of the people would be affected by a specific event. The impact of an earthquake would be primarily on water, sewers, and gas pipelines throughout Oakland County.

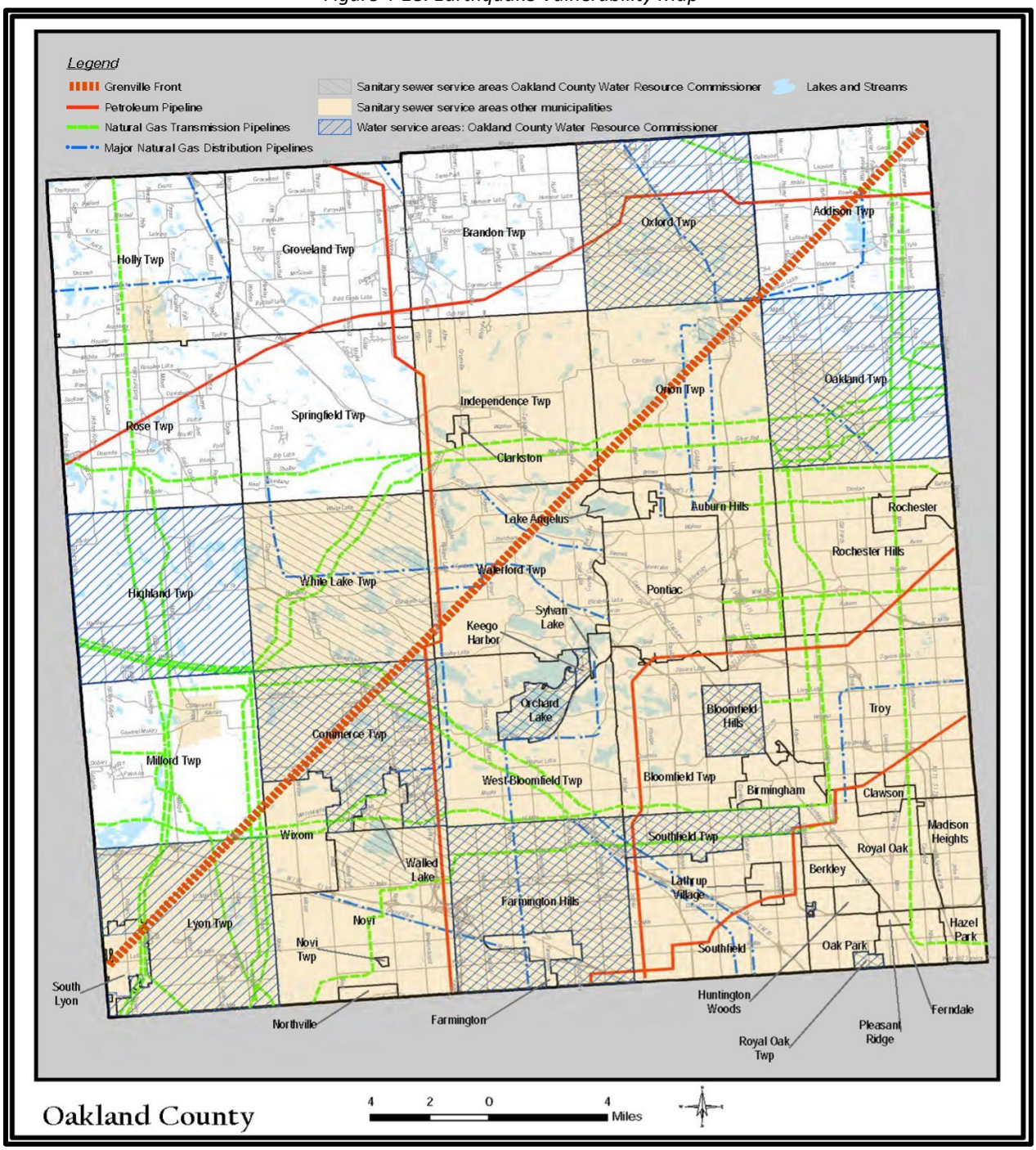
Figure 4-8 shows that Oakland County includes an area of low seismic activity called the Grenville Front (Oakland County, 1998). This front is a line marking relatively old geological changes making it less of a hazard than an actual fault line.

Figure 4-17. Earthquake Map (Grenville Front)



Source: Oakland County, MI, USDA, SEMCOG

Figure 4-18. Earthquake Vulnerability Map



Source: Oakland County, MI, USDA, SEMCOG

Hazard Extent/Intensity

"Earthquakes are one of nature's most dangerous hazards. Earthquakes, and the potential damage from earthquakes, are more widespread than people realize. Earthquakes are caused by the release of strain between or within the Earth's tectonic plates. The severity of an

earthquake depends on the amount of strain or energy released along a fault or at the epicenter of an earthquake. The energy released by an earthquake is sent to the earth's surface and released (USGS, 2023)".

Earthquake Measurements: There are several standard measures of earthquakes, including the Richter Scale and the Modified Mercalli Intensity (MMI) scale. The Richter Scale measures the magnitude or the amount of energy an earthquake releases, while seismographs measure magnitude. The Modified Mercalli Intensity is an observed measurement of the earthquake's intensity felt at the earth's surface. The MMI varies, depending on the observer's location at the earthquake's epicenter.

An earthquake's intensity depends on the area's geologic makeup and soil stability. The effects of earthquakes can be localized near its epicenter or felt significant distances away. For example, a 6.8-magnitude earthquake in the New Madrid Fault in Missouri would have a much broader impact than a similar event on the California Coast. The thick sandstone and limestone strata of the central United States behave as "conductors" of the earthquake's energy, and tremors can be felt hundreds of miles away.

Figure 4-10 correlates the MMI intensity with the Richter scale and the effects of ground shaking.

Figure 4-19. Modified Mercalli Scale vs. Richter Scale

MMI Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

Earthquakes can trigger other types of ground failures, which could contribute to the damage. These include landslides, dam failures, and liquefaction. Liquefaction occurs when shaking

mixes groundwater and soil, liquefying and weakening the ground that supports buildings and severing utility lines. This is especially a problem in floodplains where the water table is relatively high and the soils are more susceptible to liquefaction (USGS, 2023).

Figure 4-13 outlines forecasted ground shaking from potential earthquakes.

Probability and Frequency

Since 1938, Michigan Field has had approximately 26 earthquake-related disturbances (Plan, 2017). The largest recorded earthquake originating in Michigan was centered in Coldwater and registered a 4.7 on the Richter scale. An earthquake of significant magnitude is unlikely to occur due to Oakland County's distance from the fault and the type of fault in Michigan. The frequency is assumed to be once every 100 or more years. Although a slight disturbance from an earthquake is possible, the probability of a significant earthquake occurring in Oakland County is very low. It is estimated that there is a 1% annual probability of occurrence.

Figure 4-20. USGS Seismic Hazard Map – Michigan (2017)

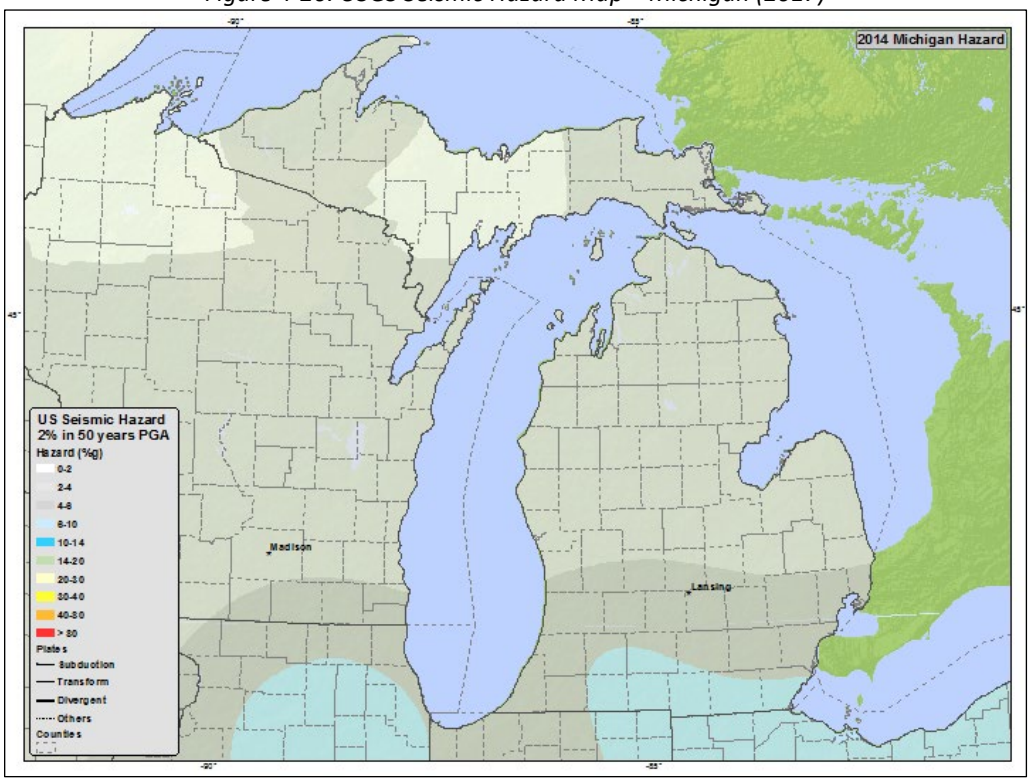


Figure 4-21. Forecast for Damage from Natural and Induced Earthquakes in 2017

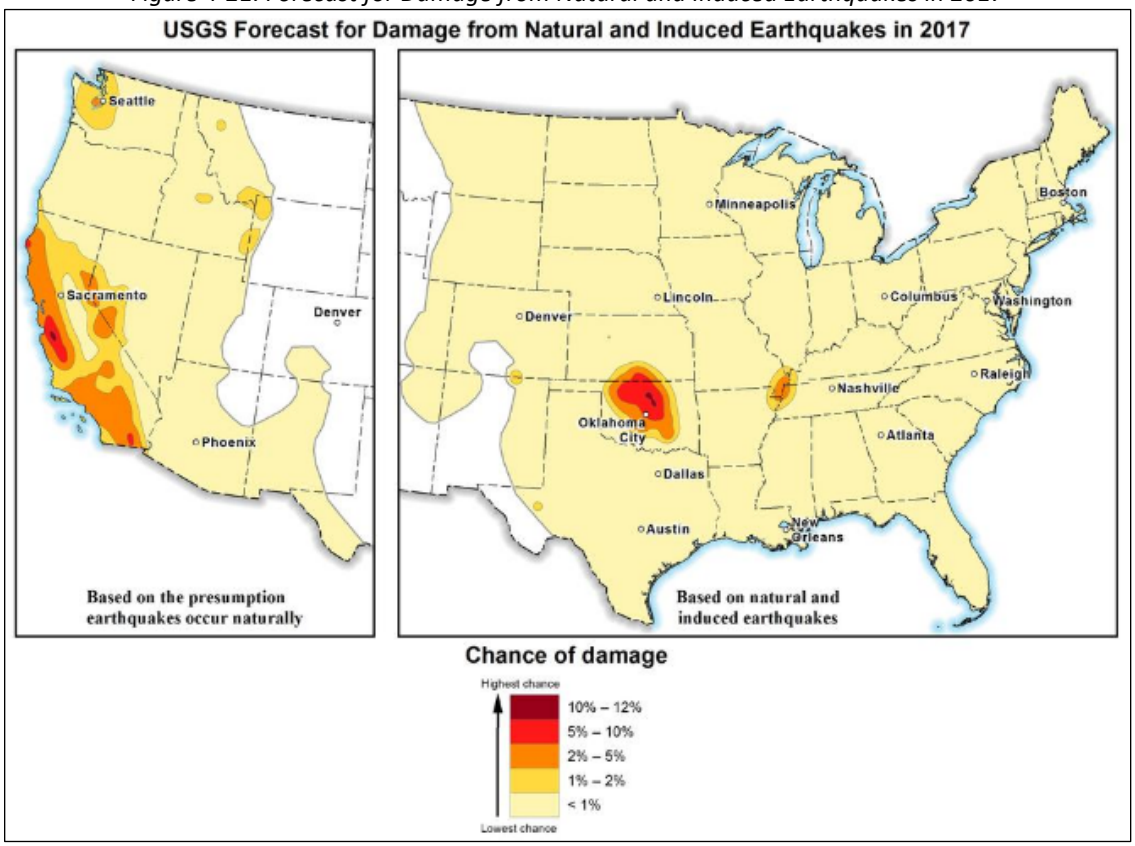
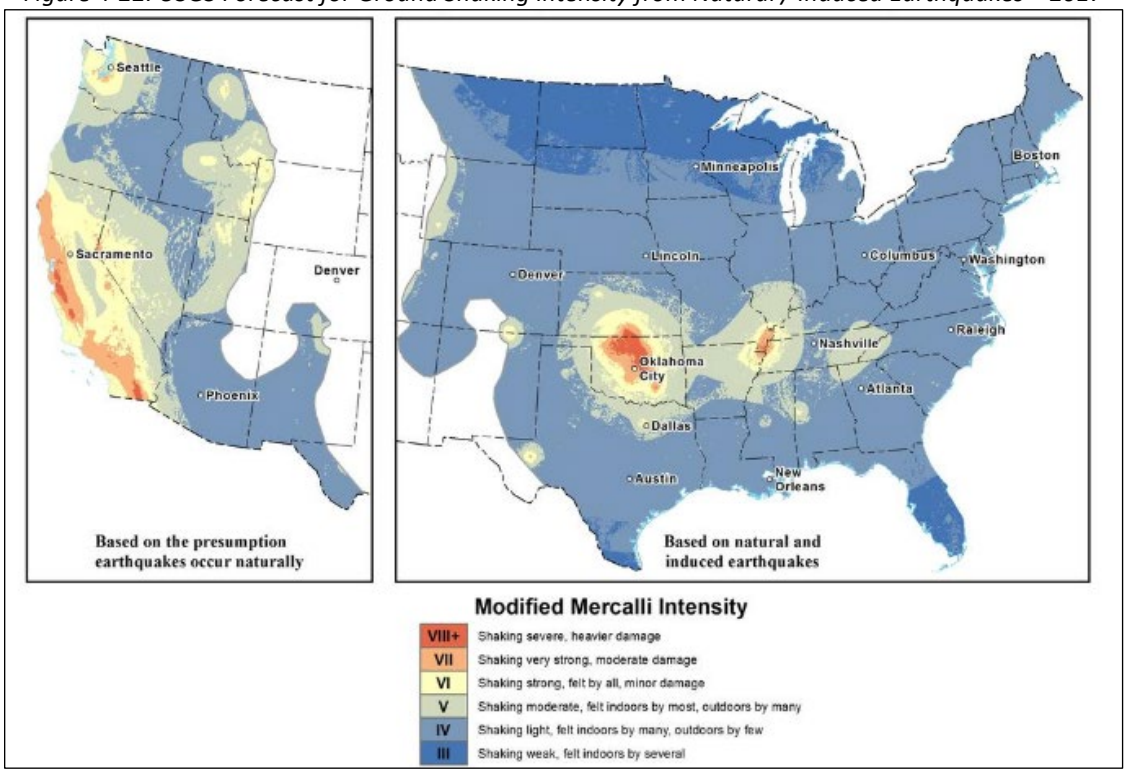


Figure 4-22. USGS Forecast for Ground Shaking Intensity from Natural / Induced Earthquakes – 2017



Past Events

Most earthquakes that occur in Michigan are minor tremors resulting in little damage. However, several mildly damaging earthquakes have been documented in Michigan since the late 1700s. Michigan has fault lines in the bedrock geology that are considered stable; however, data needs to be better documented. Michigan is most likely to be affected by earthquakes in the New Madrid Seismic Zone (centered near the Arkansas/Tennessee state line) and upstate New York.

There are no records of earthquakes originating within Oakland County. However, since this Plan was last updated in 2017, one earthquake has been recorded by US Geological Survey in southern Michigan, approximately 104.6km from Oakland County.

Table 4-14 shows the earthquake event in southern Michigan from 2013 to 2023, as recorded by USGS Earthquake Hazards Program (USGS, 2023). From 2013 to 2023, south Michigan recorded one event with no associated injuries or deaths.

Table 4-36. Earthquake Events in Southern Michigan (2013-2023)

OAKLAND COUNTY, MI PAST EARTHQUAKE EVENTS IN SOUTHERN MICHIGAN (2013-2023)						
Date	**Time**	**Location**	**Proximity to Oakland County**	**Latitude/ Longitude**	**Magnitude**	**Depth**
2022-07-11	16:49:16 (UTC)	5 km W of Luna Pier, Michigan	104km	41.816°N 83.512°W	2.4ml	5.0km
2020-08-21	22:55:09 (UTC)	2 km SSE of Detroit Beach, Michigan	65km	41.913°N 83.318°W	3.2mwr	12.0km
2018-04-20	00:01:35 (UTC)	Michigan	72km	42.118°N 83.015°W	3.4mwr	2.7km
Source: US Geological Survey (2023)						

The map shown in Figure 4-14 illustrates each (of three) earthquake events documented in Table 4-14, as recorded by the USGS Earthquake Hazards Program (USGS, 2023).

Figure 4-23. Recorded Earthquake Events in Southern Michigan from 2013 to 2023

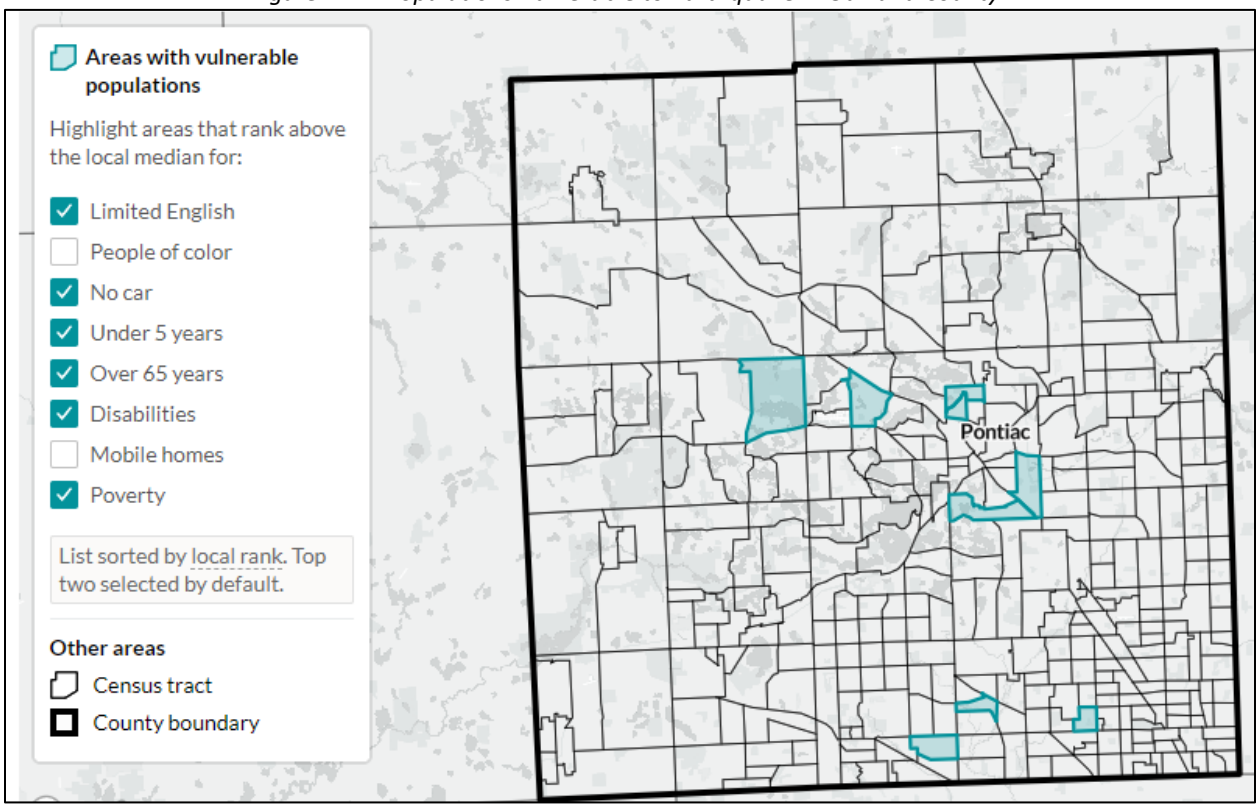
Vulnerability and Impacts

Life Safety and Health: According to FEMA, earthquakes can have various life safety and health impacts, including:

- Injury and Loss of Life: The violent shaking and ground movement during an earthquake can cause injuries, and in severe cases, lead to loss of life. Falling objects, structural collapses, and debris can pose immediate risks to individuals in affected areas.
- Structural Damage: Earthquakes can damage buildings, homes, and infrastructure, making them unsafe for occupancy. This can result in injuries, homelessness, and the need for temporary shelter.
- Displacement: People may be forced to evacuate their homes due to earthquake damage or the risk of aftershocks. This displacement can lead to overcrowding in emergency shelters and increased stress for affected individuals and families.

- Healthcare System Strain: Earthquakes can overwhelm healthcare systems with a surge of injured individuals in need of medical attention. Hospitals and medical facilities may face challenges in providing care and resources.
- Mental Health Impact: Earthquakes can have long-lasting psychological effects, including trauma, anxiety, and post-traumatic stress disorder (PTSD), which may require mental health support and counseling.
- Infrastructure Disruption: Earthquakes can damage critical infrastructure, including roads, bridges, utilities, and communication networks, affecting emergency response capabilities and access to essential services.
- Water Supply Contamination: Ground shaking can damage water supply systems, leading to contamination of drinking water sources. This poses health risks and requires water treatment and distribution efforts.
- Fire Hazards: Earthquakes can cause gas leaks and damage to electrical systems, increasing the risk of fires. Fire outbreaks can lead to additional injuries, property damage, and air quality issues.
- Aftershocks: Aftershocks following the initial earthquake can further damage weakened structures, hinder response efforts, and prolong the risks to life safety and health.

Figure 4-24. Populations Vulnerable to Earthquake in Oakland County



Source: U.S. Census Bureau, American Community Survey

A HAZUS analysis was conducted to examine the life safety and health impact to people during an earthquake incident. In this analysis, HAZUS estimates the number of people that could be injured or killed by an earthquake in Oakland County.

The casualties are broken down into four (4) severity levels that describe the extent of the injuries and are described as follows:

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

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

Table 4-15 provides a summary of the casualties estimated by HAZUS for an earthquake.

Table 4-37. HAZUS Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**

Property Damage and Critical Infrastructure: Generally, wood frame buildings and structures on solid ground fare best during an earthquake. Wood frame buildings are flexible enough to withstand ground shaking and swaying. Evaluations of recent earthquakes found that damage was primarily caused to:

- Unreinforced masonry structures.
- Older buildings with some degree of deterioration.
- Buildings without foundation ties.
- Multi-story structures with open or "soft" first floors.

Most building codes have standards related to the first three concerns. This means the most threatened buildings are older ones (built before current regulations), masonry ones, and taller ones with open first floors. Most other buildings, especially those made under a building code, would have little or no damage. However, some content damage can be expected if items fall from shelves.

In addition to the building type, the damage is related to the underlying soils. Buildings on solid ground fare better, while those on loose or sandy soils will suffer more from shaking. These can be found in floodplains. If enough water is present, the shaking can liquefy the underlying soils, removing the support under the foundation.

A HAZUS analysis was conducted to examine the exposure and damages of buildings to an earthquake incident.

Building Damage: HAZUS estimates that no buildings will be at least moderately damaged. This is over 0.00% of the total number of buildings in the region. There are also no estimated buildings that will be damaged beyond repair. Table 4-16 summarizes the expected damage by general building type.

Table 4-38. HAZUS Expected Building Damage by Occupancy

Expected Building Damage by Occupancy										
Damage	**None**		**Slight**		**Moderate**		**Extensive**		**Complete**	
Type	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Agriculture	934	0.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	37,449	7.82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Education	919	0.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government	481	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	8,941	1.87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Residential	20,136	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Religion	1,381	0.29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Single Family	408,823	85.34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**479,064**		**0**		**0**		**0**		**0**	

Table 4-39. HAZUS Expected Building Damage by Building Type (All Design Levels)

Expected Building Damage by Building Type (All Design Levels)										
Damage	**None**		**Slight**		**Moderate**		**Extensive**		**Complete**	
Type	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Wood	375,838.70	78.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Steel	15,242.04	3.18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Concrete	3,632.06	0.76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Precast	3,711.54	0.77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RM	1,439.15	0.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
URM	74,930.51	15.64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MH	4,270.00	0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**479,064**		**0**		**0**		**0**		**0**	
Note: RM: Reinforced Masonry, URM: Unreinforced Masonry, MH: Manufactured Housing										

Essential Facility Damage: HAZUS estimates show that before the earthquake, the region had 4,435 hospital beds available for use. On the day of the earthquake, the model estimates that only 4,419 hospital beds (100.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational. Table 4-18 illustrates expected damage to quantities of essential facilities.

Table 4-40. HAZUS Expected Damage to Essential Facilities

Expected Damage to # of Essential Facilities				
Classification	**Total**	**At Least Moderate Damage > 50%**	**Complete Damage > 50%**	**With Functionality > 50% on day 1**
Hospitals	18	0	0	18
Schools	471	0	0	471
Emergency Operations Center	9	0	0	9
Police Stations	46	0	0	46
Fire Stations	109	0	0	109

Fire Following Earthquake: Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00% of the region's total area. The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation: HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories:

- Brick/Wood, and
- Reinforced Concrete/Steel.

This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises % of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Shelter Impact: HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 1,274,395) will seek temporary shelter in public shelters.

Transportation and Utility Lifeline Impact: HAZUS computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Table 4-19 & Table 4-20 provide a detailed breakdown in the expected lifeline losses.

Economy: HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Table 4-19 & Table 4-20 provide a detailed breakdown in the expected lifeline losses.

Table 4-41. HAZUS Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	6813.9423	0.0000	0.00
	Bridges	1773.8035	0.0000	0.00
	Tunnels	80.8189	0.0000	0.00
	Subtotal	**8668.5647**	**0.0000**	
Railways	Segments	1440.4634	0.0000	0.00
	Bridges	282.8700	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	21.3040	0.0000	0.00
	Subtotal	**1744.6374**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	1.8591	0.0000	0.00
	Subtotal	**1.8591**	**0.0000**	
Ferry	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Port	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Airport	Facilities	32.0120	0.0000	0.00
	Runways	27.0565	0.0000	0.00
	Subtotal	**59.0685**	**0.0000**	
	Total	**10,474.13**	**0.00**	

Table 4-42. HAZUS Utility System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	35.2980	0.0000	0.00
	Distribution Lines	235.3152	0.0010	0.00
	Subtotal	**270.6132**	**0.0010**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	1899.6292	0.0000	0.00
	Distribution Lines	141.1891	0.0005	0.00
	Subtotal	**2040.8183**	**0.0005**	
Natural Gas	Pipelines	1562.5068	0.0000	0.00
	Facilities	260.9712	0.0000	0.00
	Distribution Lines	94.1261	0.0002	0.00
	Subtotal	**1917.6041**	**0.0002**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.3180	0.0000	0.00
	Subtotal	**0.3180**	**0.0000**	
Electrical Power	Facilities	3779.1464	0.0000	0.00
	Subtotal	**3779.1464**	**0.0000**	
Communication	Facilities	3.2860	0.0000	0.00
	Subtotal	**3.2860**	**0.0000**	
	Total	**8,011.79**	**0.00**	

Changes in Development and Impact of Future Development: No data exists demonstrating the impact of earthquakes on future development in Oakland County. Similarly, future development is not anticipated to increase the probability, magnitude, or vulnerability to this hazard. However, past earthquakes have been shown to impact zoning regulations and building codes requiring developers to build structures more resistant to seismic activity.

Effects of Climate Change on Severity of Impacts: The exact nature and extent of this impact still need to be studied and fully understood regarding climate change.

FEMA NRI Expected Annual Loss Estimates

Table 4-43. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI FEMA NRI EXPECTED ANNUAL LOSS TABLE FOR EARTHQUAKE EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
0.017% chance	0.02	$251,866	$970,754	N/A	$1,222,620	81.1	Relatively Low
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2023)							

FEMA Hazard-Specific Risk Index Table

Table 4-44. Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RATINGS - EARTHQUAKE		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
80.9 / 100	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2023)		

4.7 Extreme Heat

Hazard Description

According to the NOAA, "extreme heat" refers to excessively hot and humid weather, which may be accompanied by high ozone levels, that can cause significant health problems, particularly for vulnerable populations such as the elderly, young children, and those with pre-existing medical conditions. The threshold for extreme heat can vary depending on location but is generally defined as a heat index of 105°F or higher for at least two consecutive hours.

“The heat index measures how hot it feels when relative humidity is factored in with the actual air temperature. The relative humidity is the percentage of moisture in the air compared with the maximum amount of moisture the air can hold. Humidity is an important factor in how hot it feels because when humidity is high, water doesn’t evaporate as easily, so it’s harder for your body to cool off by sweating (US EPA, CDC, 2023)”.

Figure 4-16 shows the NOAA’s Heat Index (US EPA, CDC, 2023).

Hazard Location

Extreme heat could occur anywhere in Oakland County.

Hazard Extent/Intensity

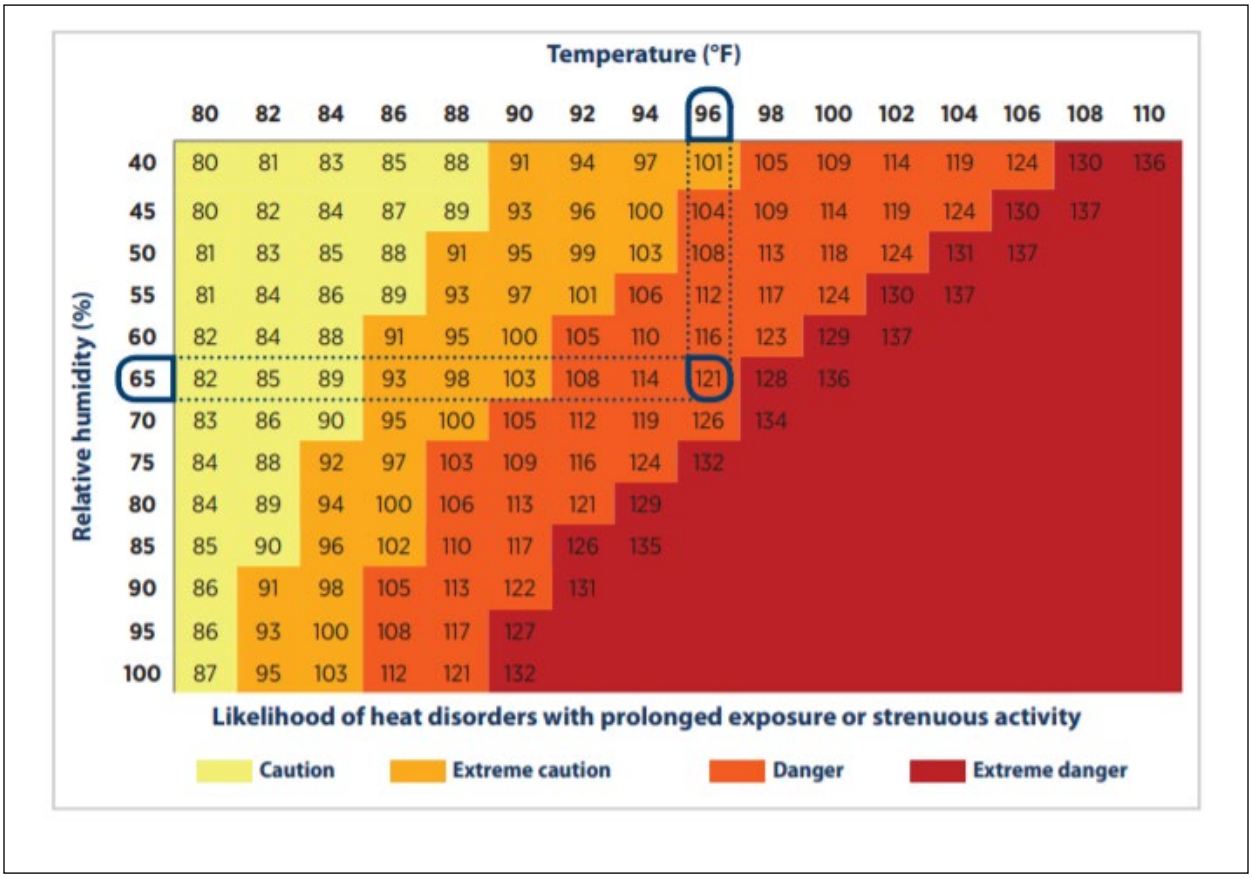
When an extreme heat event occurs, the National Weather Service may issue an excessive heat warning, a heat watch, a heat advisory, or a heat outlook. The NWS defines these as the following:

- **Excessive Heat Warning**: Take Action! An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105° or higher for at least two days, and nighttime air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas not used to extreme heat conditions. If you don’t take precautions immediately during extreme conditions, you may become seriously ill or die.
- **Excessive Heat Watches**: Be Prepared! Heat watches are issued when conditions are favorable for an extreme heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased, but its occurrence and timing are still uncertain.
- **Heat Advisory**: Take Action! A Heat Advisory is issued within 12 hours of the onset of hazardous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100° or higher for at least two days, and nighttime air temperatures will not drop below 75°; however, these criteria vary across the country, especially for areas that are not used to dangerous heat conditions.

Take precautions to avoid heat illness. If you don't take precautions, you may become seriously ill or even die.

- **Excessive Heat Outlooks** are issued when the potential exists for an extreme heat event in the next three to seven days. An Outlook provides information to those needing considerable time to prepare for the event.

Figure 4-25. National Oceanic and Atmospheric Administration National Weather Service Heat Index



Probability and Frequency

On average, the U.S. has been experiencing warmer summers throughout the past decade. This warming is correlated to recent changes in climate. "Without big steps to reduce greenhouse gas emissions, the average number of extremely hot days in the United States is projected to more than triple from 2050 to 2100 (US EPA, CDC, 2023, p. 6)". It is estimated that there is an 90% annual probability of occurrence based on activation of cooling centers and projected climate change impacts. However, the likelihood of a significant or extreme incident is still low.

Past Events

The highest temperature recorded in Michigan was 112ºF on July 13, 1936, in Mio. During that week, 570 people died state-wide, and there were 5,000 deaths nationwide attributed to the heat wave (Michigan Hazard Analysis, 2006).

During a heat wave in the summer of 1988, for 39 days, we had temperatures of 90ºF or greater. Temperatures in southeast Michigan topped the 100ºF mark on five occasions.

In July 1999, a heat wave that struck the Midwest and east coast resulted in an estimated 256 heat-related deaths in 20 states, including one in Michigan.

In mid-July of 2011, a heat wave helped cap off Detroit's warmest month on record. Three direct deaths were reported (including one fatality in Oakland County) due to the heat wave, as heat indices were above 100 degrees (NOAA, 2023).

Between 2011 and 2023, NOAA has not recorded any extreme heat events. However, cooling centers activations occurred in the County during the following dates over the past 5 years:

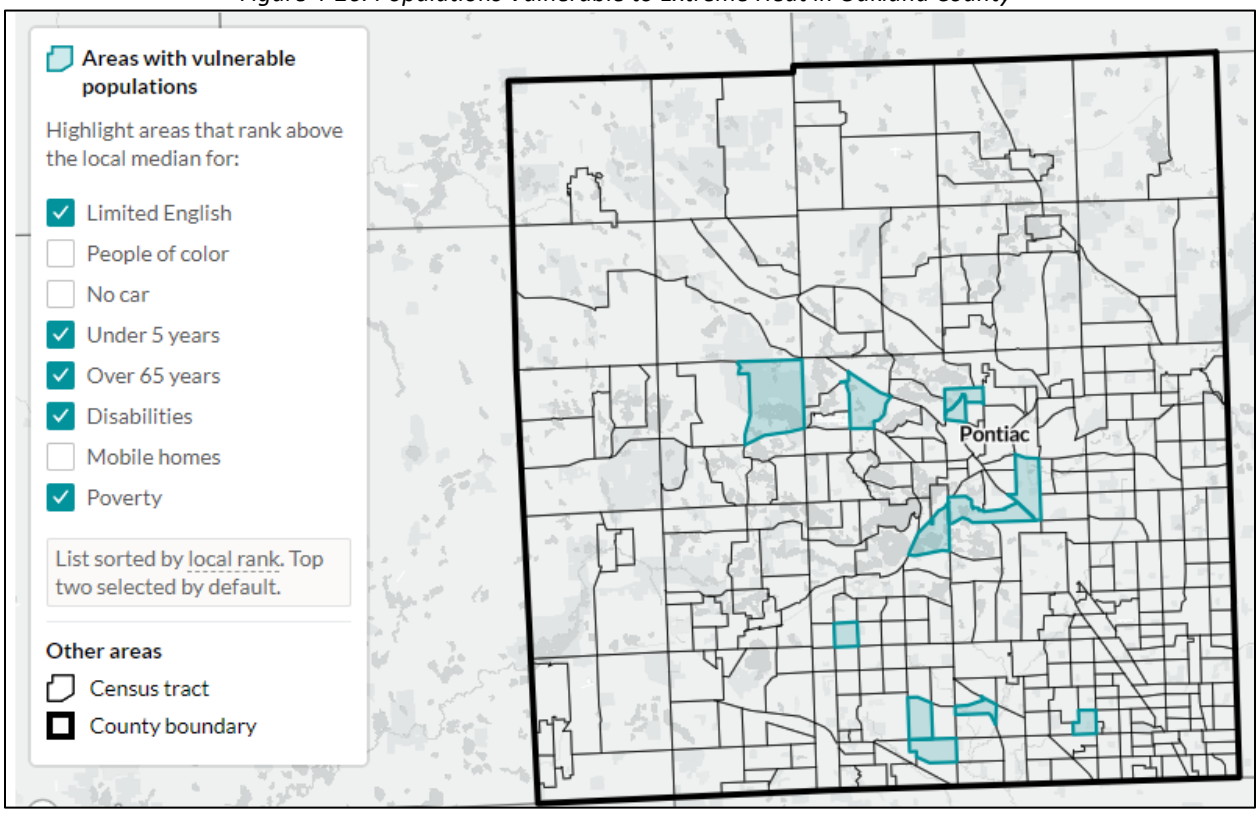
- July 2019
- July 2020
- August 2021
- June 2022
- June 2023
- July 2023
- August 2023

Vulnerability and Impacts

Life Safety and Health: According to the Centers for Disease Control and Prevention (CDC), extreme heat is a serious threat to life safety and health. The CDC provides extensive information on this topic and outlines some of the ways that extreme heat can affect health and safety. For instance, high temperatures can cause heat exhaustion, leading to heat stroke if left untreated. Symptoms of heat exhaustion include heavy sweating, weakness, dizziness, headache, nausea, and vomiting. Extreme heat can also cause dehydration, leading to kidney damage, seizures, and even coma. Furthermore, it can stress the heart and blood vessels, increasing the risk of heart attack and stroke, particularly in people with preexisting cardiovascular conditions. Heat can also worsen respiratory problems such as asthma and chronic obstructive pulmonary disease (COPD), increasing the risk of respiratory infections.

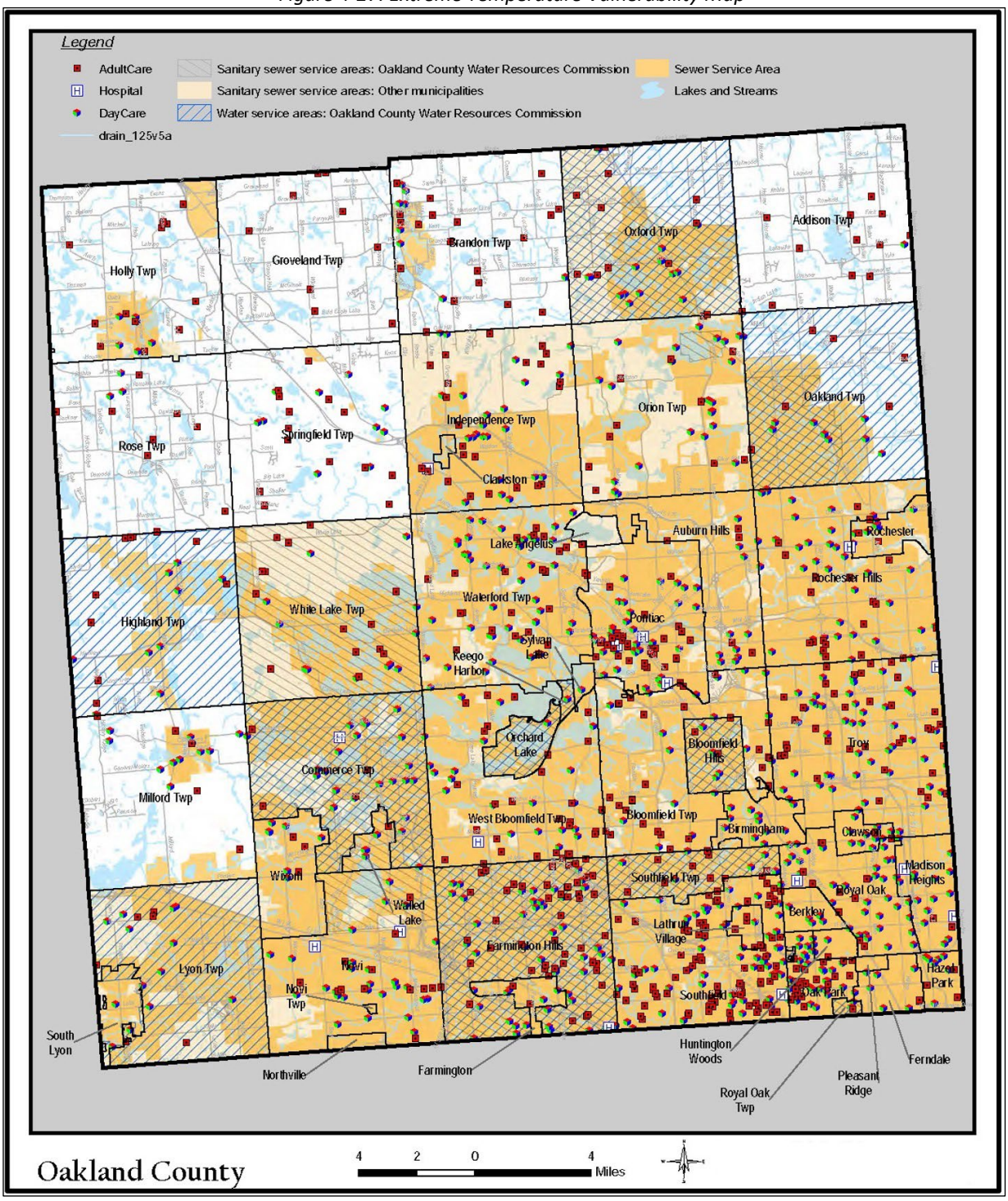
Additionally, extreme heat can exacerbate other health issues, including diabetes, mental health, and skin conditions. In some severe cases, heat can cause death, particularly in vulnerable populations such as the elderly, young children, and those with preexisting health conditions. To stay safe during extreme heat, the CDC recommends staying hydrated, avoiding outdoor activities during the hottest part of the day, wearing loose, lightweight clothing, and seeking out air-conditioned environments when possible.

Figure 4-26. Populations Vulnerable to Extreme Heat in Oakland County



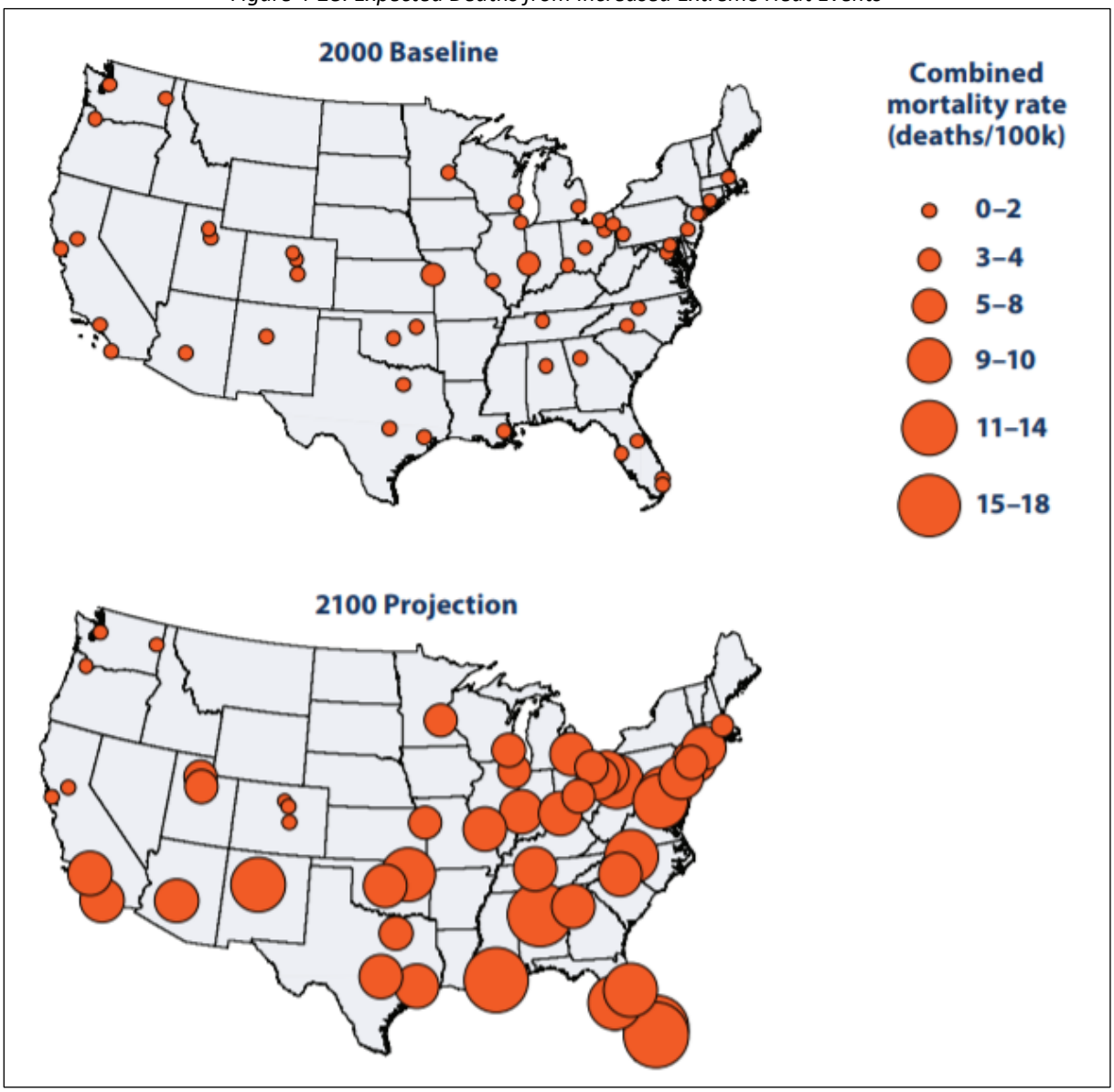
Source: U.S. Census Bureau, American Community Survey

Figure 4-27. Extreme Temperature Vulnerability Map



Source: Oakland County, MI, USDA, SEMCOG

Figure 4-28. Expected Deaths from Increased Extreme Heat Events



As extreme heat events become more common and more severe, the EPA and CDC estimate that deaths due to extreme heat events will increase. Figure 4-19 outlines the expected outcomes from increased events (US EPA, CDC, 2016, p. 8)". The U.S. EPA and CDC have also determined that those who live in primarily urban areas, like Oakland County, are also more at risk for experiencing adverse side effects of extreme heat events. "Less vegetation means less shade and moisture to keep urban areas cool. In addition, conventional roofs and pavement reflect less and absorb more of the sun's energy, which leads to higher temperatures near these structures. Additionally, tall buildings and narrow streets can reduce airflow, trapping the heat absorbed during the day and heat generated by vehicles, factories, and air conditioning vents.

According to FEMA, extreme heat can disproportionately impact disadvantaged or challenged communities in the following ways:

- Heat Vulnerability: Residents of disadvantaged communities may be more vulnerable to extreme heat due to factors such as age, pre-existing health conditions, or limited access to healthcare. They may also lack air conditioning or live in homes with poor ventilation, increasing their risk of heat-related illnesses.
- Heat Islands: Urban areas, where many disadvantaged communities are located, can experience higher temperatures due to the urban heat island effect. Asphalt, concrete, and limited green spaces absorb and retain heat, making these areas hotter than surrounding regions.
- Limited Access to Cooling Centers: Disadvantaged communities may have limited access to cooling centers or public facilities where individuals can seek relief from extreme heat. This can leave residents with few options to escape dangerously high temperatures.
- Financial Constraints: Low-income households may struggle to afford the increased energy costs associated with running air conditioning or cooling systems during heatwaves. This can lead to discomfort, health risks, and potential utility shutoffs.
- Limited Mobility: Some residents of disadvantaged communities may have limited mobility, making it difficult for them to leave their homes or access transportation to cooler areas during extreme heat events.
- Community Infrastructure: The quality of community infrastructure, including housing and public spaces, may be inadequate to cope with extreme heat. Insufficient green spaces, poor building design, and limited access to shade can exacerbate heat-related challenges.
- Social Isolation: Disadvantaged individuals may experience social isolation, reducing their support networks during extreme heat events. This isolation can impact their ability to seek help or assistance.
- Language and Cultural Barriers: Communities with non-English-speaking populations or cultural differences may face challenges in receiving and understanding heat advisories and instructions, hindering their ability to respond effectively.

Figure 3-6 in the Community Profile section illustrates the Oakland County Community Resilience Index Story Map. This map shows each participating jurisdiction with density mapping used to identify community areas that are overburdened by the 22 challenges identified by the FEMA Community Resilience Challenges Index.

Property Damage and Critical Infrastructure: Heat has little or no impact on structures. The demand for electric utilities will be elevated due to increased demand for cooling systems.

Economy: No data exists demonstrating the economic impacts of past extreme heat events on Oakland County. However, extreme heat is often accompanied by drought and can harm livestock and crops. Extreme heat can also impact energy demands and can be associated with

wildfires. In addition, medical costs and increased emergency response costs would be anticipated with an extreme heat event.

Changes in Development and Impact of Future Development: Future development is not anticipated to increase the probability, magnitude, or vulnerability to this hazard besides greater exposure of people to this hazard.

Effects of Climate Change on Severity of Impacts: Average temperatures have increased by approximately 2.5°F since the beginning of the 20th century, leading to more frequent heatwaves. This increase in average temperature also means that heat waves are becoming more intense and lasting longer. Heatwaves can cause heat stress, dehydration, and other heat-related illnesses, particularly for vulnerable populations such as the elderly, young children, and those with chronic diseases.

Climate Change Related to Extreme Heat in Oakland County:

Table 4-45. 25-Year Climate Projections for Oakland County

25-YEAR CLIMATE PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 164% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 7 more days that reach above 95°F (from 4 days to 11 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 112% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 4 more days that reach above 95°F (from 4 days to 7 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-46. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90°	**6 days**	**19 days**	**21 days**	**46 days**	**34 days**	**35 days**	**64 days**
	6-10	9-35	11-35	14-49	16-54	17-67	30-95
Annual Days With Maximum	**1 day**	**4 days**	**6 days**	**8 days**	**12 days**	**13 days**	**33 days**
	1-1	1-13	1-17	2-24	4-32	3-38	7-70

Temperature >95°							
Annual Days With Maximum Temperature >100°	**0 days**	**1 day**	**1 day**	**1 day**	**3 days**	**3 days**	**13 days**
	0-0	0-7	0-8	0-16	1-24	1-16	2-69
Annual Days With Maximum Temperature >105°	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**4 days**
	0-0	0-1	0-0	0-1	0-3	0-2	0-29
Annual Temperature							
Annual Single Highest Temperature °F	**94°F**	**98°F**	**98°F**	**99°F**	**101°F**	**101°F**	**105°F**
	93-95	94-101	95-101	96-104	97-106	97-105	99-114
Annual Highest Maximum Temperature Averaged Over a 5-Day Period	**89°F**	**92°F**	**93°F**	**94°F**	**95°F**	**96°F**	**100°F**
	88-90	89-96	90-96	91-99	92-101	92-101	94-109
Cooling Degree Days (CDD)	**654 degree-days**	**938 degree-days**	**980 degree-days**	**1,094 degree-days**	**1,247 degree-days**	**1,269 degree-days**	**1,866 degree-days**
	607-716	749-1,237	776-1,146	835-1,474	963-1,548	921-1,819	1,247-2,590
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates

Table 4-47. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI FEMA NRI EXPECTED ANNUAL LOSS TABLE FOR EXTREME HEAT EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
1.1 events per year	0.96	$11,130,063	$42,852	$1,576	$11,174,491	99.1	Relatively High

Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*
Expected Annual Loss *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*

Source: FEMA National Risk Index (2023)

FEMA Hazard-Specific Risk Index Table

Table 4-48. Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RATINGS - EXTREME HEAT		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
98.8 / 100	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2023)		

4.8 Flooding

Hazard Description

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains.

Floods are considered hazards when people and property are affected. In Michigan, flooding occurs commonly and can occur from various sources during any season of the year.

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof causes the river or stream to overflow its banks onto adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snowpacks, heavy spring rains, or a combination of the two.

According to the NOAA, a watershed is a land area that channels rainfall and snowmelt into creeks, streams, rivers, and eventually to outflow points such as reservoirs, bays, and the ocean (NOAA, 2023). Oakland County is located within the Lower Huron watershed, part of the larger Detroit River Basin. The Lower Huron watershed includes parts of Oakland County and neighboring counties Wayne and Monroe.

During high precipitation or rapid snowmelt, water may enter a watershed too quickly for the land to absorb, causing “surface runoff.” This overflow can also cause water to run on and off impervious surfaces such as parking lots, roads, buildings, and other structures, causing urban/depressional flooding.

Urban/Depressional flooding, as defined in the Urban Flooding Awareness Act, is the inundation of property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. Urban flooding does not include flooding in undeveloped or agricultural areas.

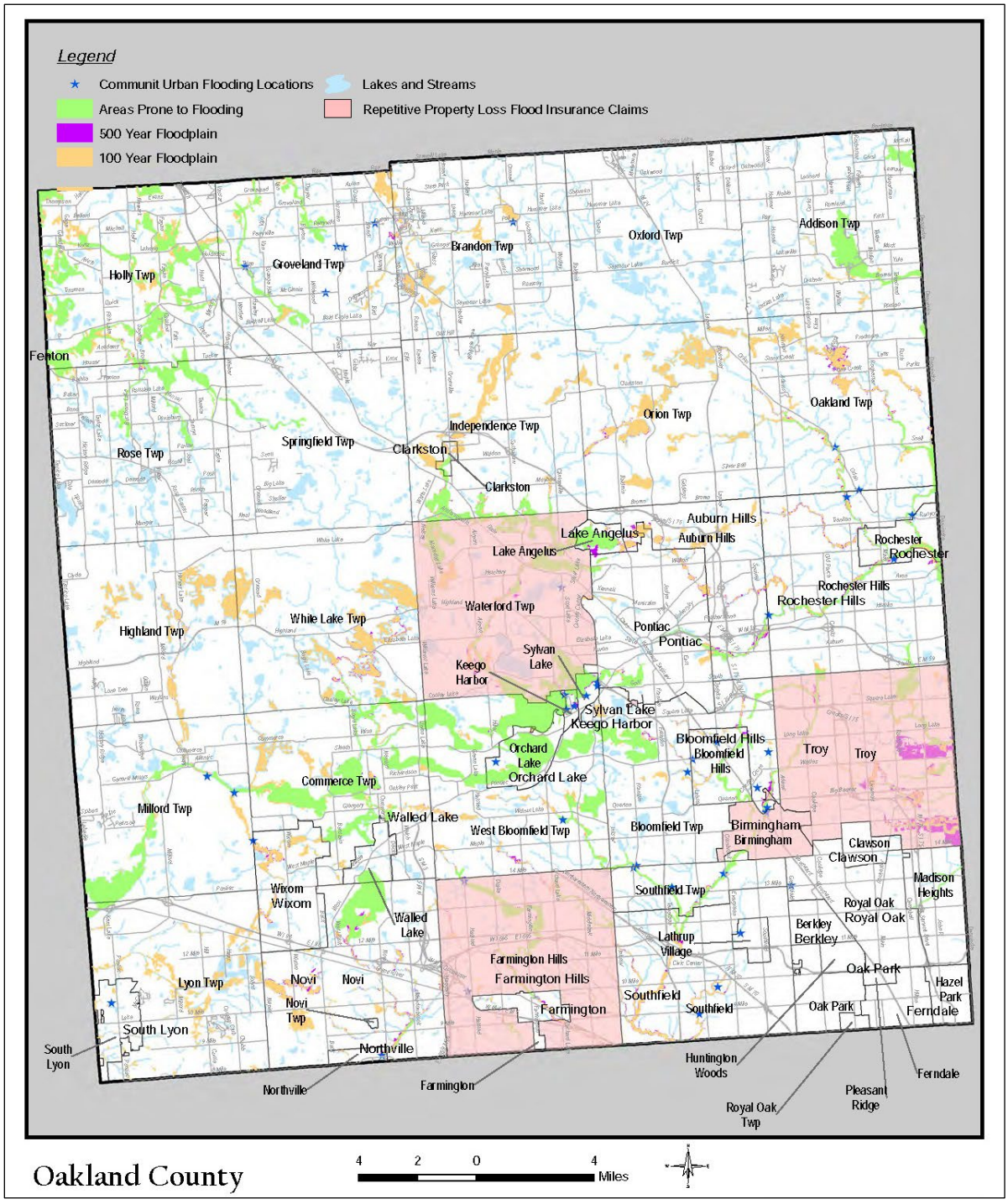
Urban flooding includes situations in which stormwater:

- Enters buildings through windows, doors, or other openings.
- Backs up through sewer pipes, showers, toilets, sinks, and floor drains.
- Seeps through walls, and/or floors.
- Accumulates on public property or rights-of-way.

Urban flooding is characterized by its repetitive, costly, and systemic impacts on communities, regardless of whether or not these communities are located within formally designated floodplains or near any body of water.

Hazard Location

Figure 4-29. Riverine Flooding Vulnerability Map



Source: Oakland County, MI, USDA, SEMCOG

Figure 4-30. 100-year Floodplain Map

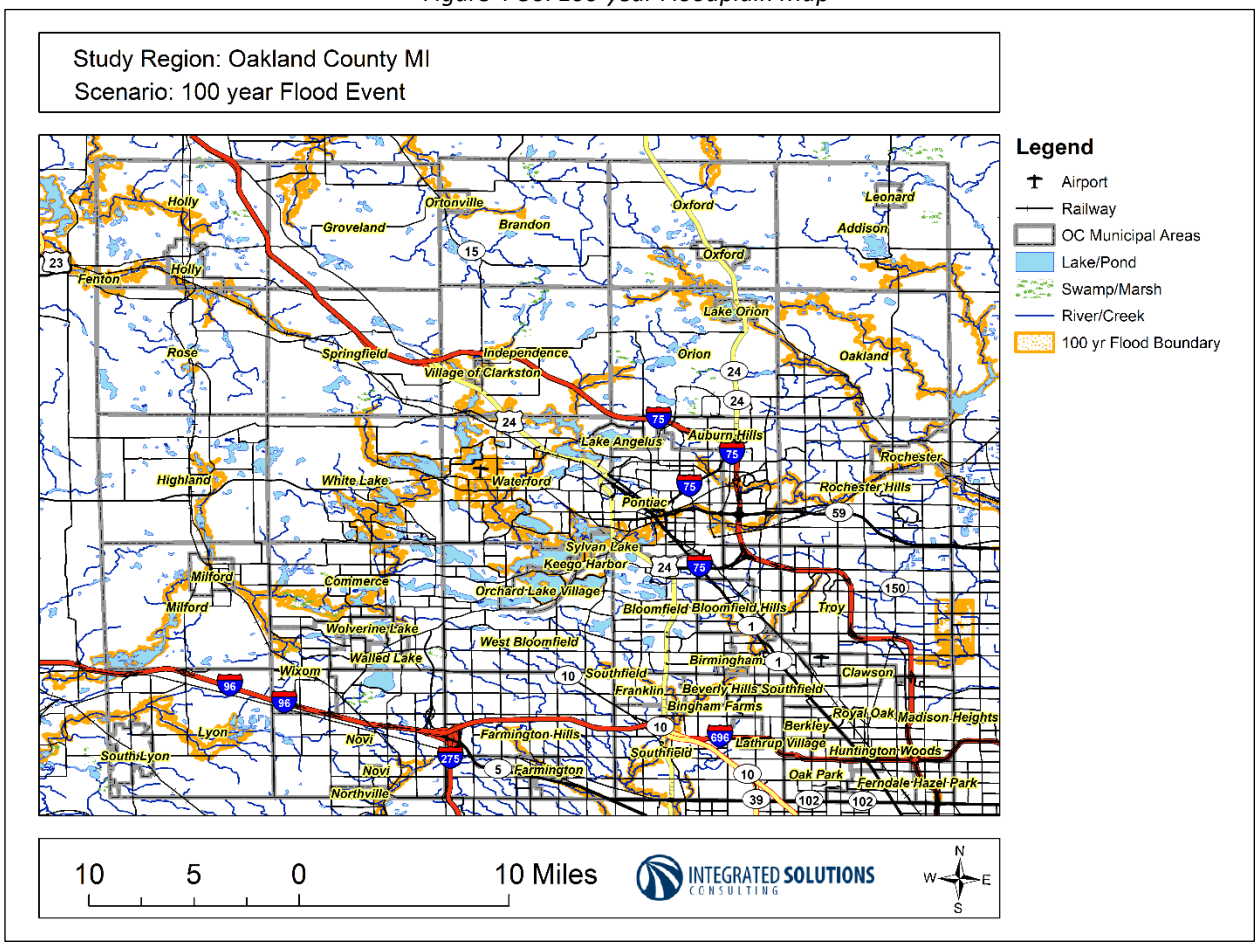
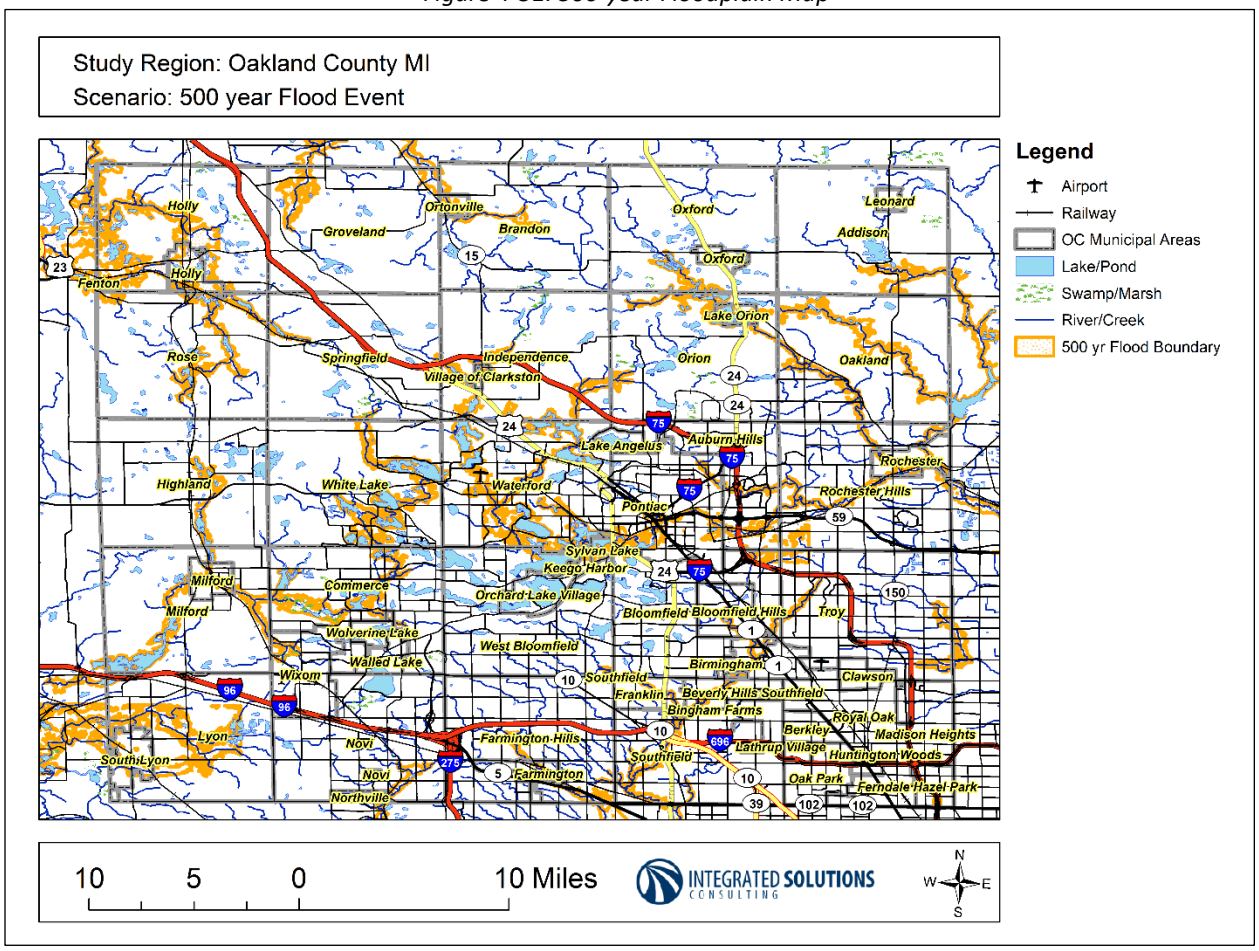


Figure 4-31. 500-year Floodplain Map



Hazard Extent/Intensity

Several factors determine the severity of floods, including rainfall intensity and duration, topography, and ground cover.

The NFIP classifies floods through recurrence intervals, as seen in Table 4-27.

Table 4-49. NFIP Flood Recurrence Intervals

Flood Recurrence Interval	Chance of occurrence during any given year
5 year	20%
10 year	10%
50 year	2%
100 year	1%
500 year	0.20%

The federal standard for floodplain management under the National Flood Insurance Plan (NFIP) is the “100-year floodplain.” This area is chosen using historical data such that in any

given year, there is a 1% chance of a “base flood” (also known as a “100-year flood” or “regulatory flood”). A base flood covers or exceeds the 100-year floodplain. A “500-year floodplain” is an area with at least a .2% chance of flood occurrence in any given year (FEMA, 2023).

Figure 4-21 illustrates the 100-year floodplain map for Oakland County, while Figure 4-22 illustrates the 500-year floodplain map.

When surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow, water overflows the stream banks, spilling out into adjacent low-lying areas. Riverine flooding occurs as a consequence. Riverine flooding can cause two types of floods: overbank flooding and flash floods. Overbank flooding is the increase in the volume of water within a river channel and the overflow of water from the channel onto the adjacent floodplain. Flash floods are the most dangerous because they combine a flood's destructive power with incredible speed and unpredictability. Flash floods occur when excessive water fills typically dry creeks or riverbeds along with currently flowing creeks and rivers, causing rapid water rises in a short amount of time. They can happen with little or no warning.

The extent for flash flooding in Oakland County can range from a few inches of water to multiple feet (historical reported range from 2 to 3 feet).

Probability and Frequency

Riverine Flooding: From 1975 through 2023, two major floods in Michigan resulted in Presidential Major Disaster Declarations (FEMA, 2023). Two of Oakland County’s major rivers, the Clinton and Rouge Rivers, will likely flood again. Portions of the Huron River also exhibit flooding, but less frequently. Smaller tributaries of these river systems are also likely to flood in the future. Therefore, it is highly probable that riverine flooding will continue to be a hazard in Oakland County. It is estimated that there is a 40% annual probability of occurrence.

Urban/Depressional Flooding: Oakland County has had 14 urban flooding events since 2003. The frequency of urban flooding is dependent on seasonal weather patterns. Urban flooding is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt. Urban flooding is more likely to occur in spring when thunderstorms and snow melt are more prominent.

Many areas of Oakland County are moderate to heavily populated and connected to municipal sewer systems (stormwater and/or sanitary sewer). Given this, it is highly probable that urban flooding will occur within the County. Additionally, as development continues within the County, an increase in urban flooding may occur. It is estimated that there is an 80% annual probability of occurrence.

Past Events

Table 4-28 illustrates all riverine flooding events between 2013 and 2023. During this timeframe, there were five events with no associated injuries or deaths. Table 4-29 shows all urban/depressional flooding events between 2013 and 2023. There were 12 events with no associated injuries or deaths during this timeframe. Narratives from select incidents (causing property damage) from Table 4-29 are provided immediately following the table.

Table 4-50. Oakland County Recorded Flood Events (2013-2023)

RIVERINE FLOODING EVENTS IN OAKLAND COUNTY, MI (2013-2023)							
Location	**County**	**Date**	**Type**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**
FERNDALE	Oakland	08/11/2014	Flood	0	0	0.00K	0.00K
OAKLEY PARK	Oakland	08/16/2016	Flood	0	0	0.00K	0.00K
FRANKLIN	Oakland	08/12/2019	Flood	0	0	0.00K	0.00K
NEWARK	Oakland	01/11/2020	Flood	0	0	0.00K	0.00K
FERNDALE	Oakland	08/28/2020	Flood	0	0	0.00K	0.00K
Totals:				**0**	**0**	**0.00K**	**0.00K**

Table 4-51. Oakland County Recorded Flash Flood Event (2013-2023)

URBAN/DEPRESSIONAL FLOOD EVENTS IN OAKLAND COUNTY, MI (2013-2023)							
Location	**County**	**Date**	**Type**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**
WHITE LAKE	Oakland	06/27/2013	Flash Flood	0	0	0.00K	0.00K
BLOOMFIELD HIGHLANDS	Oakland	08/30/2013	Flash Flood	0	0	0.00K	0.00K
FERNDALE	Oakland	08/11/2014	Flash Flood	0	0	400M	0.00K
WIXOM SPENCER ARPT	Oakland	09/29/2016	Flash Flood	0	0	500K	0.00K
NOVI	Oakland	08/28/2017	Flash Flood	0	0	0.00K	0.00K
FRANKLIN	Oakland	08/12/2019	Flash Flood	0	0	0.00K	0.00K
FERNDALE	Oakland	07/10/2020	Flash Flood	0	0	0.00K	0.00K
FERNDALE	Oakland	08/28/2020	Flash Flood	0	0	0.00K	0.00K
OAKWOOD	Oakland	06/26/2021	Flash Flood	0	0	2.0M	0.00K
BLOOMFIELD HILLS	Oakland	07/24/2021	Flash Flood	0	0	0.00K	0.00K
FERNDALE	Oakland	08/27/2021	Flash Flood	0	0	100K	0.00K
OXFORD	Oakland	10/08/2021	Flash Flood	0	0	3.4M	0.00K
Totals:				**0**	**0**	**406M**	**0.00K**

08/2014: A historic rainfall event unfolded over Southeast Michigan on Monday, August 11, leading to significant flooding and road closures. This event was caused by a strengthening low-pressure system moving over the area, focusing on the tropical moisture from the south. The hardest hit areas included Metro Detroit, surrounding communities, Flint, and the Saginaw Valley areas. Wayne, Southern Oakland, and Macomb counties saw the worst flooding as 4 to 6 inches of rain fell over 4 hours. Around 75,000 homes and businesses suffered damage, with over 3000 suffering major damage. There was also damage to the roads and bridges, along with the city sewer pumps, which were overwhelmed by the torrential rainfall. The total estimated dollar loss from the Detroit Metro area was 1.8 billion dollars. Farther north, across parts of Saginaw, Bay, and Genesee counties, flooding was not nearly as bad, but flooded roads with 2 to 3 feet of water were reported.

09/2016: Heavy rain fell across the Detroit Metro Area during the morning hours, with rainfall totals of 2 to 5 inches, the heaviest rain centered in Downtown Detroit. Widespread urban flooding was reported, with many roads and interstates closed. Many basements were also flooded.

06/2021: After several weeks of moderate to severe drought conditions in Southeast Michigan, a weather pattern brought widespread rainfall and flooding to Metro Detroit and surrounding areas during the weekend of June 25-27th. Low-pressure tracking along a stalled stationary boundary interacted with a very moist subtropical air mass to produce widespread 3 to 5 inches of rainfall across Metro Detroit (localized 6 to 8 inches), resulting in numerous reports of significant flooding within the Detroit metro vicinity, especially Washtenaw and Wayne Counties. In addition to the heavy rain, an EF-2 tornado was observed near Port Austin in Huron County during this event just before 5 pm EST on June 26th.

08/2021: Flooding at M10 and Evergreen impacting all lanes. The intersection of Grand River Westbound and Middlebelt was impassable due to flooding. Multiple main and side roads flooded across Royal Oak. Intersection locations include Sherman and Lafayette and Maple and Louis. Reports of cars stalled out on Bellaire between Campbell and Edgeworth.

10/2021: A thunderstorm dumped at least 4 inches of rain in less than 2 hours, leading to flash flooding in Orion Township. Roads were damaged, cars submerged and stranded, and homes flooded. Flood waters impacted the M-24 and I-75 interchange, with roads closed for several hours.

Vulnerability and Impacts

Life Safety and Health: Safety and health concerns during a flood range considerably. One of the primary issues communities' experiences, especially during flash floods, is vehicles getting stuck and swept away by rapidly moving waters. These scenarios also present danger to first responders and bystanders attempting to rescue vehicle occupants. "It is easy to misjudge the depth of floodwater, particularly at night. Sometimes the bridge or road masked by flood water

may have been undermined or completely washed out (The Weather Channel, 2023)". The Weather Channel also writes that according to FEMA:

- Six inches of water will reach the bottom of most passenger cars, causing loss of control and potential stalling.
- A foot of water will float many vehicles.
- Two feet of rushing water will carry away most vehicles, including SUVs and pickups.

Just as vehicles are recommended to stay away from standing and moving flood waters, the same is recommended for individuals. Flood waters can be both unsanitary and dangerous. According to Dr. Greg Forbes, a severe weather expert for The Weather Channel, water flowing at just 6 miles per hour (mph) can exert the same force as the winds of an EF5 tornado (The Weather Channel, 2023). Additionally, water moving at approximately "25 mph has the pressure equivalent of wind blowing at 790 mph, faster than the speed of sound (The Weather Channel, 2023)". When individuals get stuck in flood waters, some experience heart attacks and other medical conditions while trying to free themselves from the water.

Contact with flood waters can increase the possibility of contracting a communicable disease and other medical issues due to pollutants, chemicals, waste, and an increased number of insects (CDC, 2023). Flood waters can also saturate the ground when receding, leading to infiltration into sanitary sewer lines. When wastewater treatment facilities are flooded, there is often nowhere for the treated sewage to be discharged or inflowing sewage to be stored. Infiltration and lack of treatment lead to overloaded sewer lines, which back up into low-lying areas and some homes. Even though diluted by flood waters, raw sewage can be a breeding ground for bacteria, such as E. coli, and other disease-causing agents. Because of this threat, tetanus shots are given to people affected by a flood.

Stagnant water is often a perfect breeding ground for insects, specifically mosquitoes, known to carry and distribute various types of diseases. Standing water also creates mold, which can be a health issue for everyone, but is a hazard to those with breathing issues, children, and the elderly. If forced-air systems are affected by floods and are not subsequently appropriately cleaned, individuals may inadvertently breathe in pollutants. If the water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

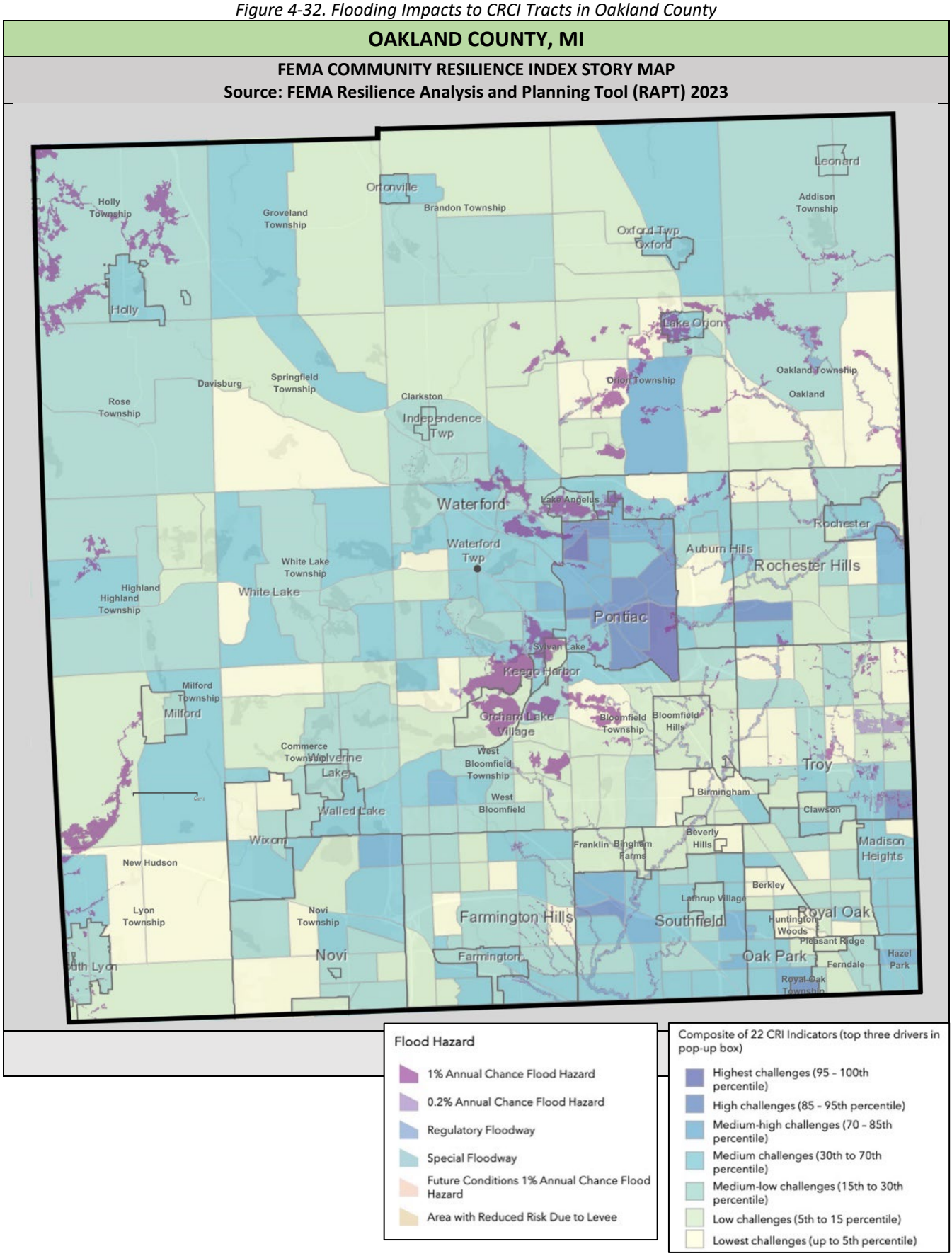
The force of flood waters can damage gas lines, which creates the potential for secondary hazards such as gas leaks and fires. This force, along with standing water, can also damage the structural integrity of buildings, which can cause injuries if issues go unnoticed or unrepaired. While fires have not resulted from flooding within Oakland County, history shows that floods can prevent fire departments and protection agencies from successfully combating and sometimes even accessing a fire, allowing it to spread.

According to FEMA, flooding can also disproportionately impact disadvantaged or challenged communities in the following ways:

- Lack of Resilience Infrastructure: Disadvantaged communities often lack the infrastructure necessary to mitigate flood impacts, such as well-maintained levees, flood barriers, and stormwater management systems. The absence of these protective measures can make these areas more susceptible to flooding and its consequences.
- Inadequate Housing: Residents of disadvantaged communities may be more likely to live in substandard housing or low-lying areas that are prone to flooding. Such housing may lack flood-resistant construction and may not provide adequate protection during floods.
- Limited Financial Resources: These communities often have fewer financial resources to prepare for, respond to, and recover from flooding. This can lead to difficulties in purchasing flood insurance, repairing flood-damaged homes, or accessing emergency resources.
- Health Vulnerabilities: Residents of disadvantaged communities may have higher rates of pre-existing health conditions or limited access to healthcare services. Flooding can exacerbate these health vulnerabilities, especially if contaminated floodwater spreads diseases or disrupts medical care.
- Transportation Challenges: Limited access to reliable transportation can hinder evacuation efforts during flooding events, placing residents in these areas at greater risk. Public transportation options may be insufficient or inaccessible, leaving residents stranded.
- Information Access: Disadvantaged communities may have limited access to timely and accurate information about flood risks and preparedness measures. This lack of information can lead to delayed or inadequate responses to flood warnings.
- Environmental Justice Concerns: Flooding can lead to the release of hazardous materials, contaminating soil and water. Disadvantaged communities are more likely to be located near industrial sites or toxic facilities, exacerbating environmental justice concerns.
- Community Disruption: Flooding can displace residents from their homes, disrupting communities and increasing social and economic hardships. The process of recovery and rebuilding may take longer in these areas due to limited resources.

The FEMA Community Resilience Challenges Index (CRCI) provides a relative assessment of a community's potential resilience and gives insights into population and community characteristics from which to build emergency operations plans and targeted outreach strategies. Figure 4-23 illustrates the impact of flooding to CRCI tracts in Oakland County.

Figure 4-32. Flooding Impacts to CRCI Tracts in Oakland County



Property Damage and Critical Infrastructure: A HAZUS analysis was conducted for a 100-year flood to examine the exposure and damages of buildings to flooding.

100-year Flood Analysis:
HAZUS estimates that about 452 buildings will be at least moderately damaged. This is over 82% of the total number of buildings in the scenario. There are an estimated 6 buildings that will be completely destroyed.

Table 4-52. HAZUS 100-year Expected Building Damage by Occupancy

Expected Building Damage by Occupancy												
Damage Level	**1-10**		**11-20**		**21-30**		**31-40**		**41-50**		**>50**	
Occupancy	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	10	53	8	42	0	0	0	0	1	5	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	240	35	320	47	87	13	27	4	3	0	6	1
Total	**250**		**328**		**87**		**27**		**4**		**6**	

Before the flood analyzed in this scenario, the region had 4,435 hospital beds available for use. On the day of the scenario flood event, the model estimates that 4,435 hospital beds are available in the region.

Table 4-53. HAZUS 100-year Expected Damage to Essential Facilities

Expected Damage to # of Essential Facilities				
Classification	**Total**	**At Least Moderate**	**At Least Substantial**	**Loss of Use**
Emergency Operations Centers	9	0	0	0
Fire Station	109	0	0	0
Hospitals	18	0	0	0
Police Stations	46	0	0	0
Schools	471	0	0	0

Table 4-54. HAZUS 100-year Building-Related Economic Loss Estimates

Building-Related Economic Loss Estimates (Millions of Dollars)						
	Area	**Residential**	**Commercial**	**Industrial**	**Others**	**Total**
Building Loss	Building	121.77	22.86	9.40	3.53	157.56
	Content	55.59	68.38	22.69	22.44	169.11
	Inventory	0.00	8.76	4.07	0.62	13.46
	Subtotal	**177.37**	**100.01**	**36.16**	**26.60**	**340.13**
Business Interruption	Income	2.86	65.97	0.70	12.92	82.45
	Relocation	36.96	15.28	0.85	5.95	59.04
	Rental Income	14.58	11.12	0.17	64.07	138.07
	Wage	6.76	66.08	1.15	64.07	138.07

	Subtotal	**61.17**	**158.45**	**2.87**	**83.33**	**305.82**
All	**Total**	**238.53**	**258.46**	**39.03**	**109.93**	**645.94**

The total economic loss estimated for the flood is $645.94 million, representing 3.32% of the total replacement value of the scenario buildings.

The total building-related losses were $340.13 million. 47% of the estimated losses were related to business interruption in the region. The residential occupancies made up 36.93% of the total loss.

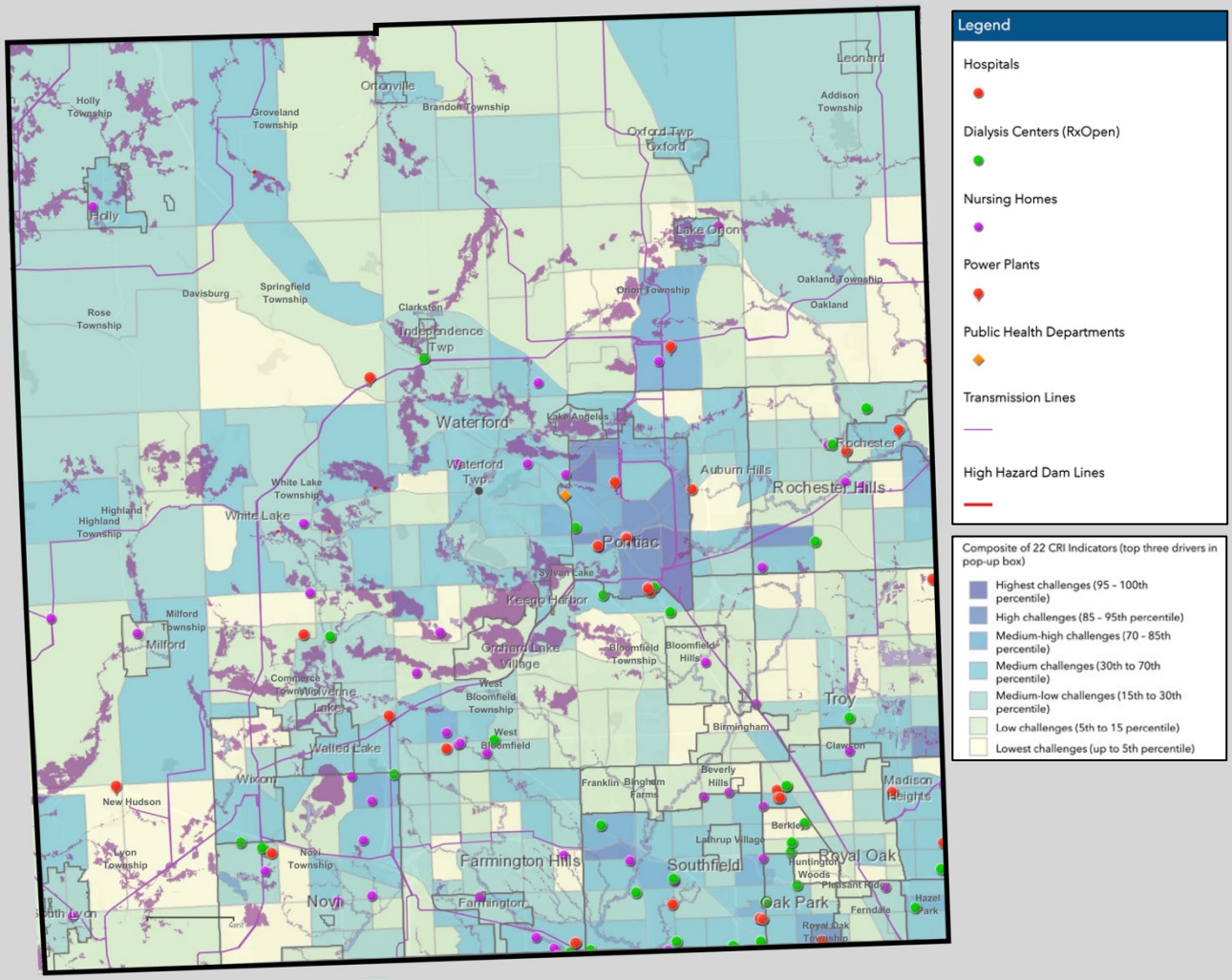
HAZUS estimates the number of households expected to be displaced due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates that 1,595 households (4,784 people) will be displaced due to the flood. Displacement includes households evacuated from within or very near the inundated area. Of these, 1,358 people are expected to seek temporary shelter in public shelters.

Figure 4-24 illustrates flooding impact to critical infrastructure in Oakland County.

Figure 4-33. Flooding Impacts to Critical Infrastructure in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



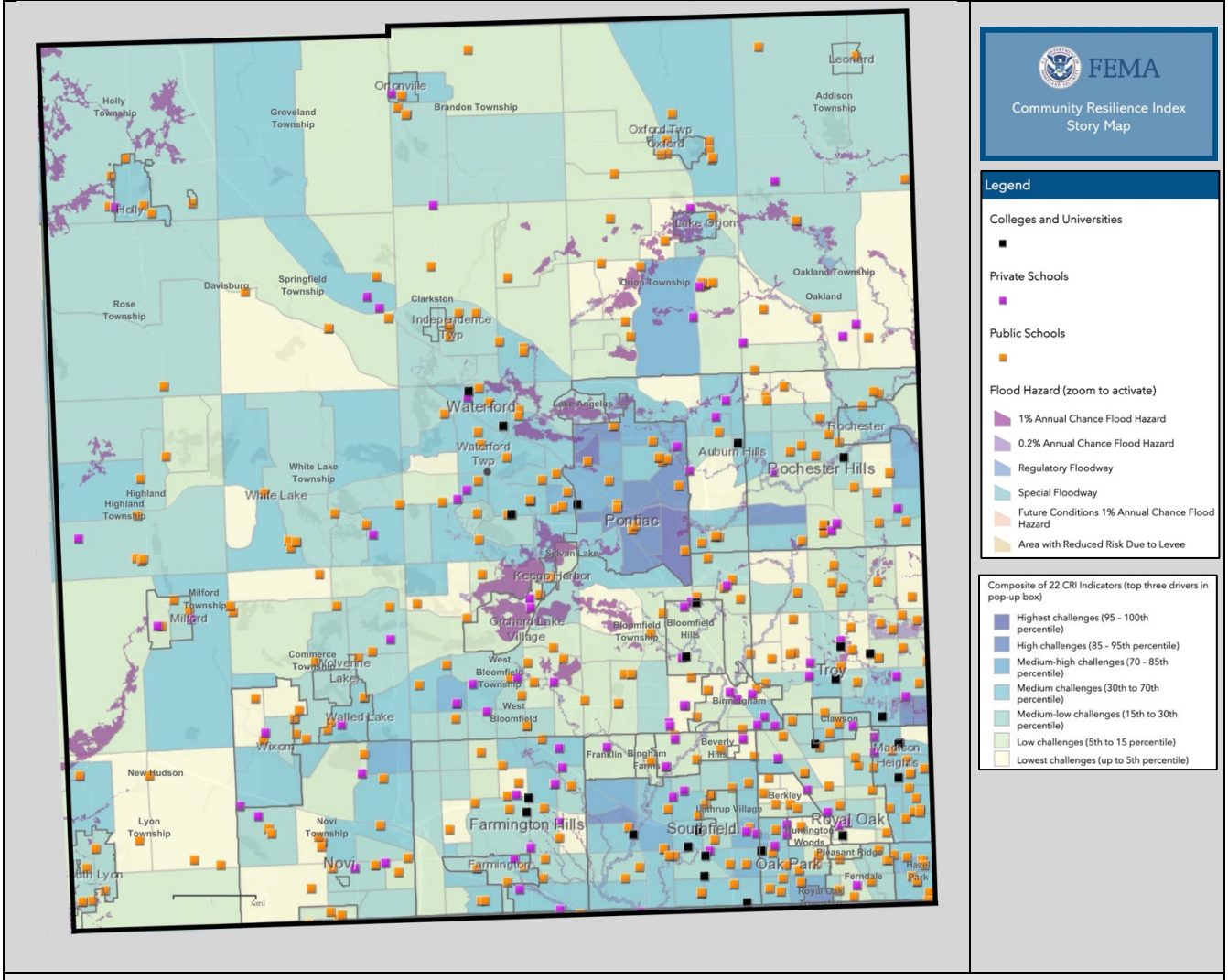
Source: [FEMA Resilience Analysis and Planning Tool](#) (RAPT) 2023

Figure 4-25 illustrates flooding impact to schools and universities in Oakland County.

Figure 4-34. Flooding Impacts to Schools and Universities in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



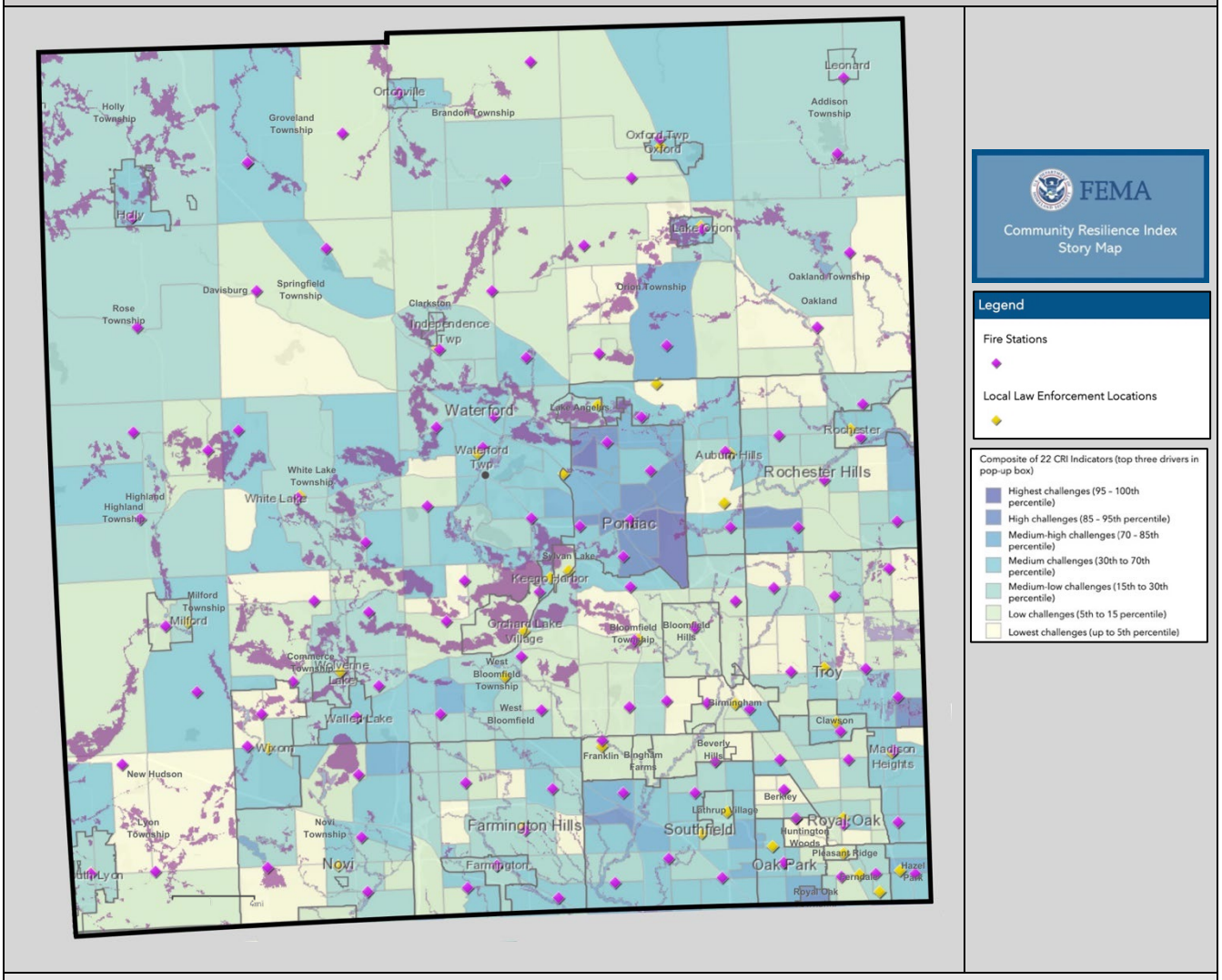
Source: [FEMA Resilience Analysis and Planning Tool](#) (RAPT) 2023

Figure 4-26 illustrates flooding impact to public safety locations in Oakland County.

Figure 4-35. Flooding Impacts to Public Safety locations in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2023

Economy: Flooding can have several different impacts on the economy in Oakland County. One potential impact is damage to businesses and infrastructure. Flooding can damage or destroy buildings, equipment, and inventory, disrupting operations and resulting in significant financial losses for companies. In addition, infrastructure such as roads, bridges, and utilities can also be damaged, which can impede transportation and communication networks and further disrupt the operations of businesses and other economic activity.

Another potential economic impact includes property values and insurance rates. Properties located in flood-prone areas may also decline in value, while insurance rates increase as the risk of flooding increases. This can make it more difficult for homeowners and businesses to secure loans and other forms of financing.

Changes in Development and Impact of Future Development: Riverine or urban flooding can significantly impact current or future development in Oakland County. Floodwaters can cause extensive damage to infrastructure, including buildings, roads, and bridges, and disrupt transportation and commerce, resulting in costly repairs. Additionally, properties in flood-prone areas may experience a decline in value, affecting property owners, developers, and local governments relying on property tax revenue. Flooding incidents can also cause flood insurance premiums to increase, posing challenges for property owners to protect their investments. Finally, flooding can prompt changes in land use patterns, impacting the availability of land for development and altering the character of neighborhoods and communities. Future development will increase the probability, magnitude, or vulnerability to this hazard.

Effects of Climate Change on Severity of Impacts: Heavy precipitation leads to riverine flooding and flash floods as the ground fails to absorb the high volume of precipitation that falls in a short period. Increasing annual precipitation contributes to sustained flooding. (Neighborhoods At Risk, 2023).

Table 4-33 illustrates 25-year precipitation projections for Oakland County, while Table 4-34 shows future climate indicators for Oakland County.

Table 4-55. 25-Year Precipitation Projections for Oakland County

25-YEAR PRECIPITATION PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 13% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.3 more days of heavy precipitation per year (from 2.5 days to 2.8 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 7% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.17 more days of heavy precipitation per year (from 2.44 days to 2.61 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-56. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**32”**	**33”**	**33”**	**34”**	**34”**	**34”**	**35”**
	30-33	31-37	30-35	31-38	30-37	30-39	31-40
Days Per Year With Precipitation (Wet Days)	**194 days**	**192 days**	**191 days**	**191 days**	**189 days**	**190 days**	**187 days**
	191-198	179-200	178-198	179-203	172-201	177-202	157-201
Maximum Period of Consecutive Wet Days	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**
	11-13	11-13	10-13	10-13	10-13	11-13	10-13
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**2 days**	**2 days**	**2 days**	**3 days**	**3 days**	**3 days**	**3 days**
	1-2	2-3	2-3	2-4	2-4	2-4	2-6
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**4 days**	**5 days**	**5 days**	**5 days**	**6 days**	**6 days**	**7 days**
	4-5	5-6	5-6	5-6	5-6	5-6	6-8
Days With Maximum Temperature Below 32°F	**49 days**	**36 days**	**35 days**	**31 days**	**27 days**	**25 days**	**13 days**
	45-53	18-47	24-45	13-42	11-38	8-40	1-29
Source: Climate Mapping for Resilience and Adaptation (2023)							

National Flood Insurance Program (NFIP) Participation

The majority of Oakland County communities participate in the National Flood Insurance Program.

All 62 Oakland County communities, except for Hazel Park and Lake Angelus, are known to have adopted local ordinances and/or site Plan review standards that regulate construction and land uses within designated floodplains.

In addition, as amended, Part 31, Water Resources Protection, Act 451 of 1994 regulates activities that result in occupation, fill or grade lands within floodplains along watercourses with a drainage area over two square miles. Such actions require an application, review, and permit issuance from the EGLE before disturbance.

Policies In-Force: According to FEMA, Oakland County communities had 1,398 insurance policies in-force, totaling $386,077,000.

Table 4-57. NFIP Policies In-Force

Community Name	Policies In-Force	Total Coverage	Total Written Premium + FPF
AUBURN HILLS, CITY OF	5	$1,833,000	$5,325
BERKLEY, CITY OF	17	$4,154,000	$8,519
BEVERLY HILLS, VILLAGE OF	6	$1,515,000	$4,680
BINGHAM FARMS, VILLAGE OF	2	$850,000	$1,019
BIRMINGHAM, CITY OF	58	$14,572,000	$23,885
BLOOMFIELD HILLS, CITY OF	22	$7,738,000	$24,807
BLOOMFIELD, TOWNSHIP OF	65	$22,183,000	$39,677
BRANDON, TOWNSHIP OF	10	$2,404,000	$4,784
CLARKSTON, CITY OF	1	$220,000	$448
CLAWSON, CITY OF	6	$1,801,000	$2,637
COMMERCE, TOWNSHIP OF	13	$3,890,000	$6,192
FARMINGTON HILLS, CITY OF	96	$17,351,000	$21,868
FARMINGTON, CITY OF	108	$28,189,000	$51,808
FERNDALE, CITY OF	4	$1,606,000	$2,904
FRANKLIN, VILLAGE OF	9	$2,646,000	$4,255
GROVELAND, TOWNSHIP OF	2	$485,000	$1,552
HAZEL PARK, CITY OF	2	$477,000	$815
HIGHLAND, TOWNSHIP OF	3	$1,050,000	$1,544
HOLLY, TOWNSHIP OF	7	$882,000	$3,103
HOLLY, VILLAGE OF	4	$595,000	$1,754
HUNTINGTON WOODS, CITY OF	9	$2,672,000	$4,675
INDEPENDENCE, TOWNSHIP OF	11	$3,645,000	$6,350
KEEGO HARBOR, CITY OF	11	$2,495,000	$6,558
LAKE ANGELUS, CITY OF	2	$425,000	$793
LAKE ORION, VILLAGE OF	8	$1,811,000	$4,056
LATHRUP VILLAGE, CITY OF	3	$1,050,000	$1,454
LYON, TOWNSHIP OF	6	$1,489,000	$2,508

MADISON HEIGHTS, CITY OF	2	$153,000	$572
MILFORD, TOWNSHIP OF	4	$940,000	$2,178
MILFORD, VILLAGE OF	11	$2,495,000	$6,558
NORTHVILLE, CITY OF	13	$5,229,000	$17,663
NOVI, CITY OF	35	$11,637,000	$16,740
OAKLAND, TOWNSHIP OF	12	$3,196,000	$5,462
OAK PARK, CITY OF	12	$2,752,000	$5,461
ORCHARD LAKE VILLAGE, CITY OF	6	$2,100,000	$2,906
ORION, TOWNSHIP OF	9	$2,936,000	$3,890
ORTONVILLE, VILLAGE OF	1	$44,000	$662
PONTIAC, CITY OF	9	$4,292,000	$9,627
ROCHESTER, CITY OF	6	$2,150,000	$10,580
ROCHESTER HILLS, CITY OF	36	$8,946,000	$16,591
ROSE, TOWNSHIP OF	2	$488,000	$968
ROYAL OAK, CITY OF	25	$6,112,000	$12,618
SOUTHFIELD, CITY OF	43	$12,121,000	$26,154
SPRINGFIELD, TOWNSHIP OF	2	$700,000	$1,200
SOUTH LYON, CITY OF	1	$70,000	$421
TROY, CITY OF	89	$31,084,000	$69,517
WALLED LAKE, CITY OF	1	$115,000	$276
WATERFORD, CHARTER TOWNSHIP OF	36	$9,785,000	$15,716
WEST BLOOMFIELD, TOWNSHIP OF	67	$18,022,000	$35,434
WHITE LAKE, TOWNSHIP OF	10	$2,376,000	$4,974
WIXOM, CITY OF	3	$1,031,000	$1,569
WOLVERINE LAKE, VILLAGE OF	2	$700,000	$1,038
UNKNOWN, UNKNOWN	482	$131,070,000	$276,489
TOTAL	**1,398**	**$386,077,000**	**$776,676**
Source: FEMA as of 08/31/2023			

Table 4-58. CRS Eligible Communities

Community Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA	% Discount for Non-SFHA	Status
Commerce, Township of	05/1/03	10/1/14	9	05%	05%	C
Farmington Hills, City of	10/1/94	10/1/95	10	0%	0%	R
Novi, City of	10/1/99	5/1/19	8	10%	05%	C
Source: FEMA as of 3/17/2022						

Repetitive Loss Properties*:* There are several different definitions of a "repetitive loss property." The current FEMA definition of a repetitive loss property is:

> "**Repetitive Loss Structure:** An NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978." (FEMA, 2023).

Additionally, the definitions of a severe repetitive loss building, and severe repetitive loss property are:

> **"Severe Repetitive Loss Building:** Any building that:
> Is covered under a Standard Flood Insurance Policy made available under this title.
> Has incurred flood damage for which:
> a. Four or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or
>
> b. At least two separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss" (FEMA, 2023).
>
> **"Severe Repetitive Loss Property:** Either a severe repetitive loss building or the contents within a severe repetitive loss building, or both" (FEMA, 2023).

FEMA encourages the mitigation of severe repetitive loss and repetitive loss properties through the distribution of mitigation grants, the NFIP's Increased Cost of the Compliance program, and the Community Rating System (CRS) program. Depending on the number of repetitive loss properties within a CRS community, the community may be required to develop a specific plan to determine the causes of the repetitive claims and ways to mitigate the causes of the repetitive claims. At a minimum, each CRS community must conduct an annual outreach project to these properties advising the owners of their location in the regulatory floodplain, property protection measures, and any funding options for property protection and flood insurance.

FEMA offers several programs to support communities in identifying and addressing the root causes of their repetitive losses. One such program is the Community Rating System (CRS).

Oakland County has approximately 18 properties that were designated as having suffered repetitive flood claims, according to an official list maintained by FEMA and the National Flood Insurance Program. Eleven of these eighteen properties are located within the City of Farmington Hills, four are in Waterford Township, two are in the City of Birmingham, and one is in the City of Troy. These properties are listed as not yet having fully benefited from flood mitigation activities, and they should be prioritized for future projects that might alleviate their flood risks. In addition, FEMA funds are available through HMGP, BRIC, and FMA to help subsidize these types of flood mitigation activities. Although most of FEMA's hazard mitigation grants are provided with a 75/25 cost-share agreement, repetitive loss properties can enjoy an even more favorable cost-share ratio, with 90% and sometimes even 100% of the flood mitigation costs potentially able to be paid through these federal programs.

Of the eleven repetitive loss properties in the City of Farmington Hills, eight are of a single-family residential type, and three are classified as 'other residential' (i.e., not single-family occupancy). Although some properties have experienced 4 or 5 damaging events during the

past several decades, others have only two or three events listed within a few years, before or after which the property might not have been covered by insurance. For example, one property reported four insurance claims for flood damages throughout the 1980s and 1990s and is still insured. Several other properties have reported four or five claims between the late 1990s and the present and are currently insured. But the remaining properties listed for the city tend to have had just a couple of reported flood claims within one decade, along with at least one said lapse in their insurance coverage. In other words, additional damages are likely to have occurred to these homes but were not reported during periods when no insurance was being carried under the NFIP. Average claim payments for some of these properties have even exceeded $100,000. However, the average damages per event tend to be in the $10,000 to $20,000 range when all these listed properties in the city are being considered. These are more severe flood damages than documented for the other Oakland County communities. Hence, these properties in the city seem to merit being heavily prioritized for flood mitigation activities.

Waterford Township's four identified repetitive loss properties are all single-family residential types. Their claim history is similar to those described in Farmington Hills, in which only a few damaging events occurred within a decade. Still, some lapse in insurance coverage is also indicated in the records. The current list of Waterford's repetitive loss properties had just two claims reported, with the most extended accompanying period ranging from 2004 to 2013, while the shortest range of time involved a period of only a year and a half. Average damages to each property per event amounted to less than $10,000.

The City of Birmingham had two identified properties classified as 'other non-residential properties' and were the only non-residential properties to appear in the Oakland County listings. One of the properties only had a couple of claims in 1997, followed by an uninsured period. The other identified property reported four claims over 15 years and hasn't had any listed flood events since 1996. However, the property is designated as currently insured, and the average claim amounts were a few thousand dollars lower than those reported by Waterford Township.

Finally, the City of Troy had one single-family residential property listed as suffering three damaging events during the early 1980s, followed by some lapse in insurance coverage and average damage comparable to that reported for Waterford Township. The prioritization of these properties may ultimately be determined at the household level. Still, this general planning analysis must protect insurance confidentiality and claim information for all specific addresses. Therefore, the general prioritization suggested here would be to emphasize the more significant number of heavily damaged properties found within Farmington Hills, then the moderately damaged properties located in Waterford Township and the City of Troy, and finally, the properties listed for the City of Birmingham. Since the level of interest, activity, and motivation will naturally vary among individual property owners, any opportunity to implement flood mitigation activities at any of these properties should be sought and followed up on, as each property on this list has already been defined as meriting high priority. All of the NFIP-

identified repetitive loss properties are recommended to maintain flood insurance coverage while funding is sought to alleviate their risks.

Another interesting pattern found within the information from the NFIP is regarding the dates of damaging flood events. Sorting all reports by date reveals some 21 events between April 1979 and September 2013 for which claims were paid. Ten of these 21 flood events only involved a single property from the county's list. Still, the following events affected multiple properties (the number of listed properties affected by each event is provided in parentheses): October 1, 1981 (5), March 13 to 16, 1982 (3), May 1 to 2, 1983 (5), June 20 to 21, 1989 (4), June 18 to 19, 1996 (3), July 2, 1997 (2), August 6 to 9, 1998 (5), June 24, 2000 (3), May 22 to 23, 2004 (3), September 13, 2008 (3), and September 3, 2013 (3). In addition, some of the event dates correspond with declared flood disasters, such as an event on September 11, 2000 (affecting one of the listed properties), which was when widespread basement flooding occurred and eventually resulted in federal disaster 1346 being declared.

FEMA NRI Expected Annual Loss Estimates

Table 4-59. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI FEMA NRI EXPECTED ANNUAL LOSS TABLE FOR RIVERINE FLOODING EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Expected Annual Loss Rating**
1 event per year	0.02	$258,942	$7,010,886	$3,763	$7,273,592	95.6	Relatively High
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2023)							

FEMA Hazard-Specific Risk Index Table

Table 4-60. Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RATINGS – RIVERINE FLOODING		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
94.4 / 100	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*		

Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*
Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2023)

4.9 High-Hazard Dams

Hazard Description

A dam is a barrier constructed across a watercourse for water storage, control, or diversion. Dams are typically built of earth, rock, concrete, or mine tailings.

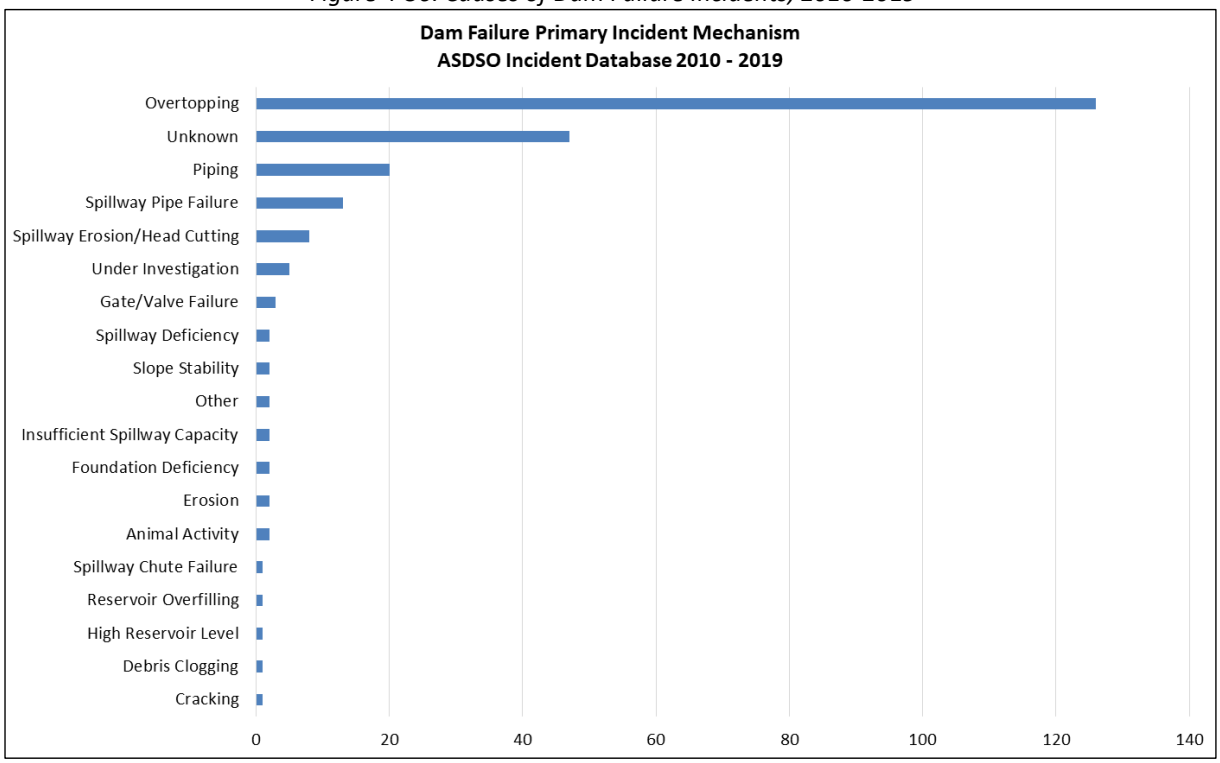
Dam Failure:

Rapid and uncontrolled release of impounded water or liquid-borne solids characterizes failure. However, it is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water could be considered a failure.

The Causes of Dam Failure: Dam failures are most likely to happen for one of five reasons (ASDSO, 2023):

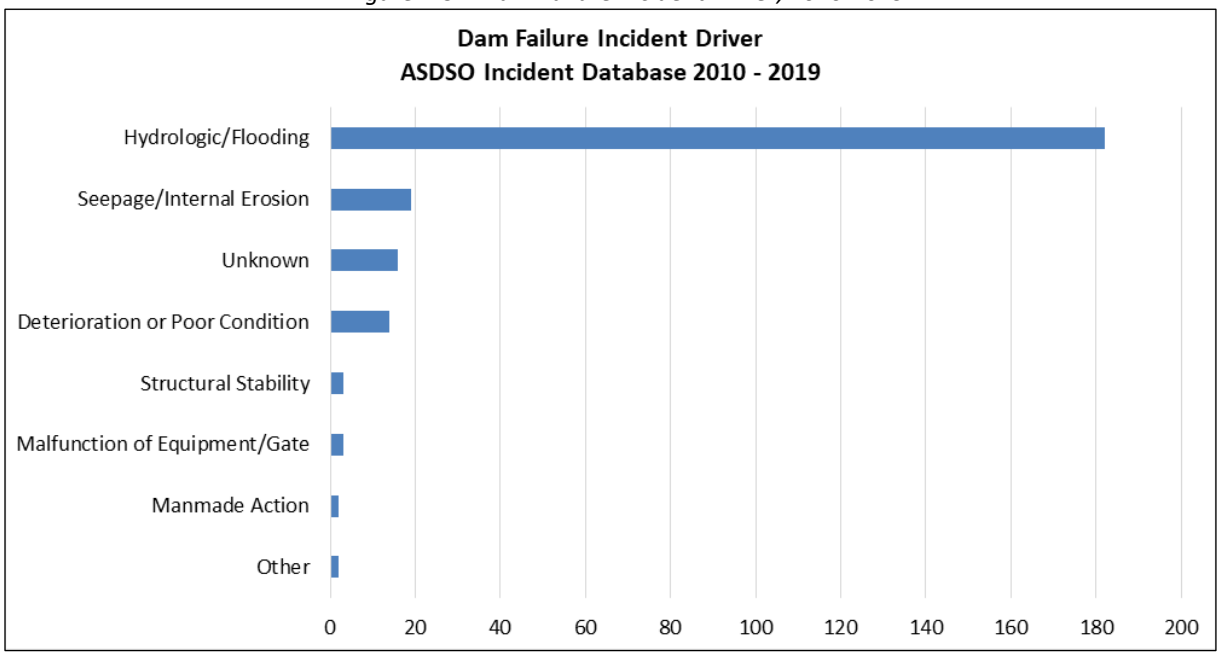
1. Overtopping is caused by water spilling over the top of a dam. Overtopping of a dam is often a precursor of dam failure. For example, national statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam failures.
2. Foundation defects, including settlement and slope instability, cause about 30% of all dam failures.
3. Cracking is caused by movements like the natural settling of a dam.
4. Inadequate maintenance and upkeep.
5. Piping is when seepage through a dam is not adequately filtered, soil particles continue to progress and form sinkholes in the dam. Another 20% of U.S. dam failures have been caused by piping (internal erosion caused by seepage). Seepage often occurs around hydraulic structures, such as pipes and spillways; through animal burrows; around roots of woody vegetation; and through cracks in dams, dam appurtenances, and dam foundations.

*Figure 4-36. Causes of Dam Failure Incidents, 2010-2019***



*** From the ASDSO Dam Incident Database, dam failure incidents for 2010 through 2019. Incident data is mainly obtained from the state dam safety programs and/or media reports. Therefore, the incident data is not inclusive of all dam safety incidents.*

Figure 4-37. Dam Failure Incident Driver, 2010-2019



Hazard Location

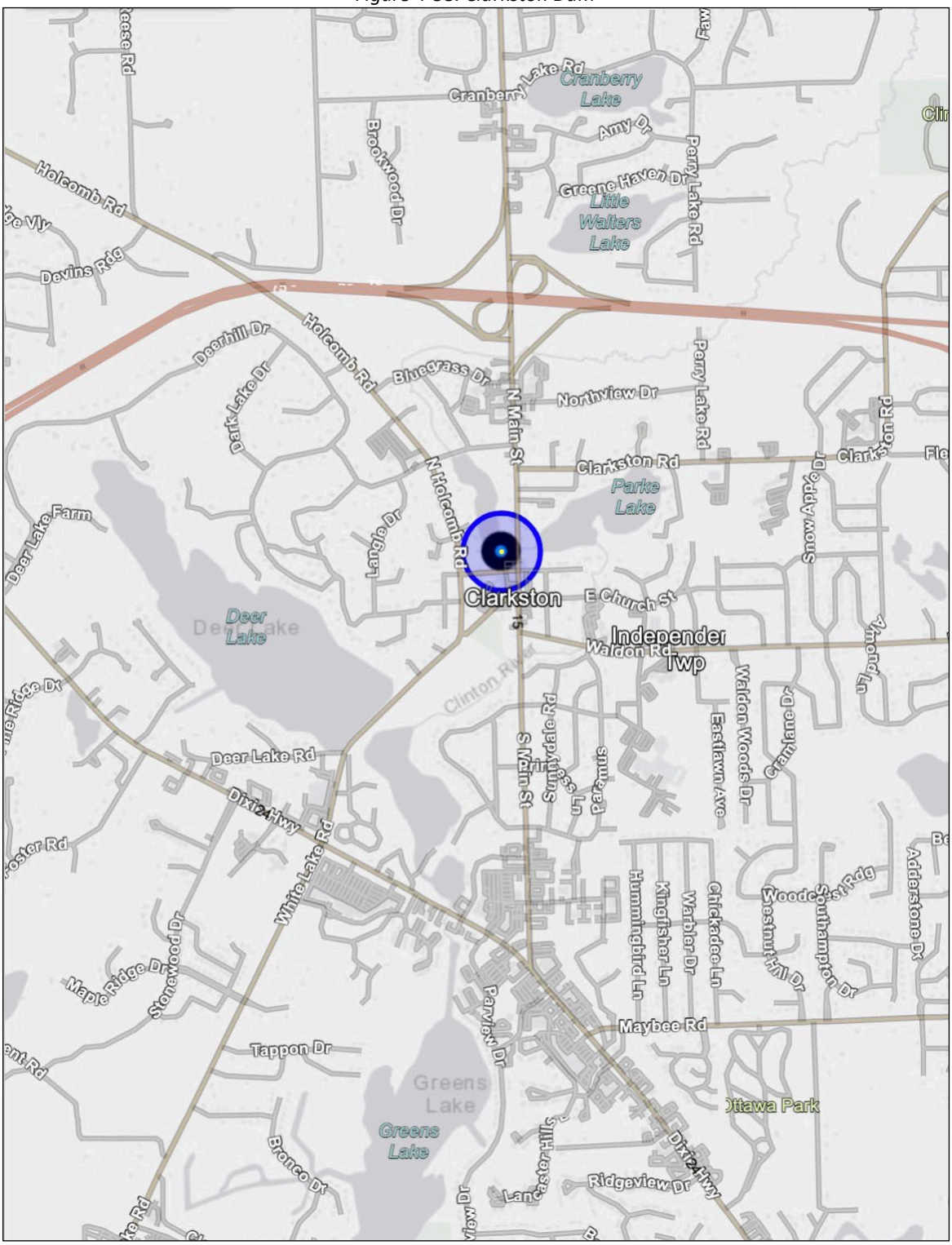
There are 23 “high” or “significant” risk dams in Oakland County, as listed in Table 4-39 below. Eight of these dams are classified as high risk, while 15 are classified as significant risk. Both high and significant classifications indicate sufficient downstream populations to warrant the classification. Following the table, Figure 4-29 through Figure 4-51 illustrate maps of each dam within the county. Emergency action plan status is also indicated below each map.

Table 4-61. List of (High and Significant Risk) Dams within Oakland County

Name	National ID#	Location	Owner	Year Built	Primary Purpose	Height (feet)	Storage Capacity (acre-feet)	Max Discharge (cubic feet/sec)	Hazard Potential Classification
Clarkston Dam	MI00240	Oakland, Michigan	Lehman Investment Company	1900	Recreation	34	90	80	High
Clintonville Dam	MI00241	Oakland, Michigan	Oakland County Drain Commissioner	1915	Recreation	14	3,900	775	Significant
Loon Lake Dam	MI00245	Oakland, Michigan	County Drain Commissioner	1936	Recreation	8	3,800	1,282	Significant
Ford Dam #3 (Hubbell Pond)	MI00248	Oakland, Michigan	Village of Milford	1939	Recreation	25	1,200	1,350	Significant
Gehrke Dam	MI00250	Oakland, Michigan	Anmar Inc.	1913	Other	18	60	-	Significant
Holly Dam	MI00253	Oakland, Michigan	Village of Holly	1840	Recreation	12	555	600	Significant
Lake Louise Dam	MI00255	Oakland, Michigan	Oakland County Drain Commissioner	1925	Recreation	12	860	555	High
Lake Orion Dam	MI00259	Oakland, Michigan	Village of Lake Orion	1829	Other	18	3,600	1,010	Significant
Oxbow Dam	MI00263	Oakland, Michigan	Oakland County Drain Commissioner	1964	Recreation	15	6,900	458	High
Pontiac Lake Dam	MI00265	Oakland, Michigan	Oakland County WRC	1920	Other	21	7,400	596	High
Quarton Dam	MI00267	Oakland, Michigan	City of Birmingham	1921	Recreation	19	160	3,736	Significant
Waterford Multi-Lakes Level Control	MI00275	Oakland, Michigan	Oakland County Drain Commissioner	1973	Recreation, Other	12	3,800	1,520	Significant
Wildwood Lake Dam	MI00276	Oakland, Michigan	MDNR Parks & Recreation	1961	Recreation	22	775	57	High
Winkler Pond Dam	MI00277	Oakland, Michigan	Nathaniel L. & Bryn Brock	1917	Recreation	13	200	1,113	Significant
Lake Neva Dam	MI00614	Oakland, Michigan	Lakewood Village	1955	Recreation	17	700	285	High

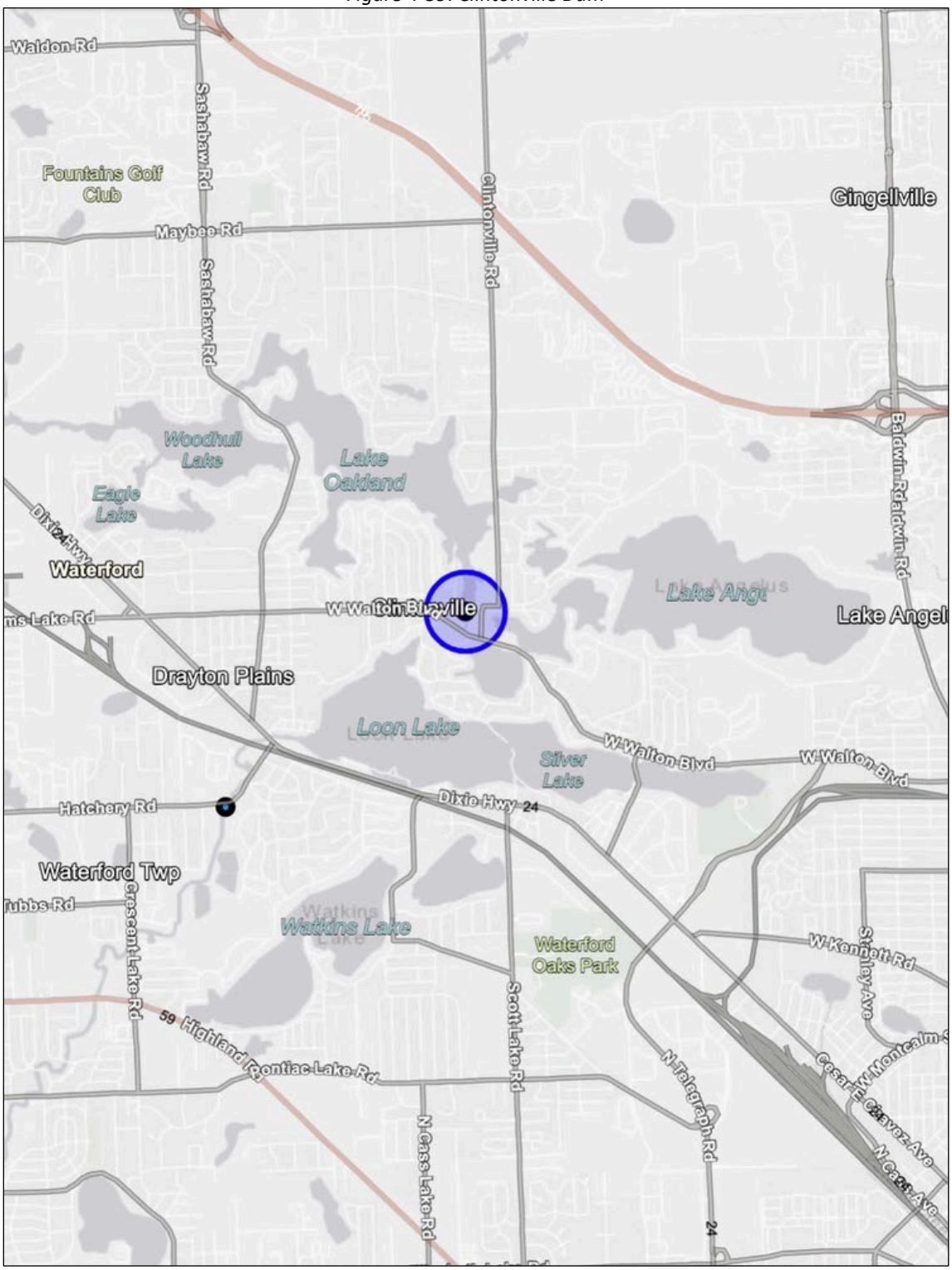
			Improvement Assoc						
Lake Sherwood Dam	MI00615	Oakland, Michigan	Lake Sherwood Association	1957	Recreation	22	2,300	384	Significant
Endicott Dam	MI00684	Oakland, Michigan	Linda Goldman	1913	Recreation	14	200	200	Significant
Heron Dam	MI00692	Oakland, Michigan	MDNR Parks & Recreation	1969	Recreation	26	1,600	74	High
Davisburg Trout Pond Dam	MI00693	Oakland, Michigan	MDNR Wildlife	1951	Recreation	12	145	520	Significant
Dawson Millpond Dam	MI00718	Oakland, Michigan	Oakland County Drain Commissioner	1915	Recreation	9	3,447	919	High
Wolverine Lake Dam	MI00777	Oakland, Michigan	Village of Wolverine Lake	1925	Recreation	15	1,560	260	Significant
Pontiac Motor Division Detention Basin	MI01367	Oakland, Michigan	Pontiac Motor Division	1982	Flood Risk Reduction	12	10	58	Significant
Wau-Me-Gah Lake Dam	MI01675	Oakland, Michigan	Oakland County Drain Commissioner	1930	Recreation	8	600	153	Significant
Source: National Inventory of Dams (2023)									

Figure 4-38. Clarkston Dam



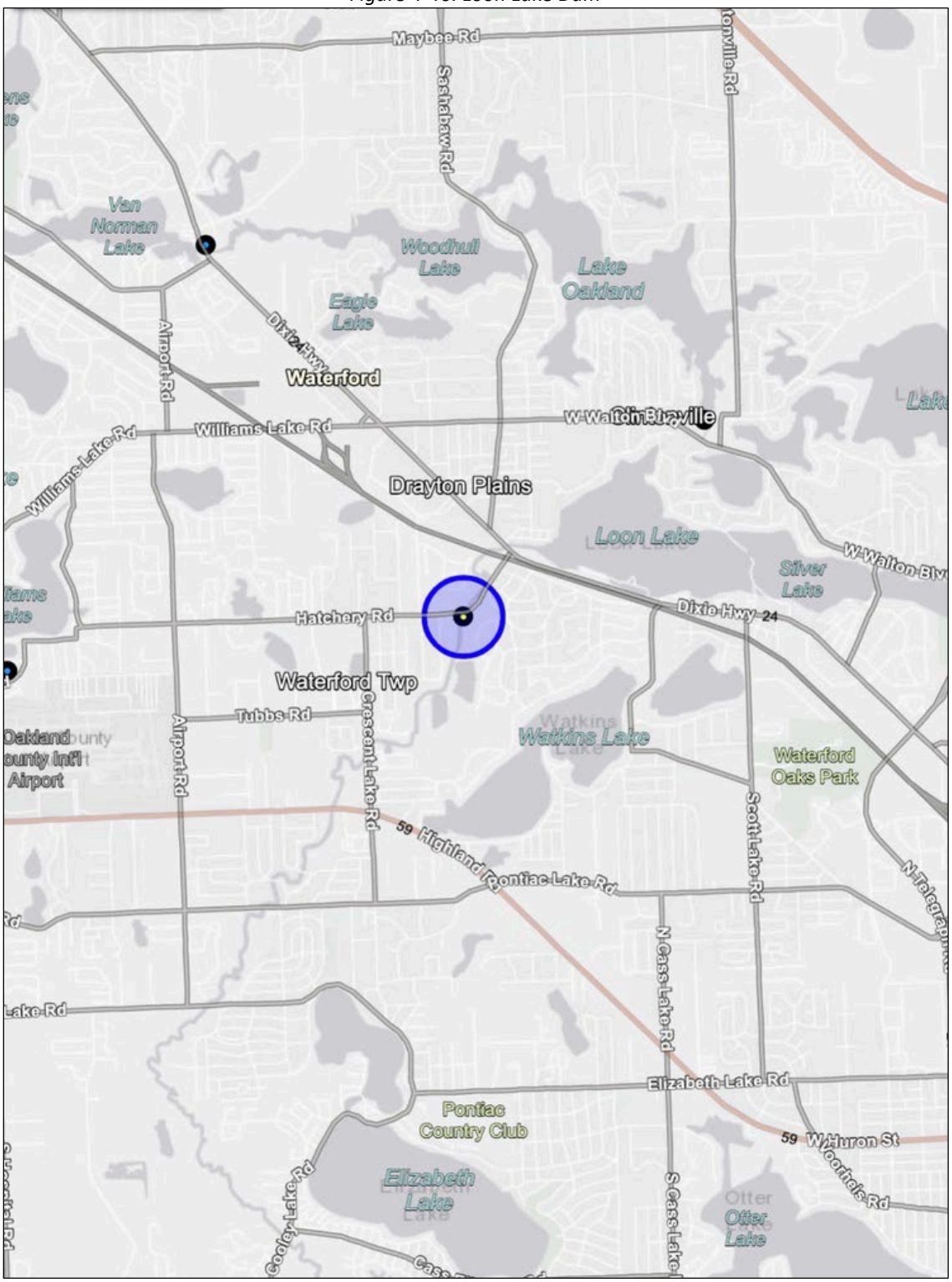
Emergency Action Plan Prepared: YES / Last Revision: 9/9/2020

Figure 4-39. Clintonville Dam



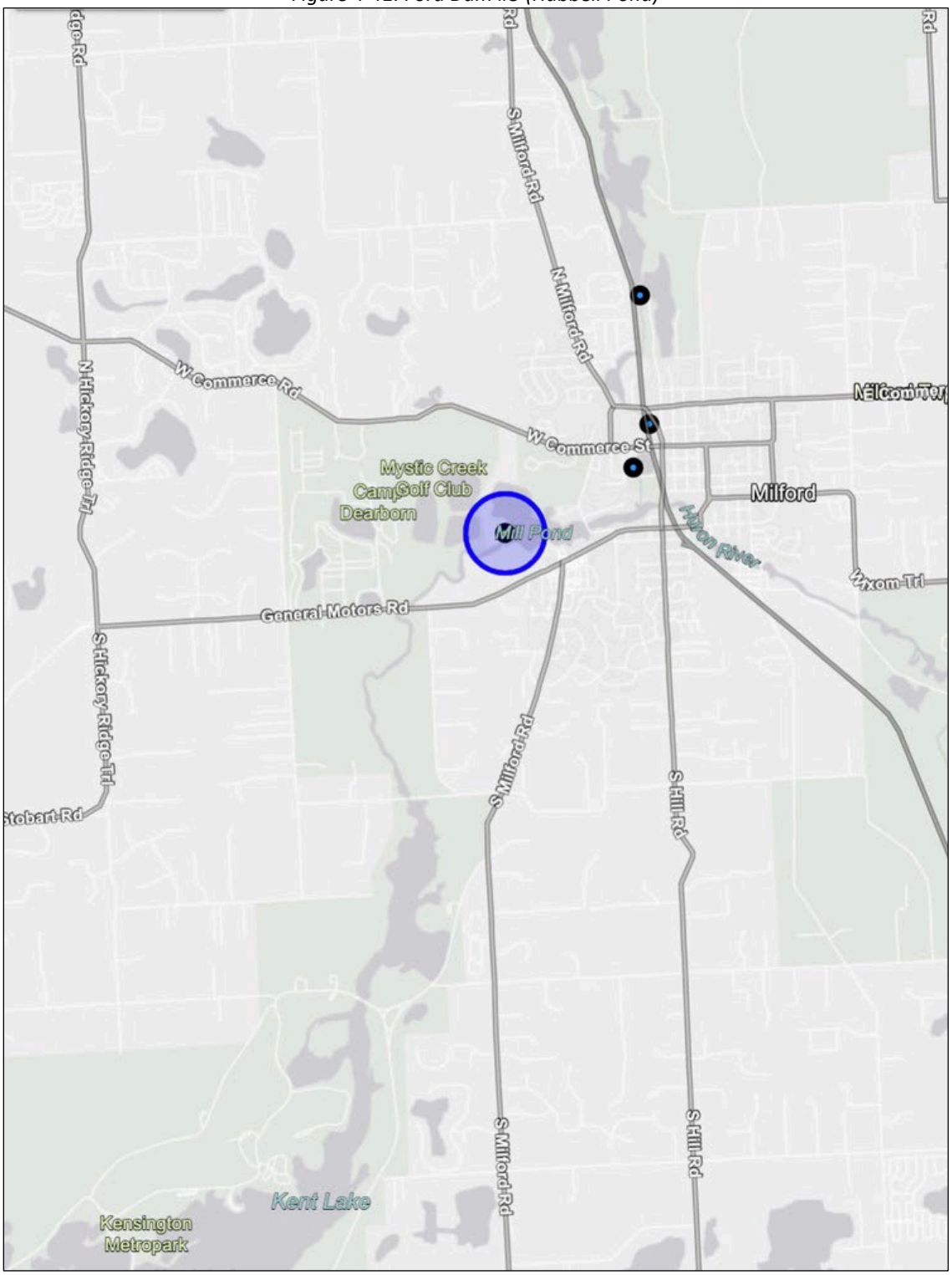
Emergency Action Plan Prepared: YES / Last Revision: 9/30/2019

Figure 4-40. Loon Lake Dam



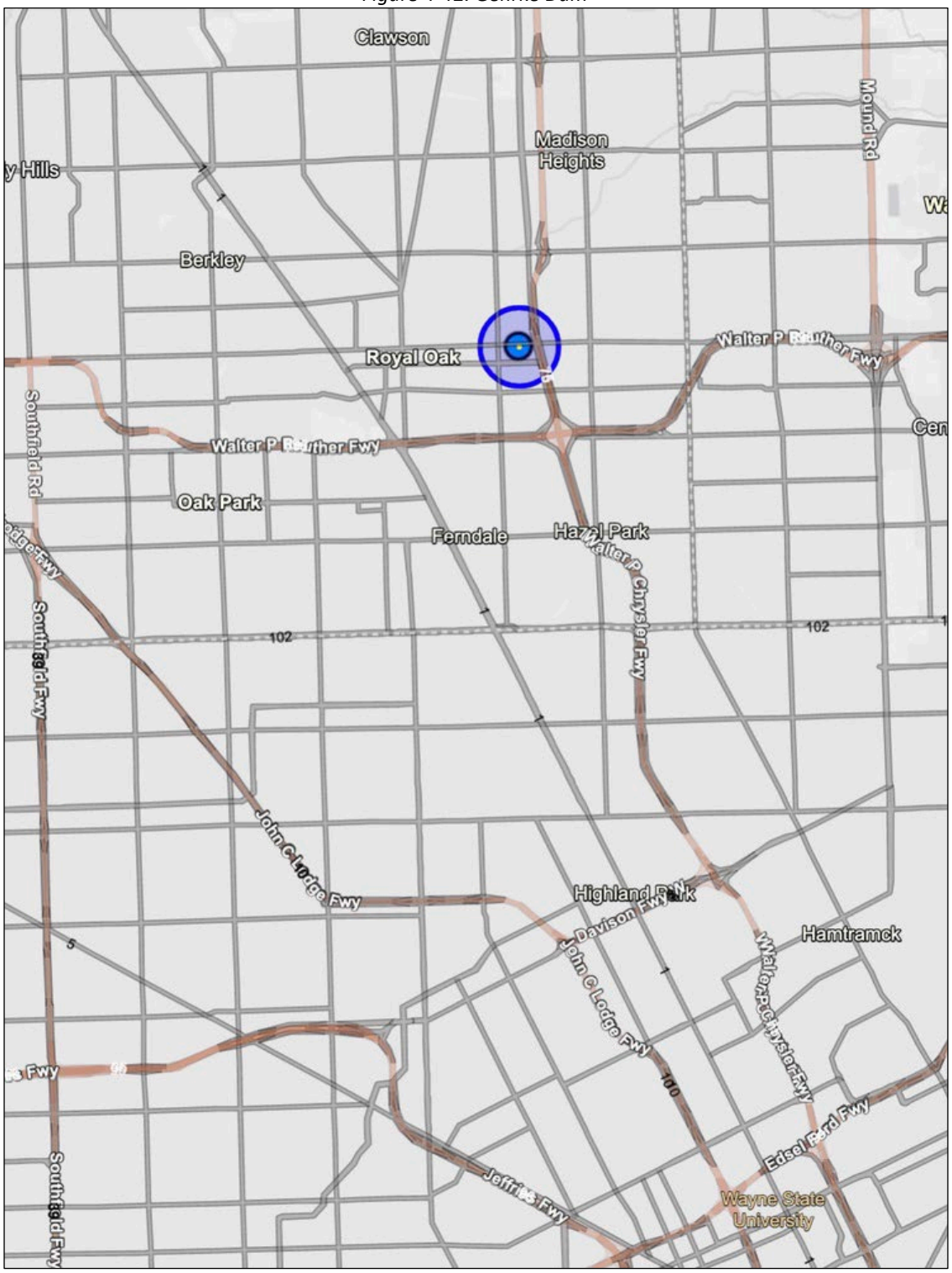
Emergency Action Plan Prepared: YES / Last Revision: 9/30/2019

Figure 4-41. Ford Dam #3 (Hubbell Pond)



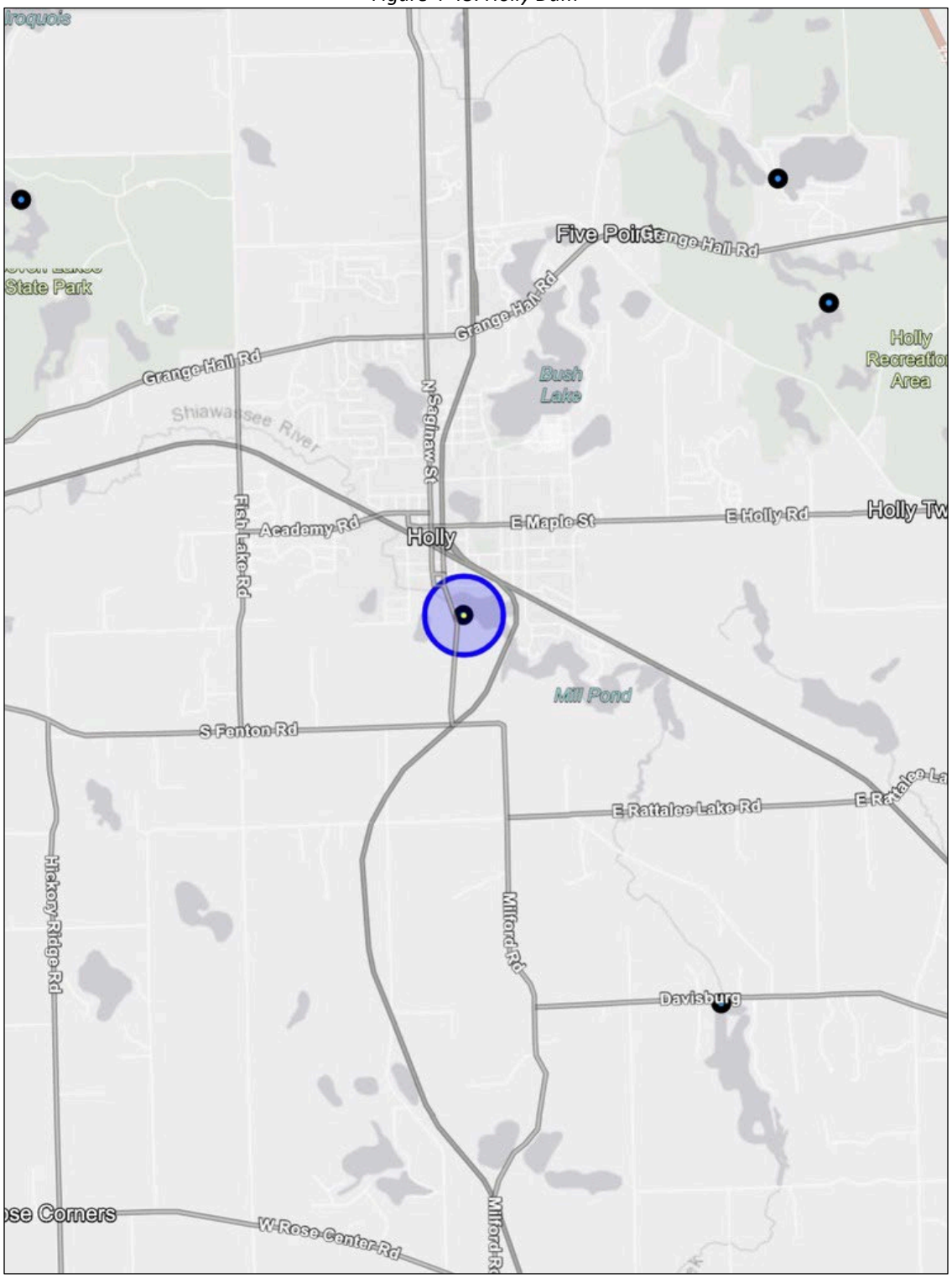
Emergency Action Plan Prepared: YES / Last Revision: 6/01/2013

Figure 4-42. Gehrke Dam



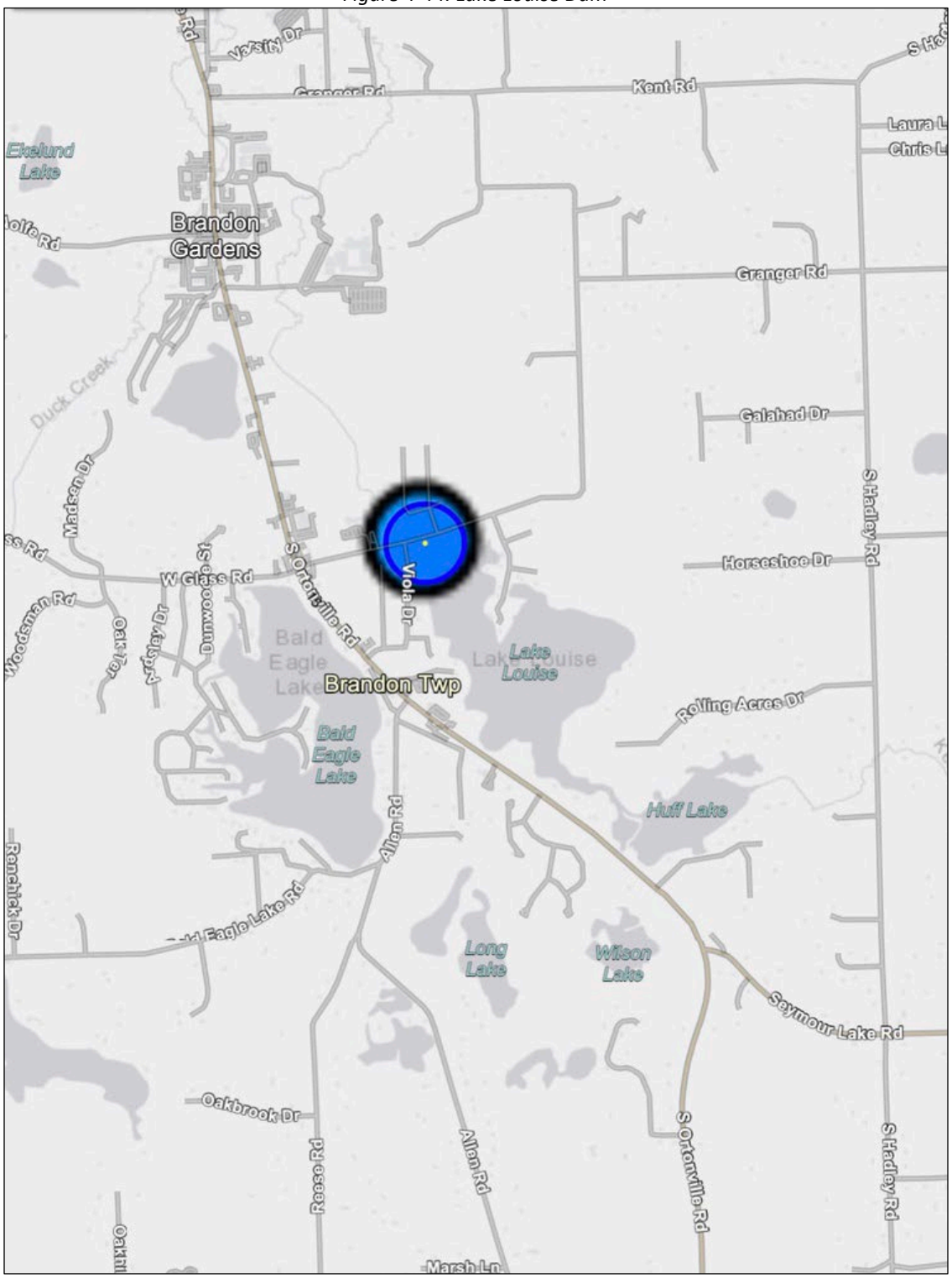
Emergency Action Plan Prepared: Not Required / Last Revision: N/A

Figure 4-43. Holly Dam



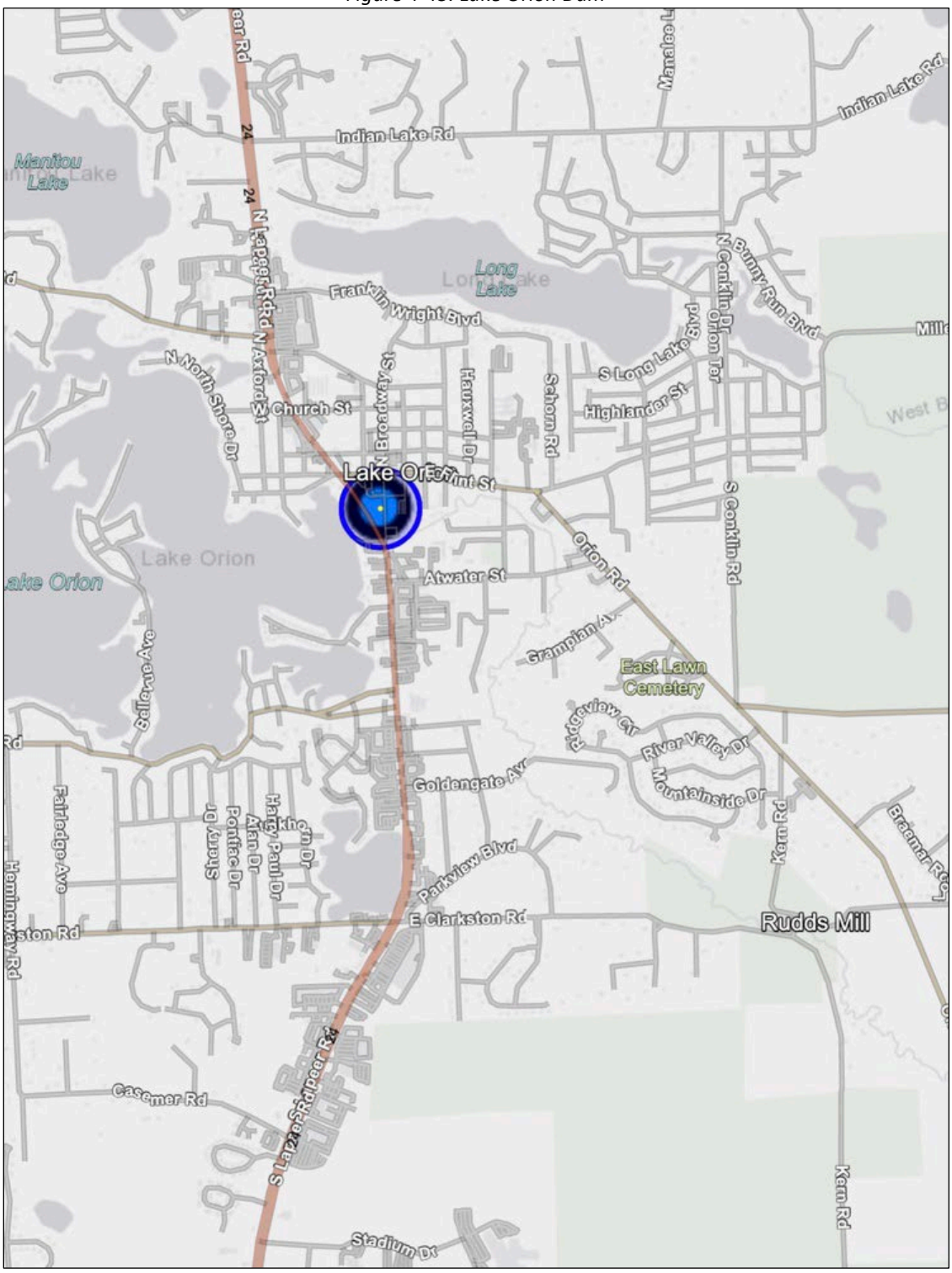
Emergency Action Plan Prepared: Yes / Last Revision: 2/07/2018

Figure 4-44. Lake Louise Dam



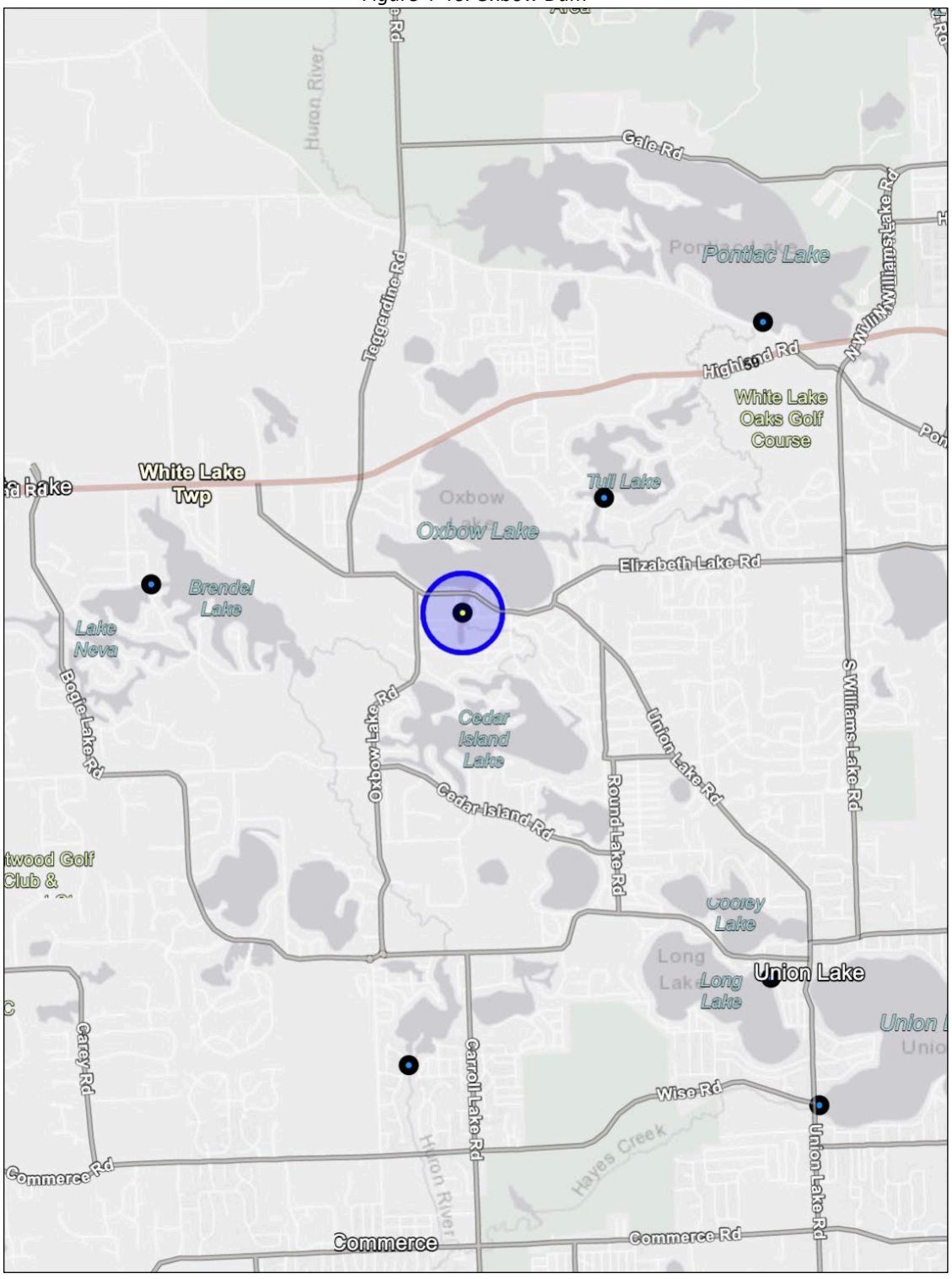
Emergency Action Plan Prepared: Yes / Last Revision: Unknown

Figure 4-45. Lake Orion Dam



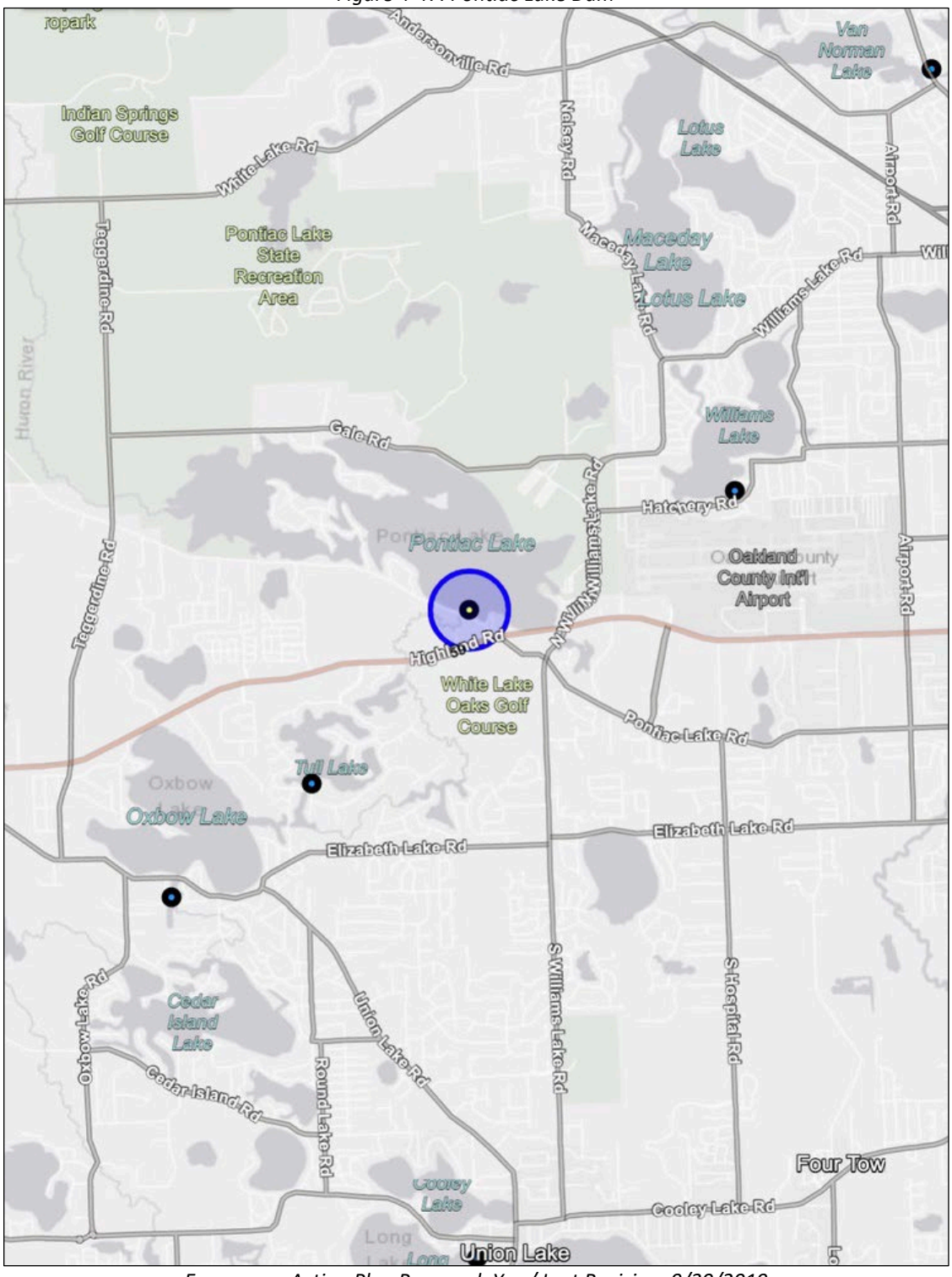
Emergency Action Plan Prepared: Yes / Last Revision: 5/13/2002

Figure 4-46. Oxbow Dam



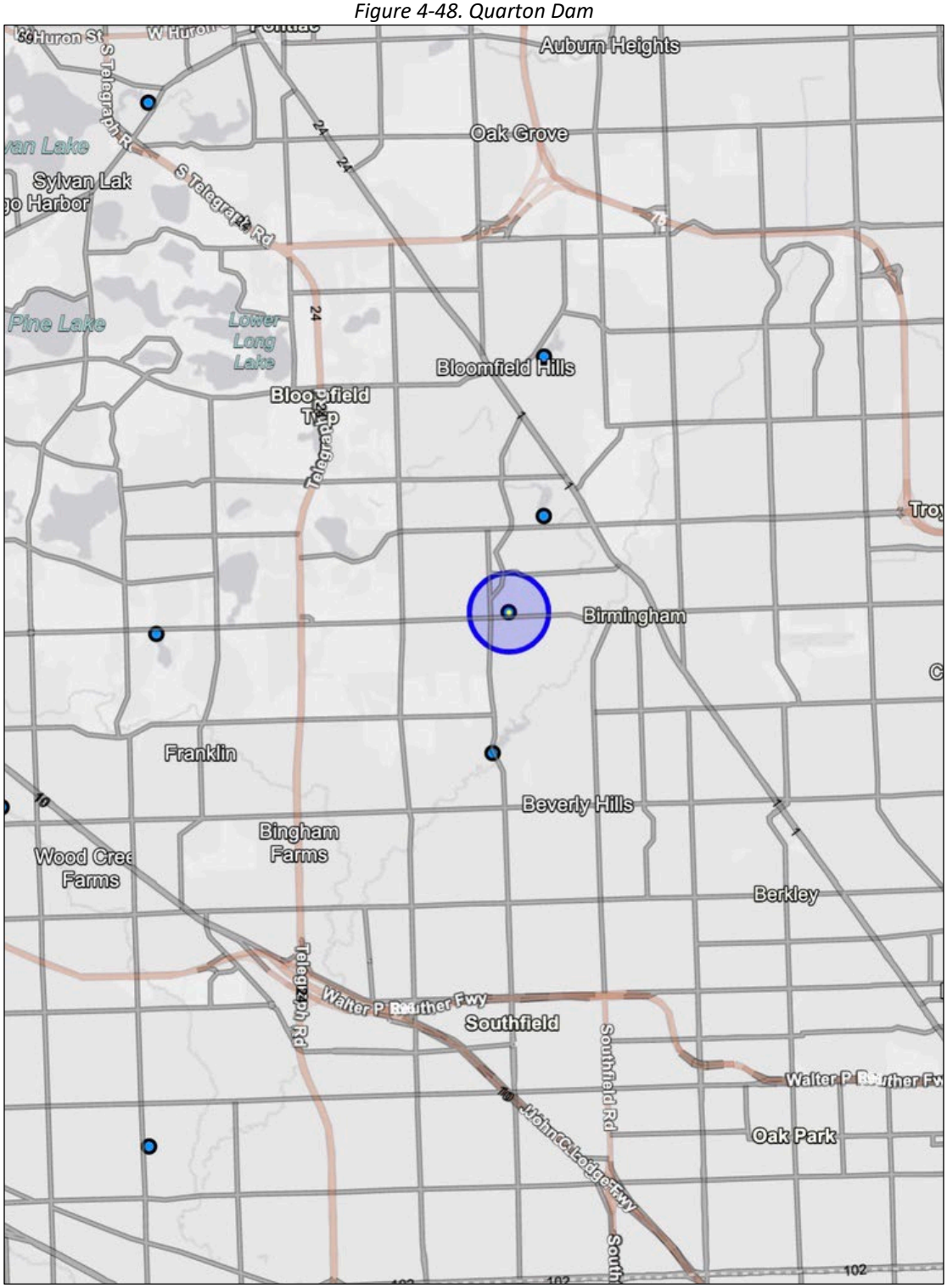
Emergency Action Plan Prepared: Yes / Last Revision: 9/30/2019

Figure 4-47. Pontiac Lake Dam



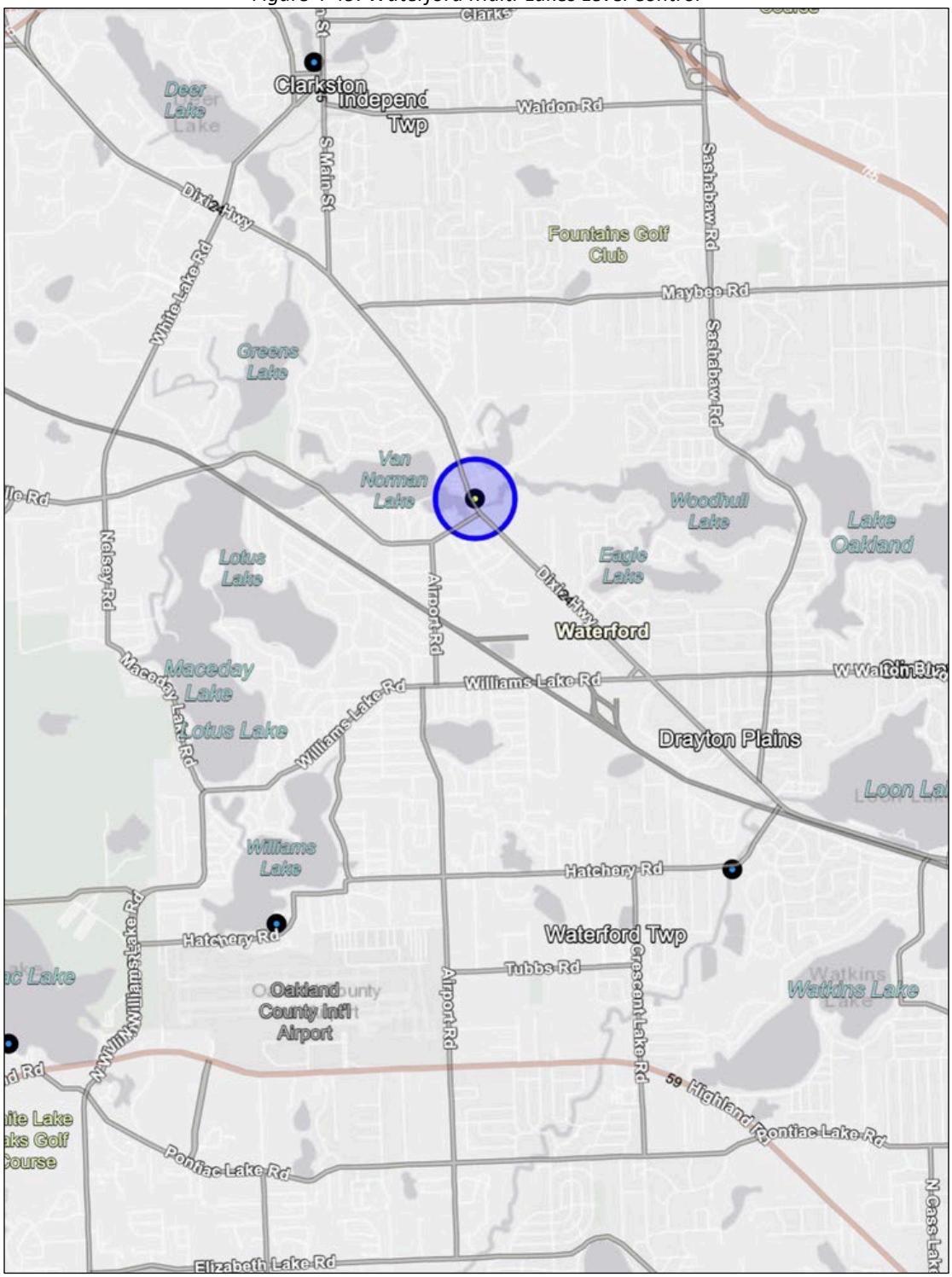
Emergency Action Plan Prepared: Yes / Last Revision: 9/30/2019

Figure 4-48. Quarton Dam



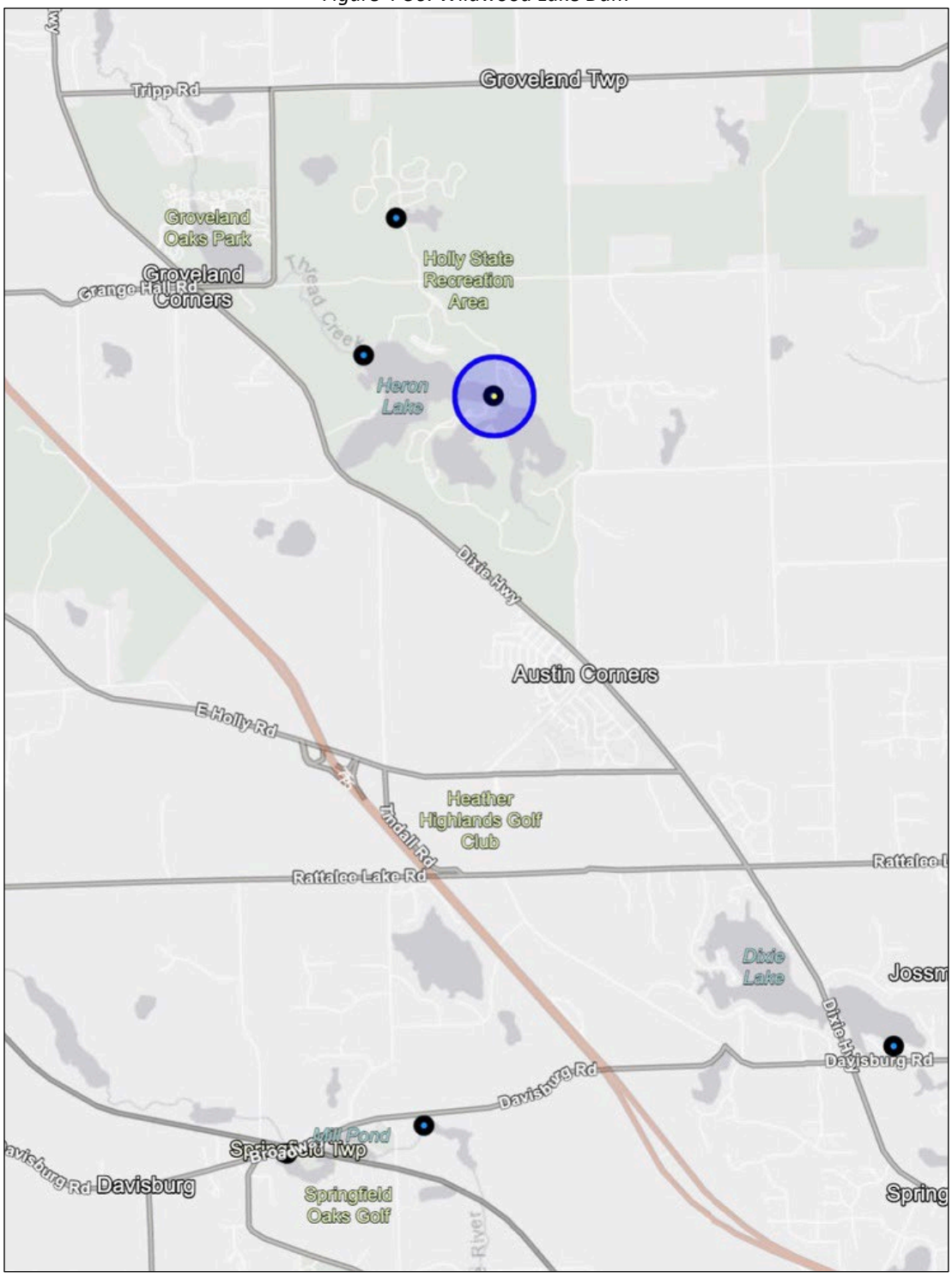
Emergency Action Plan Prepared: Yes / Last Revision: 6/20/2017

Figure 4-49. Waterford Multi-Lakes Level Control



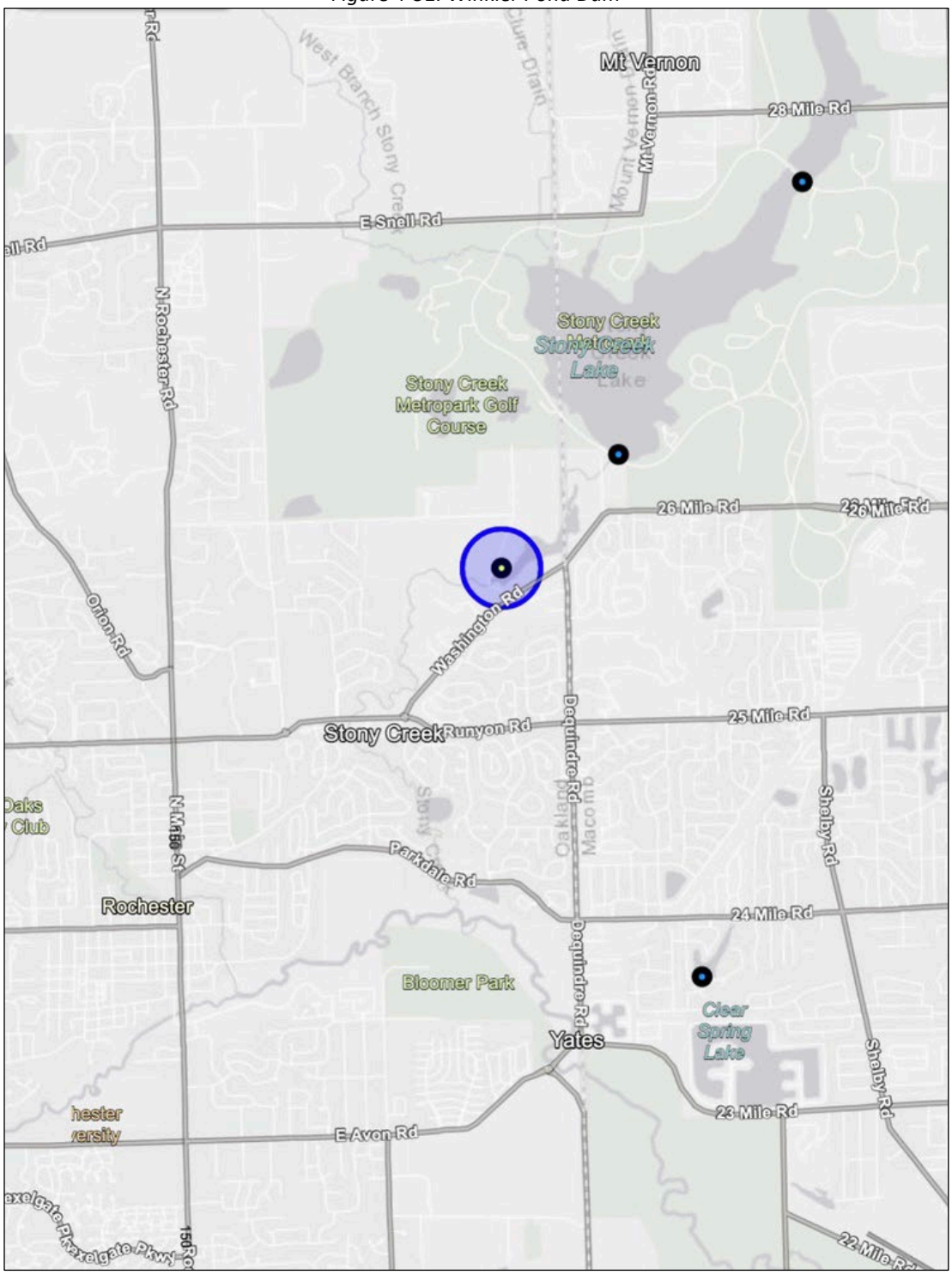
Emergency Action Plan Prepared: Yes / Last Revision: 9/30/2019

Figure 4-50. Wildwood Lake Dam



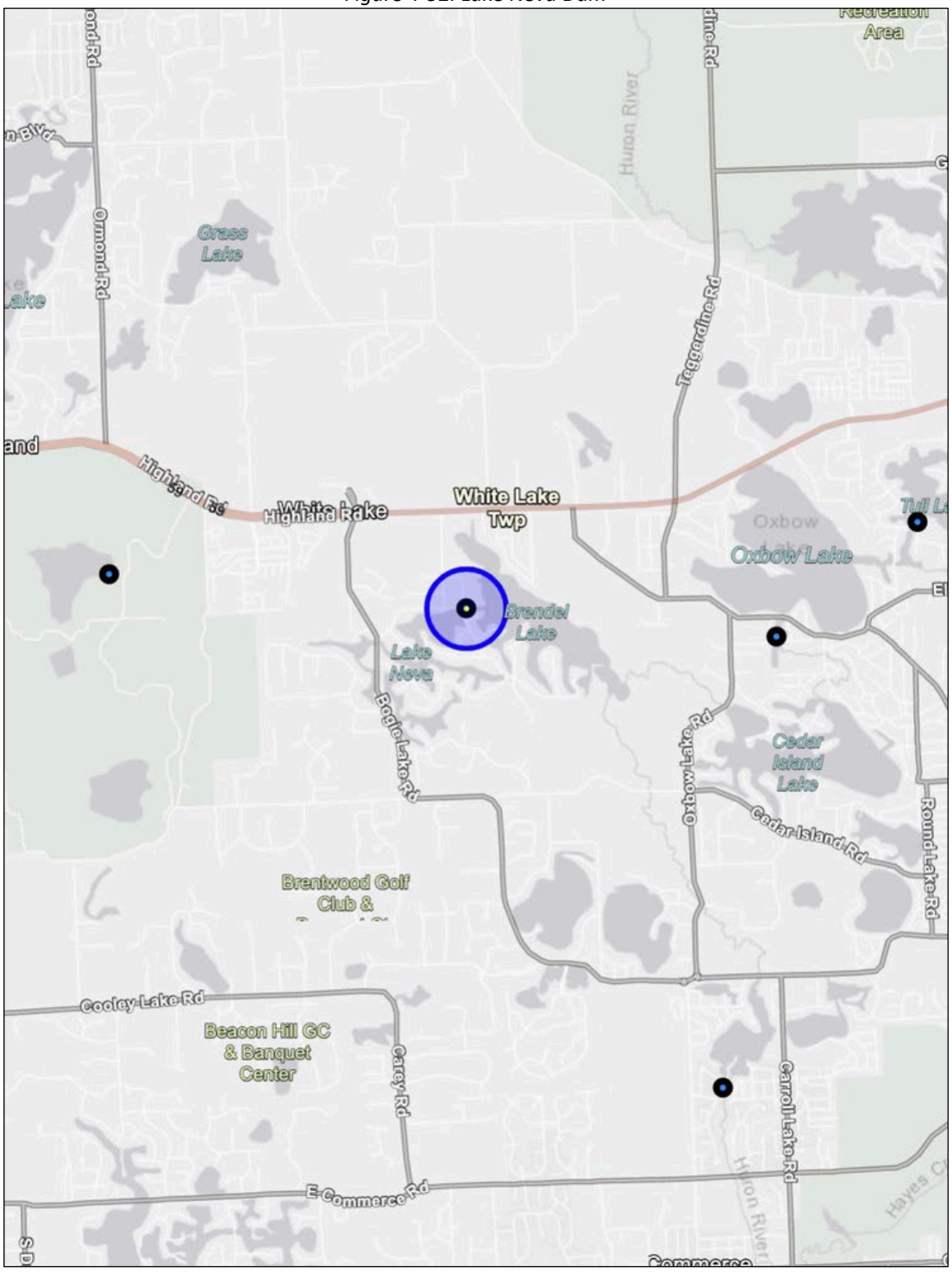
Emergency Action Plan Prepared: Yes / Last Revision: 3/18/2019

Figure 4-51. Winkler Pond Dam



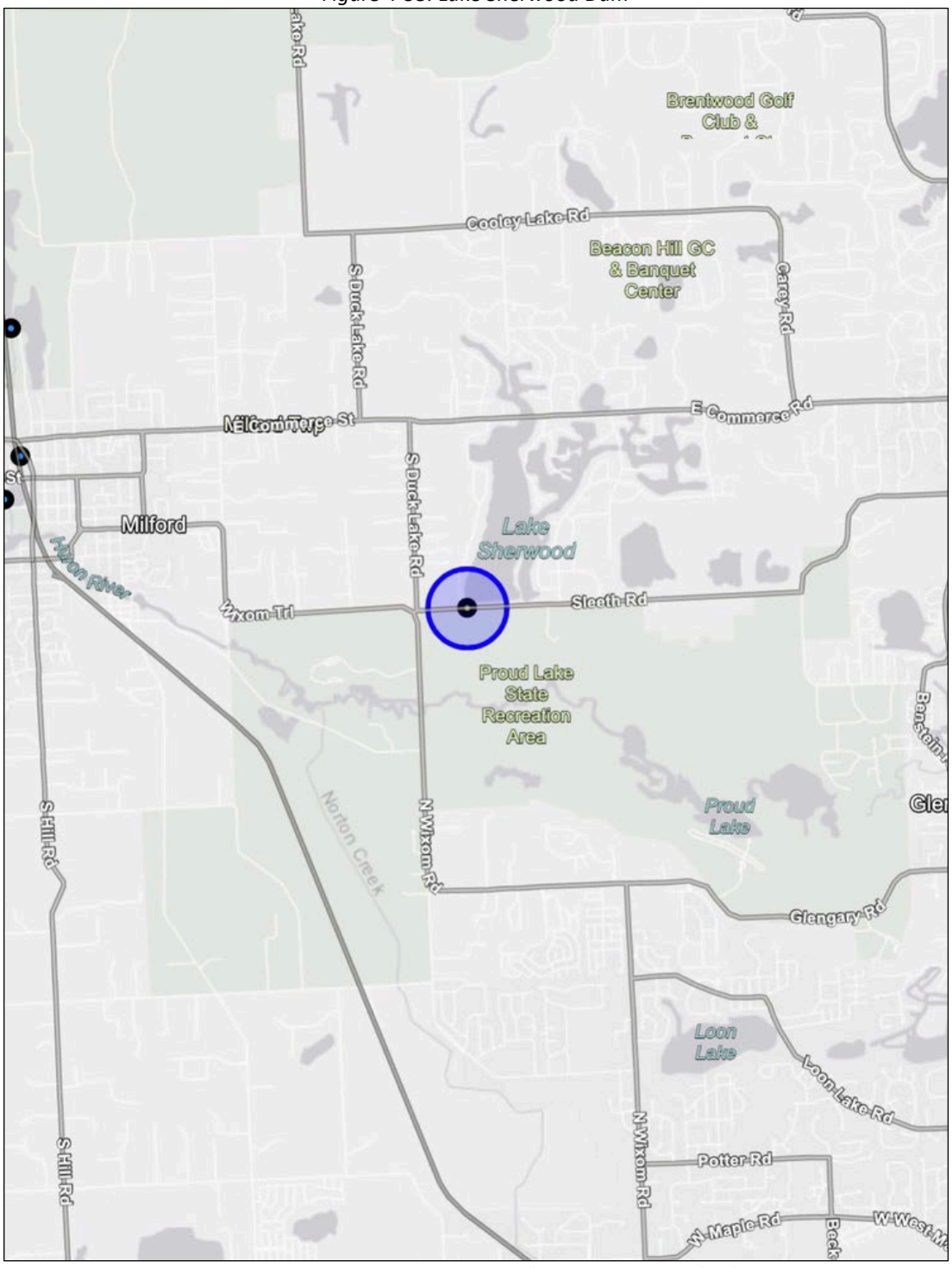
Emergency Action Plan Prepared: Yes / Last Revision: 6/11/2020

Figure 4-52. Lake Neva Dam



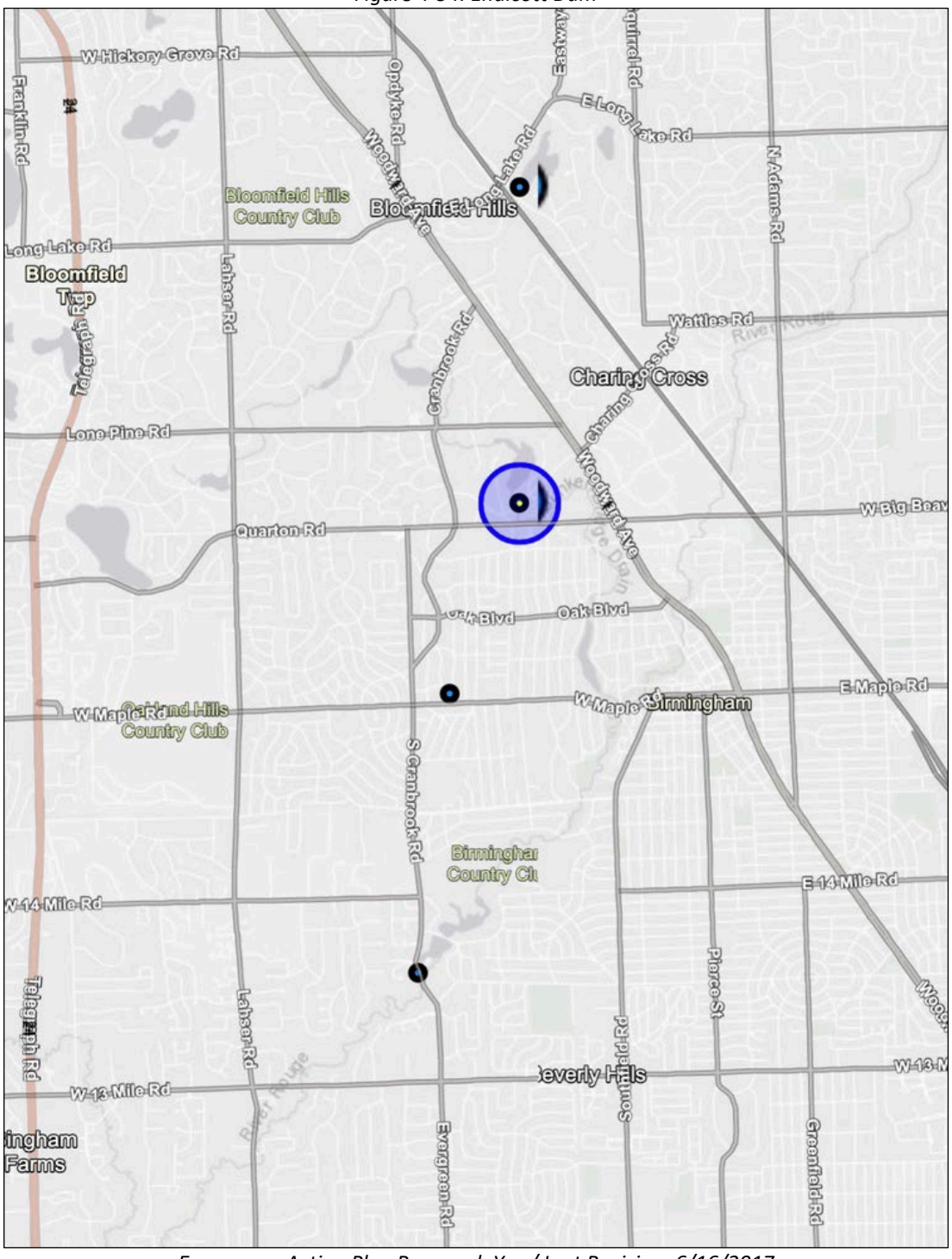
Emergency Action Plan Prepared: Yes / Last Revision: 4/30/2004

Figure 4-53. Lake Sherwood Dam



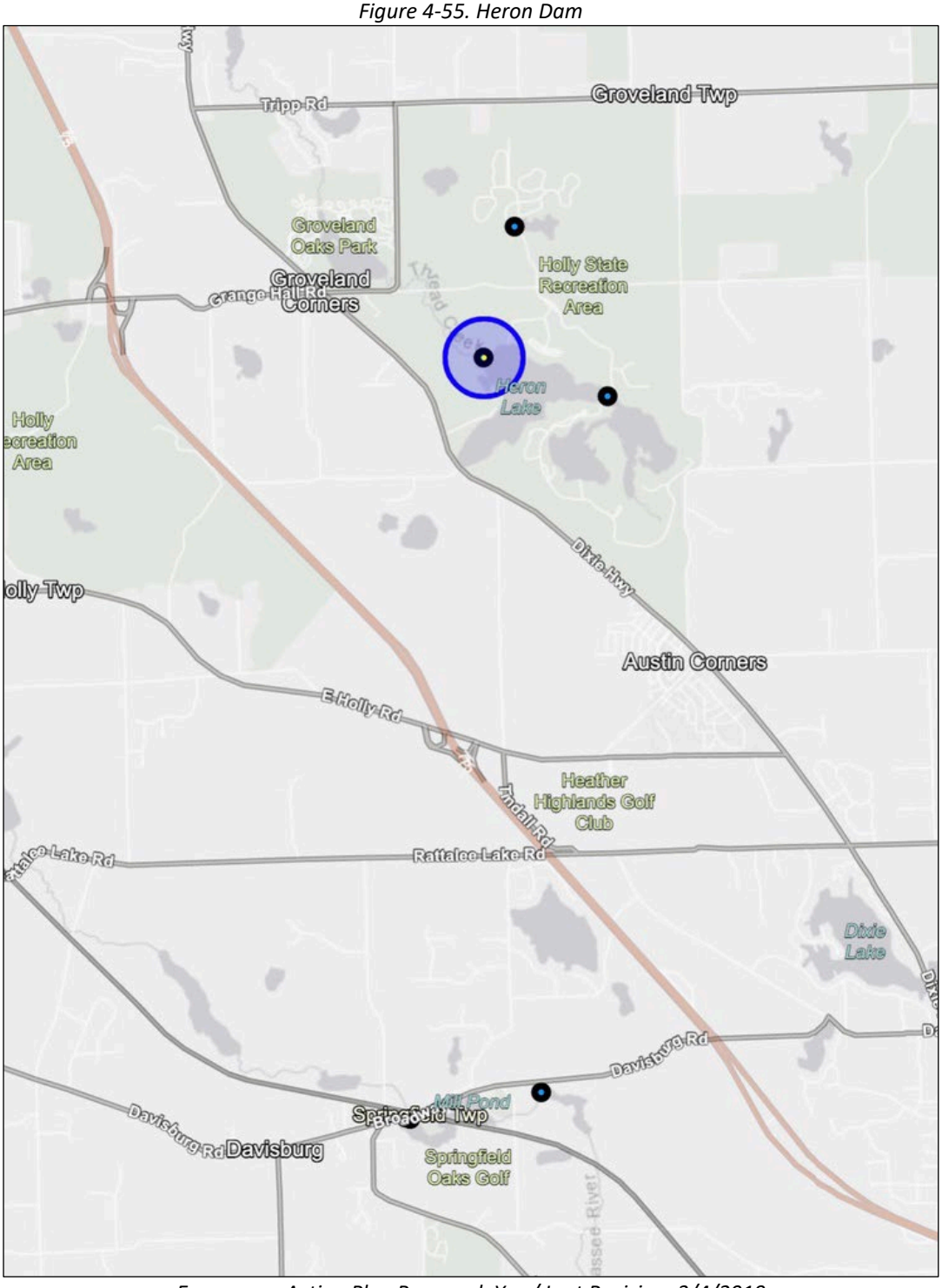
Emergency Action Plan Prepared: Yes / Last Revision: 12/31/2001

Figure 4-54. Endicott Dam



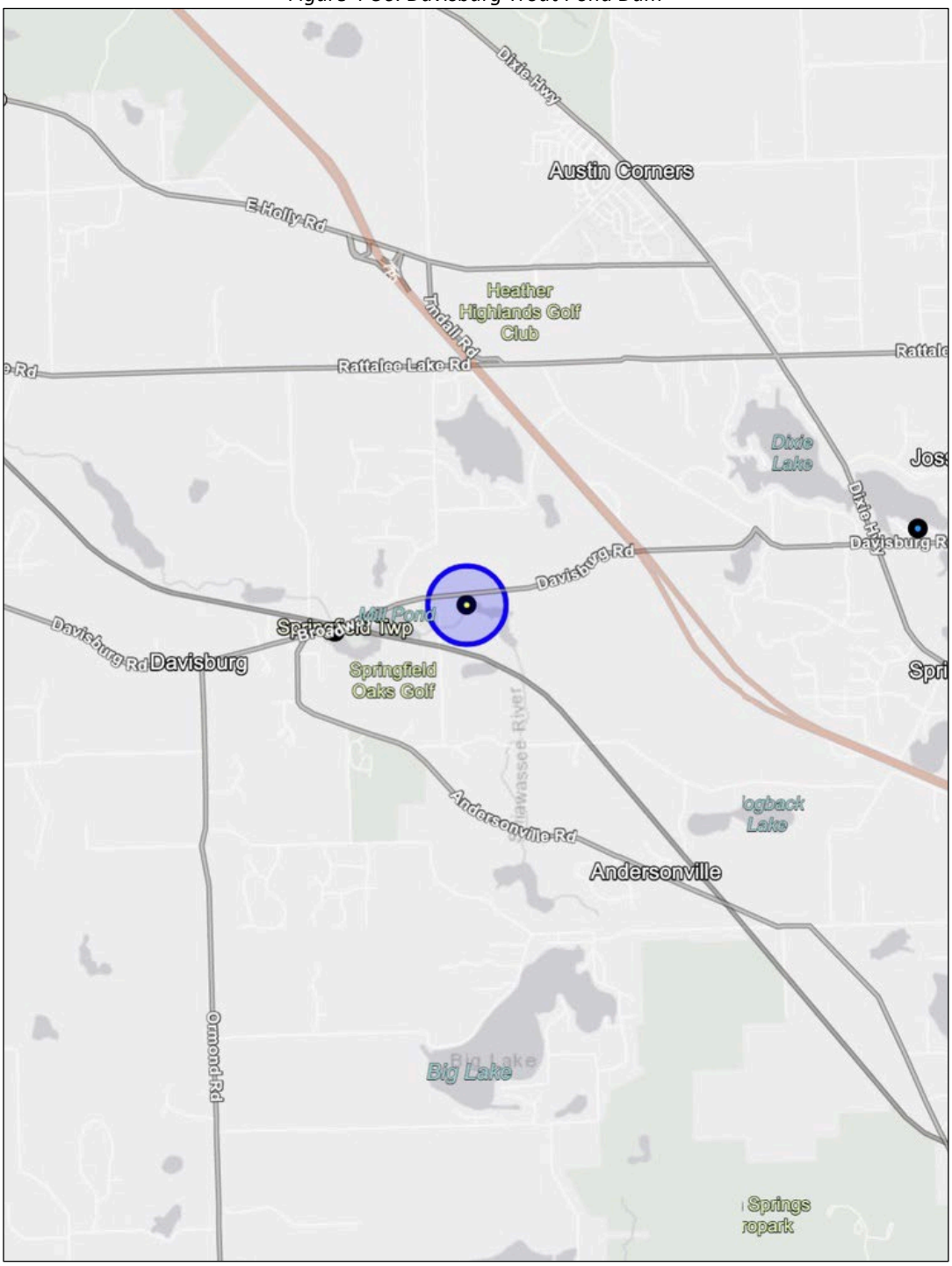
Emergency Action Plan Prepared: Yes / Last Revision: 6/16/2017

Figure 4-55. Heron Dam



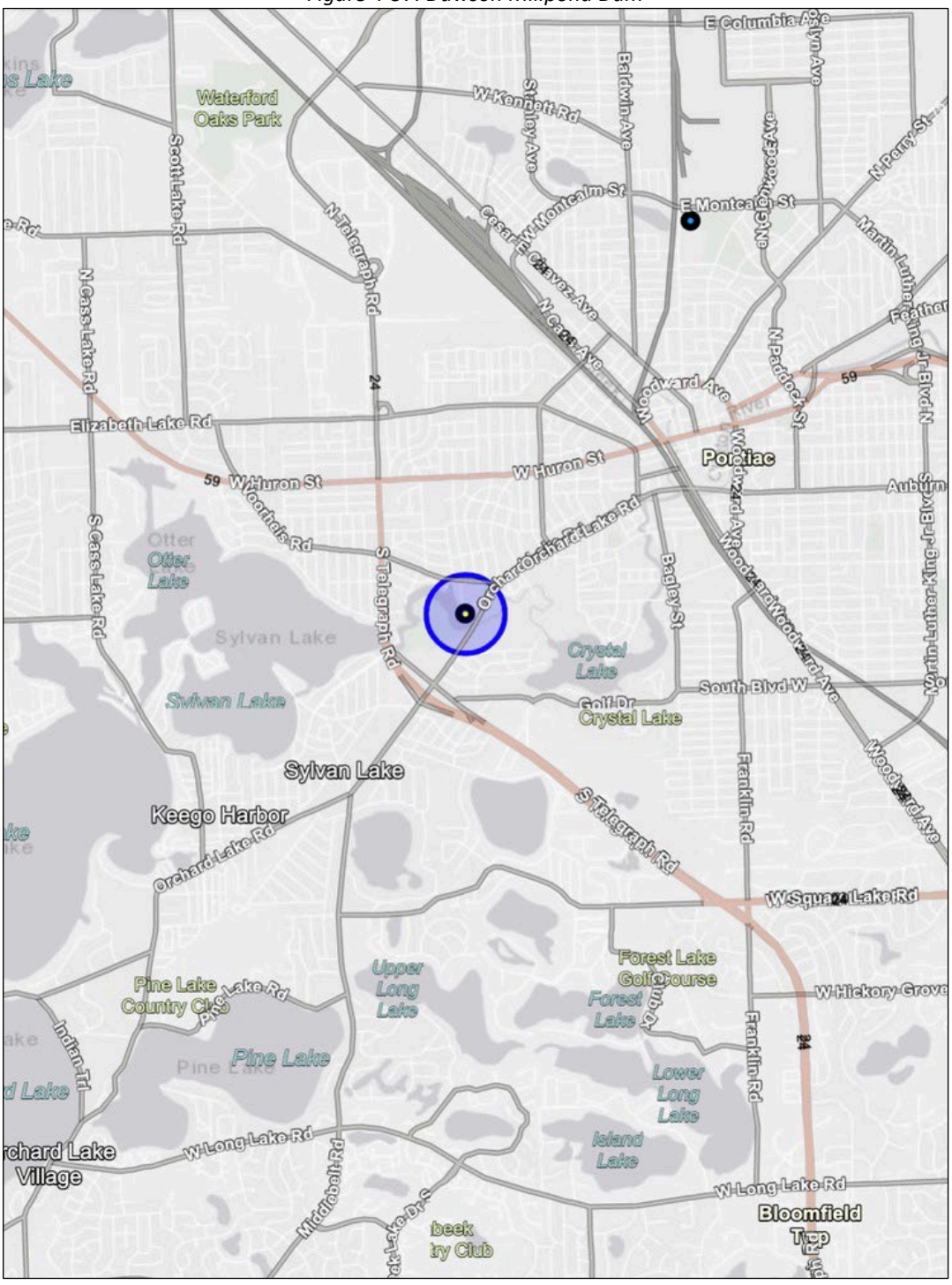
Emergency Action Plan Prepared: Yes / Last Revision: 3/4/2019

Figure 4-56. Davisburg Trout Pond Dam



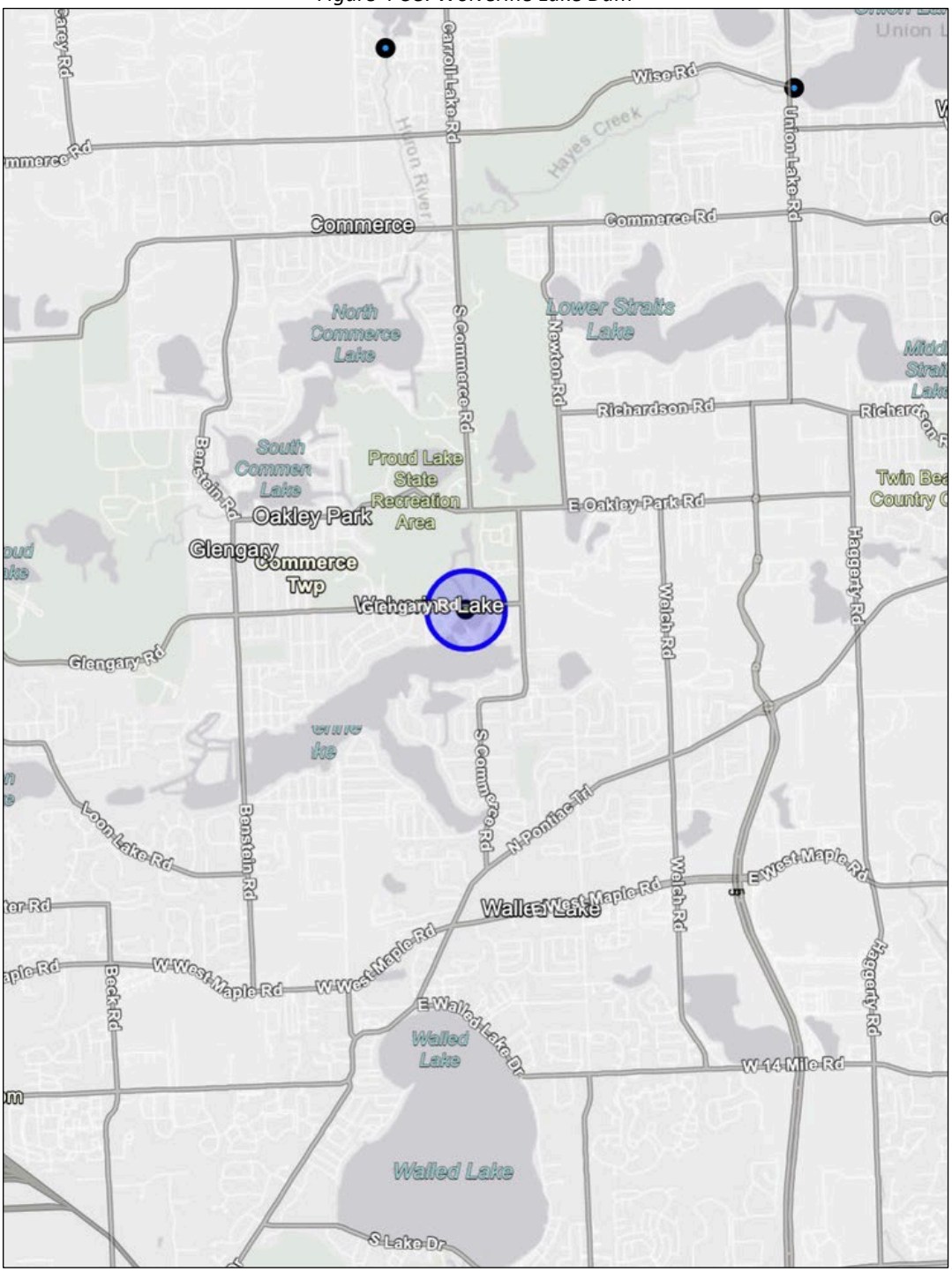
Emergency Action Plan Prepared: Yes / Last Revision: Unknown

Figure 4-57. Dawson Millpond Dam



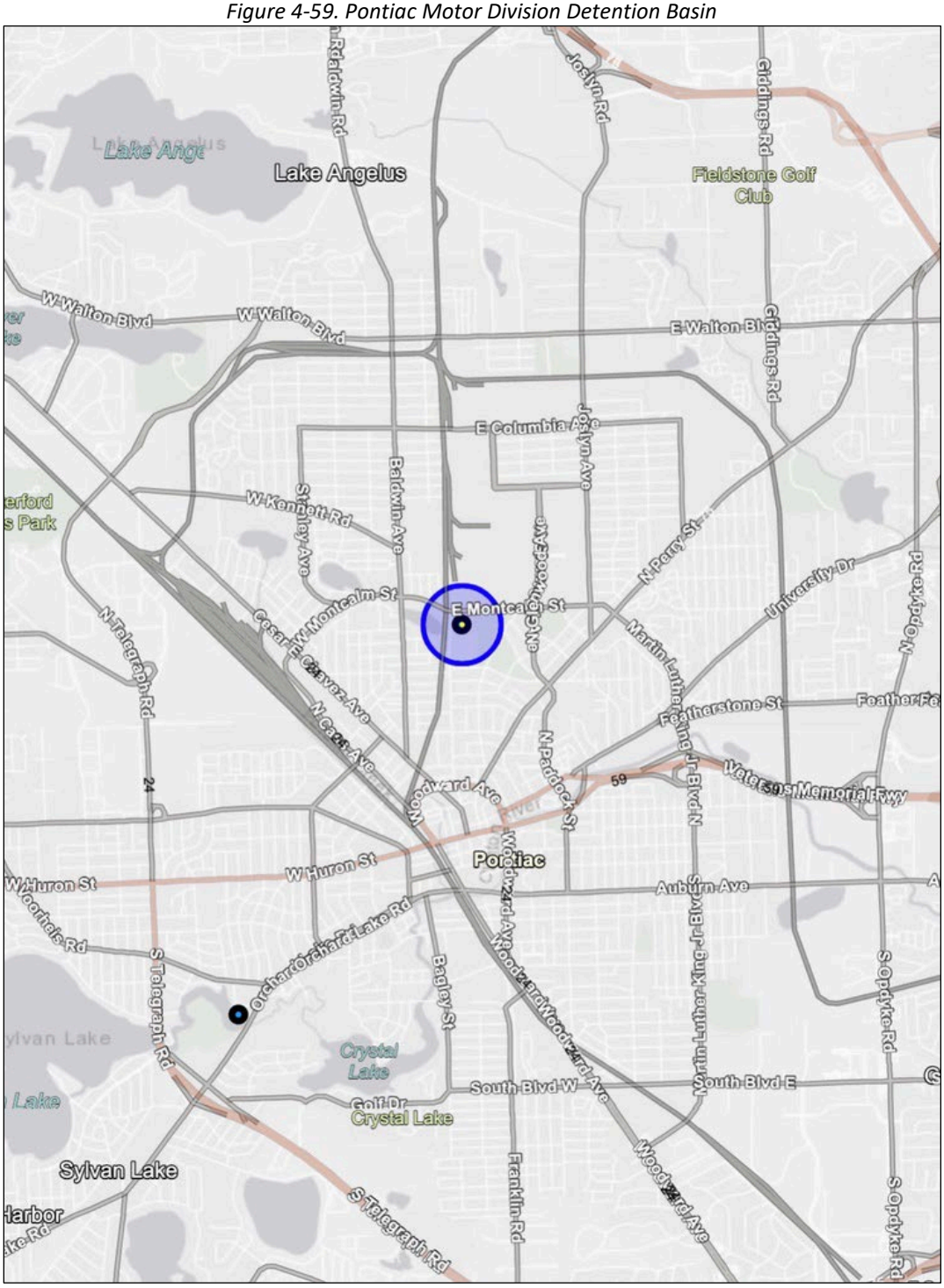
Emergency Action Plan Prepared: Yes / Last Revision: 9/30/2019

Figure 4-58. Wolverine Lake Dam



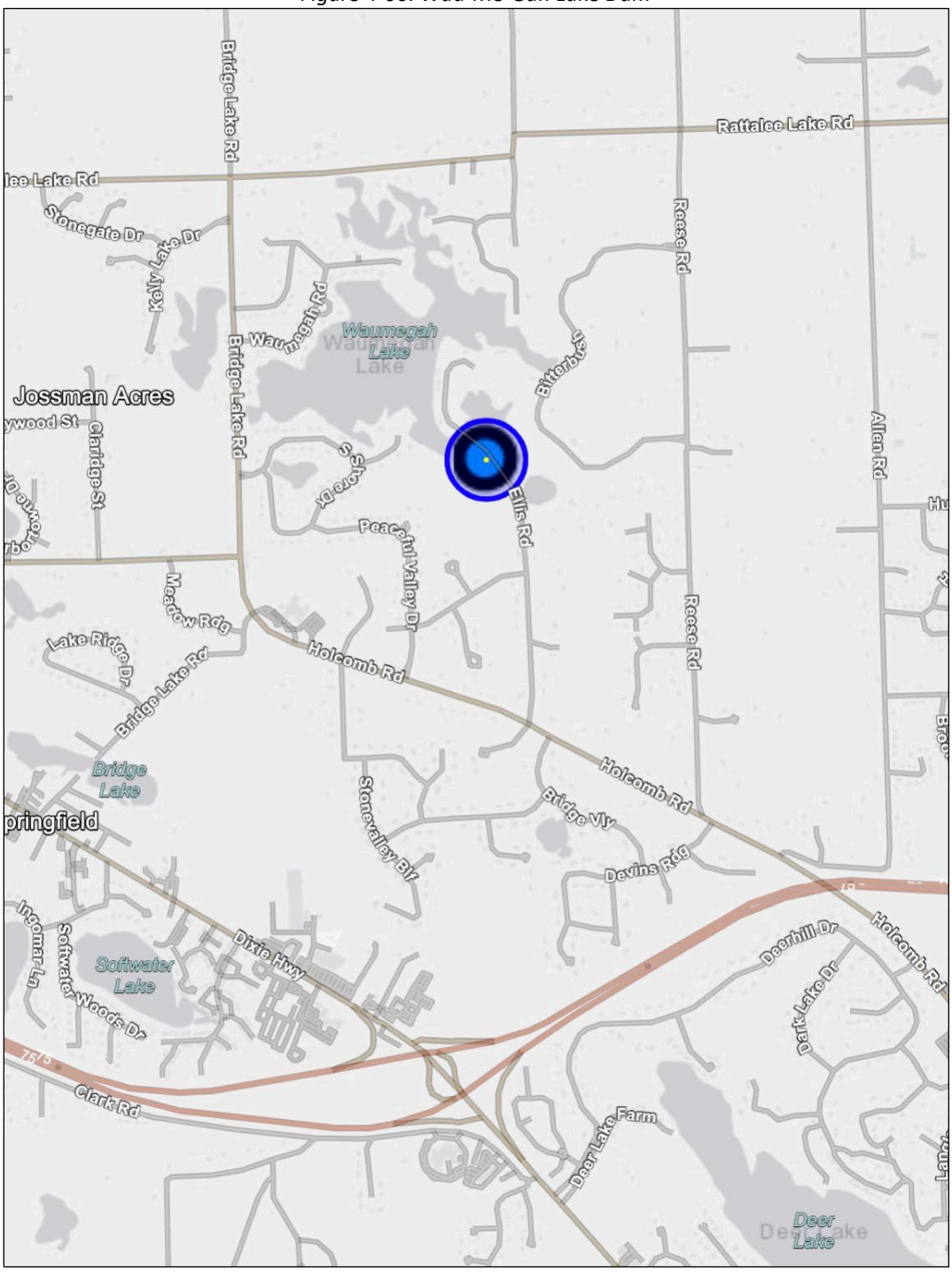
Emergency Action Plan Prepared: Yes / Last Revision: 3/17/2009

Figure 4-59. Pontiac Motor Division Detention Basin



Emergency Action Plan Prepared: Not Required / Last Revision: N/A

Figure 4-60. Wau-Me-Gah Lake Dam



Emergency Action Plan Prepared: Yes / Last Revision: 9/30/2019

Hazard Extent/Intensity

Existing dam classification systems are numerous and vary within and between both federal and state agencies. Although differences in classification systems exist, they share a common thread: each system attempts to classify dams according to the potential impacts from a dam failure or misoperation, should it occur. The hazard potential classification does not reflect the dam's current condition (e.g., safety, structural integrity, flood routing capacity).

In the state of Michigan, dam classifications are defined in the Natural Resources and Environmental Protection Act (NREPA), specifically in Part 307, "Inland Lakes and Streams". Section 307.51 of the act establishes a classification system for dams based on their size and potential impact on the environment, and provides regulations for the construction, maintenance, and operation of each class of dam.

Under the NREPA, dams are classified as follows:

1. **Class A:** Large dams with a height of 6 feet or more and a maximum storage capacity of 50 acre-feet or more.
2. **Class B:** Intermediate dams with a height between 2 and 6 feet and a maximum storage capacity of 15 acre-feet or more.
3. **Class C:** Small dams with a height of less than 2 feet and a maximum storage capacity of less than 15 acre-feet.

The classification of a dam determines the level of regulatory oversight and requirements for maintenance and operation. Dam owners are required to register their dams with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) and comply with the applicable regulations based on the dam's classification.

FEMA categorizes dams according to the degree of adverse incremental consequences of a failure or misoperation of a dam. The National Inventory of Dams uses the federal classification system. Dams are federally categorized into Low, Significant, and High Hazard Potential based on the probable loss of human life and the impacts on economic, environmental, and lifeline interests. Improbable loss of life exists where persons are only temporarily in the potential inundation area.

1. **Low Hazard Potential**: Failure or misoperation results in no probable loss of human life and low economic and environmental losses. Losses are principally limited to the owner’s property.
2. **Significant Hazard Potential:** Failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.
3. **High Hazard Potential**: Failure or misoperation will probably cause loss of human life.

Probability and Frequency

Under the right circumstances, a dam can fail at any time. As a dam ages, the likelihood of failure increases due to various issues, such as undesirable woody vegetation on the embankment, deteriorated concrete, inoperable gates, and corroded outlet pipes. Furthermore, dam failures can often be worsened by flooding, so projected flood frequencies can also be associated with the probability of dam failures.

In Oakland County, there are a significant number of high and significant dam hazards, making it possible that a dam failure could occur in the future. It is estimated that there is a 5% annual probability of occurrence.

Past Events

2020: On May 19, 2020, the Edenville and Sanford Dams, which are part of a four-dam system near Midland, failed. The failures forced the evacuation of thousands of residents and created catastrophic flooding and property losses. The two other dams on the same river system, the Smallwood and Secord dams, were damaged. The dams were unable to manage water flows that resulted when storms dropped as much as eight inches of rain over 48 hours in parts of Northeast Michigan.

2009: The failure of the Yates Dam in 2009 caused flooding and property damage in the area. The Yates Dam was classified as a Class C dam, with a height of less than 2 feet and a maximum storage capacity of less than 15 acre-feet. The cause of the failure was determined to be a breach in the dam's embankment, which was likely caused by heavy rainfall and erosion.

1981: In this incident, the Woodhull Dam failure resulted in significant flooding and downstream property damage. The Woodhull Dam was also classified as a Class C dam. The cause of the failure was determined to be inadequate spillway capacity, which resulted in overtopping of the dam during a period of heavy rainfall.

Additional examples of significant dam failures in the Michigan include: 1) Marquette in 2003 when an earthen dam failed causing over $10 million in property damages and 2) in September 1986, an intense rainfall caused 11 dams to fail in the Lower Peninsula of Michigan.

Out of the 2,521 dams in Michigan, 730 are privately-owned dams regulated by the state, and 329 are publicly owned dams regulated by the state. 85 state-regulated dams are classified as high hazard, meaning in the event of a breach, there is expectation of severe damage and potential loss of life. Of those dams classified as high hazard, 0 are rated 'unsatisfactory' and 5 are rated in 'poor' condition. All numbers are approximate, as Michigan's dam inventory constantly changes.

Vulnerability and Impacts

Dam analyses, including dam breach inundation areas are the most appropriate means for examining the impact on people and property. Vulnerability analysis for dam failure for all dams listed in Table 4-39 have been conducted with emergency action plan revision information included with each figure of each dam. Table 4-40 highlights dam inventory data from the Michigan Department of Environment, Great Lakes, and Energy (EGLE), and specifically describes the downstream hazard potential, design flood, which is a hypothetical flood adopted as the basis in engineering design, and the current condition for each dam. Additional studies, mapping and analysis are needed to determine downstream vulnerability and impacts to key assets.

Table 4-62. Hazard Potential of Dams within Oakland County

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Oxford Multi-lakes Control Structure	Oxford Multi-lakes Dam	Low	North Branch Paint Creek		Meets applicable tolerable risk criteria
Bunny Run Dam		Low	Stony Creek		Meets applicable tolerable risk criteria
Clarkston Dam	Clarkston Mill Pond Dam	High	Clinton River	200 Year	Meets applicable tolerable risk criteria
Clintonville Dam	Oakland-Woodhull Lake Dams	Significant	Clinton River	Q200	Meets applicable tolerable risk criteria
Commerce Dam	Commerce Lake Level Control Structure	Low	Huron River		
Davisburg Dam	Davisburg Mill Pond Dam	Low	Shiawassee River	Q100	Meets applicable tolerable risk criteria
Loon Lake Dam	Upper Hatchery Dam	Significant	Clinton River	Q200	Meets applicable tolerable risk criteria
Erity Dam	Erity Dam	Low	River Rouge	100 Year	Deficiency recognized
Ford Dam #3 (Hubbell Pond)	Milford Dam	Significant	Huron River	200 Year	Meets applicable tolerable risk criteria
Gehrke Dam	Gehrke Dam	Significant	Tributary to Stoney Creek		Not under state jurisdiction
Holly Dam	Stiff's Millpond Dam	Significant	Shiawassee River	200 Year	Deficiency recognized
Lake Louise Dam		High	Kearsley Creek	200 Year	Meets applicable tolerable risk criteria
Lakeville Lake Dam	Lakeville Lake Level Control Structure	Low	Stony Creek		Meets applicable tolerable risk criteria
Lake Orion Dam	Michigan Central Dam	Significant	Paint Creek	200 Year	Meets applicable tolerable risk criteria
Oxbow Dam	Oxbow Lake Dam	High	Huron River	200 Year	Meets applicable tolerable risk criteria

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Perrysville Dam	Stillers Dam	Low	Thread Creek	Q100	Dam has not been inspected
Pontiac Lake Dam	Pontiac Lake Dam	High	Huron River	200 Year	
Pungs Dam		Low	Paint Creek Drain	Q100	
Quarton Dam		Significant	Quarton Br River Rouge	200 Year	Meets applicable tolerable risk criteria
Bald Mountain Pond Dam	Slocum Dam	Low	Spring Creek		Other
Spring Lake Dam	Great Lakes Dam	Low	Swartz Creek	200 Year	Dam has not been inspected
Waterford Multi-Lakes Level Control	Van Norman Lake (Waterford Dam)	Significant	Clinton River	Q200	Meets applicable tolerable risk criteria
Wildwood Lake Dam		High	Thread Creek	200 Year	Meets applicable tolerable risk criteria
Winkler Pond Dam	Winkler Dam	Significant	Stony Creek	200 Year	Meets applicable tolerable risk criteria
Phipps Lake Dam	Phillips Lake Dam	Low	Zimmerman Branch	100 Year	
Dixie Lake Dam		Low	Tributary to Clinton River		Not under state jurisdiction
Big Seven Lake Dam		Low	Tributary to Swartz Creek	100 Year	
Seven Lakes Addition Dam	Little Seven Lake Dam	Low	Swartz Creek	100 Year	Meets applicable tolerable risk criteria
Lake Neva Dam		High	Cedar Creek	200 Year	Meets applicable tolerable risk criteria
Lake Sherwood Dam		Significant	Tributary to Huron River	200 Year	Meets applicable tolerable risk criteria
Addison Oaks Dam		Low	Tributary to Krohn Drain		Not under state jurisdiction
Twelve Oaks Mall Dam		Low	Bishop Creek		Not under state jurisdiction
Upper Trout Lake Dam		Low	Trout Creek	100 Year	
Lower Trout Lake Dam		Low	Trout Creek	Q100	
Endicott Lake Dam		Significant	Tributary to River Rouge	200 Year	Meets applicable tolerable risk criteria
Indian Lake Dam		Low	Trib to W Br Stony Creek	100 Year	Meets applicable tolerable risk criteria
Prince Lake Dam		Low	Trib to W Br Stony Creek	100 Year	Meets applicable tolerable risk criteria
Pettibone Creek Dam #1	Lower Mill Dam	Low	Pettibone Creek	100 Year	Meets applicable tolerable risk criteria
Pettibone Creek Dam No 2	Upper Mill Dam or Milford Dam	Low	Pettibone Creek		Not under state jurisdiction

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Moore Lake Dam		Low	Pettibone Creek	100 Year	
Heron Dam		High	Thread Creek	200 Year	
Davisburg Trout Pond Dam		Significant	Shiawassee River	200 Year	Meets applicable tolerable risk criteria
Braemar Lake Dam		Low	Buckhorn Creek	100 Year	Meets applicable tolerable risk criteria
Knoblock Lake Dam		Low	Shiawassee River	100 Year	
Haven Hill Lake Dam		Low	Cedar Creek	100 Year	Deficiency recognized
Duck Lake Dam		Low	Paint Creek	100 Year	
Indianwood Lake Dam		Low	Paint Creek	Q100	Meets applicable tolerable risk criteria
Dawson Millpond Dam	Price Dam	High	Clinton River	200 Year	Meets applicable tolerable risk criteria
Renchik Dam		Low	Duck Creek		Dam has not been inspected
Crystal Lake Dam		Low	Swartz Creek	200 Year	Other
Wolverine Lake Dam		Significant	Trib to Huron River	Q200	
Vhay Lake Dam		Low	Amy Drain	Q100	Deficiency recognized
Duck Lake Dam	Duck Lake Level Control Structure	Low	Tributary to Pettibone Creek	100 Year	
Susin Lake Dam		Low	Trib to Clinton River	100 Year	
Walter Moore Dam	Crystal Lake Dam	Low	Clinton River	100 Year	
Union Lake Level Control Structure	Union Lake	Low	Hayes Creek		Meets applicable tolerable risk criteria
Walled and Shawood Lakes Dam	Walled Lake Control Structure	Low	Ingersoll Creek		
Watkins Lake Dam	Watkins Lake Control Structure	Low	Unnamed Tributary to Clinton		Meets applicable tolerable risk criteria
Williams Lake Control Structure		Low			Meets applicable tolerable risk criteria
Petrauskas Pond Dam		Low			Dam has not been inspected
Leavenworth Detention Pond Dam		Low	Walled Lk Branch River Rouge	Q100	Meets applicable tolerable risk criteria

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Sisters of Mercy Dam		Low	Tributary to River Rouge		Not under state jurisdiction
Pontiac Motor Division Detention Basin		Significant	Montcalm Storm Sewer	100 Year	Not under state jurisdiction
Bevins Lake Dam	Bevins Lake Level Control Structure	Low	Patterson Holly Drain		Deficiency recognized
Buell Road Dam		Low	West Branch Stony Creek		Not under state jurisdiction
Bush Lake Dam		Low	Shiawassee River		Meets applicable tolerable risk criteria
Cass Lake Control Structures 1 and 2	Cass Lake Canal Level Control	Low	Clinton River		
Cedar Island Dam		Low	Huron River		Meets applicable tolerable risk criteria
Cranbrook Lake Dam		Low	River Rouge		Dam has not been inspected
Farmington Venture Detention Pond Dam		Low	Tributary to Seeley Drain		Dam has not been inspected
Fenton Dam #1	Upper Fenton Dam	Low	Tributary to Shiawassee River	100 Year	
Fenton Dam #2		Low	Tributary to Shiawassee River	100 Year	
Fenton Dam #3		Low	Tributary to Shiawassee River		Not under state jurisdiction
Eggleston Dam		Low	West Branch Stoney Creek		Not under state jurisdiction
Heather Lake Dam	Village Oaks Lake Dam	Low	Tributary to Walled Lake		Dam has not been inspected
Wau-Me-Gah Lake Dam	Waumegah Lake Dam	Significant	Tributary to Clinton River	200 Year	Meets applicable tolerable risk criteria
Lake Charnwood Dam		Low	Sprague Branch River Rouge	100 Year	Dam has not been inspected
Lake Genesareth Dam		Low	Tributary to Pebble Creek		Not under state jurisdiction
Lovett Dam		Low	Trib to Sunken Bridge Drain		Not under state jurisdiction
Lower Hatchery Dams	Drayton Plains Hatchery # 3	Low	Clinton River		Dam has not been inspected
Manito Lake Dam	Marl Lake Dam	Low			Not under state jurisdiction
McGinnis Lake Dam		Low	Tributary to Thread Creek	100 Year	

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Meadowbrook Retention Dam		Low	Tributary to Bell Creek		Not under state jurisdiction
Meadowglen Sub Storm Ret Pond Dam		Low	Tributary to Tarabusi Creek	100 Year	Meets applicable tolerable risk criteria
Meadowhills Est Retention Pond North		Low	Tributary to Tarabusi Creek		Not under state jurisdiction
Meadowhills Estates Retention Pond South		Low	Tributary to Tarabusi Creek		Not under state jurisdiction
Meadow Lake Dam		Low	Franklin Drain	100 Year	Meets applicable tolerable risk criteria
Franklin Drain Dam		Low	Franklin Drain		Not under state jurisdiction
Stony Creek Dam		Low	Stony Creek		Not under state jurisdiction
River Rouge Dam #1		Low	Tributary to Cranbrook Lake		Not under state jurisdiction
River Rouge Dam #2		Low	Quarton Branch River Rouge		Not under state jurisdiction
Baldwin Pond Dam		Low	East Pond Creek		Not under state jurisdiction
Cranbrook Foundation Dam		Low	River Rouge		Not under state jurisdiction
Franklin Drain Dam		Low	Franklin Drain		Not under state jurisdiction
Franklin Drain #2 Dam		Low	Franklin Drain		Not under state jurisdiction
Northbrook Gardeners Dam		Low	Seely Ditch		Not under state jurisdiction
Northfield Hills Dam		Low	River Rouge	100 Year	Meets applicable tolerable risk criteria
Old Hamestead		Low	Seely Ditch		Not under state jurisdiction
Paint Creek Cider Mill Dam		Low	Paint Creek		Not under state jurisdiction
Rochester City Park Dam		Low	Paint Creek		Not under state jurisdiction
Hillview Lake Dam		Low	Tributary-Paint Creek Drain		Not under state jurisdiction
San Marino Golf Club Dam		Low	Seely Ditch		Not under state jurisdiction
Sashabaw Creek Dam		Low	Sashabaw Creek		Not under state jurisdiction

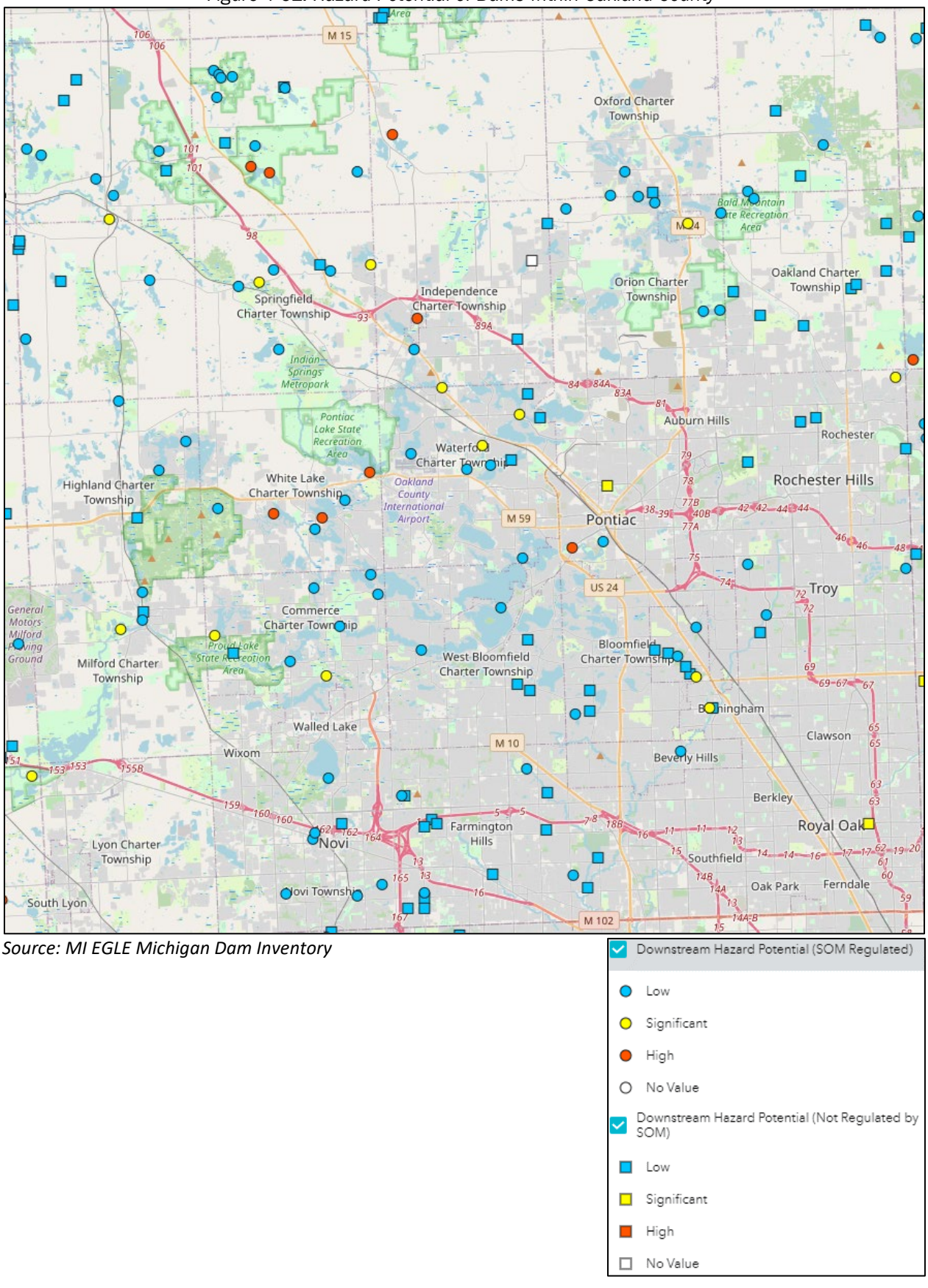
Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Secord Lake Dam		Low	East Pond Creek		Dam has not been inspected
Sargent Creek Dam		Low	Sargent Creek		Not under state jurisdiction
Shoup Pond		Low	Clark Drain		Not under state jurisdiction
Lake Araho Dam	Sitzes Dam Gillespie Dam	Low	Paint Creek Drain		Dam has not been inspected
Smith Dam		Low	Below Phipps Lake Outlet		Not under state jurisdiction
Stewart Lake Dam		Low	Thread Creek	100 Year	Not under state jurisdiction
Taylor Lake Dam		Low	Taylor Lake Outlet		Not under state jurisdiction
Traxler Dam		Low	McClure Drain		Not under state jurisdiction
Waldon Pond Dam		Low	Inlet Wing Lake		Not under state jurisdiction
Tull Lake Dam		Low	Huron River	Q100	Dam has not been inspected
Woodcreek Hills Dam	Danvers Pond Dam	Low	Pebble Creek		Other
Yates Mill Dam	Yates Cider Mill Dam	Low	Clinton River		Not under state jurisdiction
Pettibone Pond Dam	Winegar Lake Dam	Low	Pettibone Creek	100 Year	Deficiency recognized
Lake Angelus Level Control Structure		Low	Lake Angelus Outlet		Not under state jurisdiction
Big Lake Dam	Big Lake Level Control Structure	Low	Huron River		Meets applicable tolerable risk criteria
Eagle Lake Dam		Low	Eagle Lake Outlet		Not under state jurisdiction
Fox Lake Dam	Fox Lake Level Control Structure	Low	Huron River		
Middle & Lower Straits Dam		Low	Lower Straits Lake Outlet		
Storm Retention Pond Dam		Low	Clinton River		Not under state jurisdiction
Tipsico Lake Dam	Tipsico Lake Level Control Structure	Low	Tipsico Lake Outlet		
Upper Straits Dam	Upper Straits Lake Level Control Str	Low	Upper Straits Lake Outlet		
Proud Lake Dam		Low	Huron River	100 Year	Meets applicable hydrologic and seismic regulatory criteria
Cemetery & Dollar Lake Dam		Low	Clinton River		

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Taft Road Regional Detention Basin		Low	Walled Lk Branch River Rouge	Q200	Meets applicable tolerable risk criteria
Thornton District Detention Basin		Low	Thornton Creek	Q100	Meets applicable tolerable risk criteria
Meadowbrook Lake Dam		Low	Walled Lk Branch River Rouge	Q100	
Misuaraca Dam		Low	Tributary to S Stony Creek		Not under state jurisdiction
Mill Pond Dam		Low	Swartz Creek		Not under state jurisdiction
Ray Dam	Carpenter Lake Dam	Low	Tributary to River Rouge	Q100	Meets applicable tolerable risk criteria
Outwood Sub Dam		Low	Tributary to River Rouge		Other
Warstler Dam		Low	Tributary to Paint Creek		Not under state jurisdiction
Galloway Creek USGS Control		Low	Galloway Creek		Not under state jurisdiction
River Rouge USGS Control		Low	River Rouge		Not under state jurisdiction
Upper River Rouge USGS Control		Low	Upper River Rouge		Not under state jurisdiction
Applebrook Detention Basin #1		Low	Tributary to Seeley Drain		Not under state jurisdiction
Oak River Sub #2 Dam		Low	River Rouge		Not under state jurisdiction
Troy Lakes Estates Dam		Low	Tributary tp Gibson Drain		Dam has not been inspected
Waterfowler's Impoundment Dam	Van Road Dam	Low	Tributary to Thread Creek	100 Year	
Thread Creek Impoundment Dam		Low	Trib to Thread Creek	100 Year	Meets applicable tolerable risk criteria
Orchard Lake Dam	Orchard Lake Overflow	Low	Orchard Lake Outlet		Meets applicable tolerable risk criteria
Pebble Creek Detention Basin Dam	Glen Oak Detention Dam	Low			Dam has not been inspected
Hartman & Tyner Mitigation Pond 1		Low	Tributary to Thread Creek	Q100	
Hartman & Tyner Mitigation Pond 2		Low	Tributary to Thread Creek	Q100	Meets applicable tolerable risk criteria

Dam Name	Other Name for Dam	Downstream Hazard Potential	River	Design Flood	Condition Assessment Detail
Long Lake Dam	Long Lake Control Structure	Low	Long Lake Outlet		Meets applicable tolerable risk criteria
Scott Lake Control Structure		Low			Other
White Lake Dam	White Lake Control Structure	Low	White Lake Outlet		Meets applicable tolerable risk criteria

Source: MI EGLE Michigan Dam Inventory

Figure 4-61. Hazard Potential of Dams within Oakland County



Source: MI EGLE Michigan Dam Inventory

Life Safety and Health: According to the NREPA, the failure of a dam can have significant impacts on life safety and health. Dam failures can lead to loss of life or injury to individuals in the immediate downstream area, property damage, and disruption of essential services such as power, water supply, and transportation. In addition, dam failures can also cause environmental damage, including damage to aquatic habitats, erosion, and sedimentation. To mitigate these impacts, the NREPA mandates that dam owners ensure their dams are designed, constructed, operated, and maintained safely and responsibly. The act also requires the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to inspect and regulate dams, and mandates dam owners to take appropriate action to address any identified safety or environmental concerns.

Property Damage and Critical Infrastructure: Dam failure can lead to extensive property damage, including damage to homes, businesses, and infrastructure such as roads and bridges. Additionally, a dam failure can disrupt critical services like power, water supply, and transportation. For instance, if a dam failure causes power outages to critical facilities like hospitals or water treatment plants, it can have cascading effects on the surrounding community. Transportation routes may also be affected as floodwaters damage or wash out roads and bridges.

Additionally, dam failure can cause significant environmental damage, including damage to aquatic habitats, erosion, and sedimentation. This can have far-reaching impacts on the ecosystem, water quality, and aquatic species, with lasting effects on the environment and local communities.

Economy: No data exists demonstrating the economic impact of past dam failure events in Oakland County.

Changes in Development and Impact of Future Development: Dam failure can influence local governments to reassess their development plans and building codes to address any increased risks associated with living and working near dams. Developers may also need to take additional precautions when designing and constructing buildings and infrastructure in areas that are downstream of dams. This can include implementing flood-resistant designs, elevating buildings, and relocating critical infrastructure such as power and water supply facilities to higher ground.

Dam failure can also lead to changes in land use and zoning in affected areas. In some cases, local governments may need to restrict or prohibit certain types of development in areas that are at high risk of flooding or other hazards associated with dam failure. This limitation can impact potential for future development and affect property values in the area. Future development may increase the magnitude and vulnerability to this hazard if development occurs in the inundation areas.

Effects of Climate Change on Severity of Impacts: Heavy precipitation leads to riverine flooding and flash floods as the ground fails to absorb the high volume of precipitation that falls in a

short period. Increasing annual precipitation contributes to sustained flooding. (Neighborhoods At Risk, 2023).

Table 4-41 illustrates 25-year precipitation projections for Oakland County, while Table 4-42 shows future climate indicators for Oakland County.

Table 4-63. 25-Year Precipitation Projections for Oakland County

25-YEAR PRECIPITATION PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 13% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.3 more days of heavy precipitation per year (from 2.5 days to 2.8 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 7% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.17 more days of heavy precipitation per year (from 2.44 days to 2.61 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-64. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**32”**	**33”**	**33”**	**34”**	**34”**	**34”**	**35”**
	30-33	31-37	30-35	31-38	30-37	30-39	31-40
Days Per Year With Precipitation (Wet Days)	**194 days**	**192 days**	**191 days**	**191 days**	**189 days**	**190 days**	**187 days**
	191-198	179-200	178-198	179-203	172-201	177-202	157-201
Maximum Period of Consecutive Wet Days	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**
	11-13	11-13	10-13	10-13	10-13	11-13	10-13
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**2 days**	**2 days**	**2 days**	**3 days**	**3 days**	**3 days**	**3 days**
	1-2	2-3	2-3	2-4	2-4	2-4	2-6
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0

Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**4 days**	**5 days**	**5 days**	**5 days**	**6 days**	**6 days**	**7 days**
	4-5	5-6	5-6	5-6	5-6	5-6	6-8
Days With Maximum Temperature Below 32°F	**49 days**	**36 days**	**35 days**	**31 days**	**27 days**	**25 days**	**13 days**
	45-53	18-47	24-45	13-42	11-38	8-40	1-29
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates and Hazard-Specific Risk

The FEMA NRI does not assess high-hazard dams.

4.10 Fog

Hazard Description

Fog is a cloud-like mass of condensed water vapor that hovers close to the ground and reduces visibility.

Hazard Location

Fog could occur anywhere in Oakland County.

Hazard Extent/Intensity

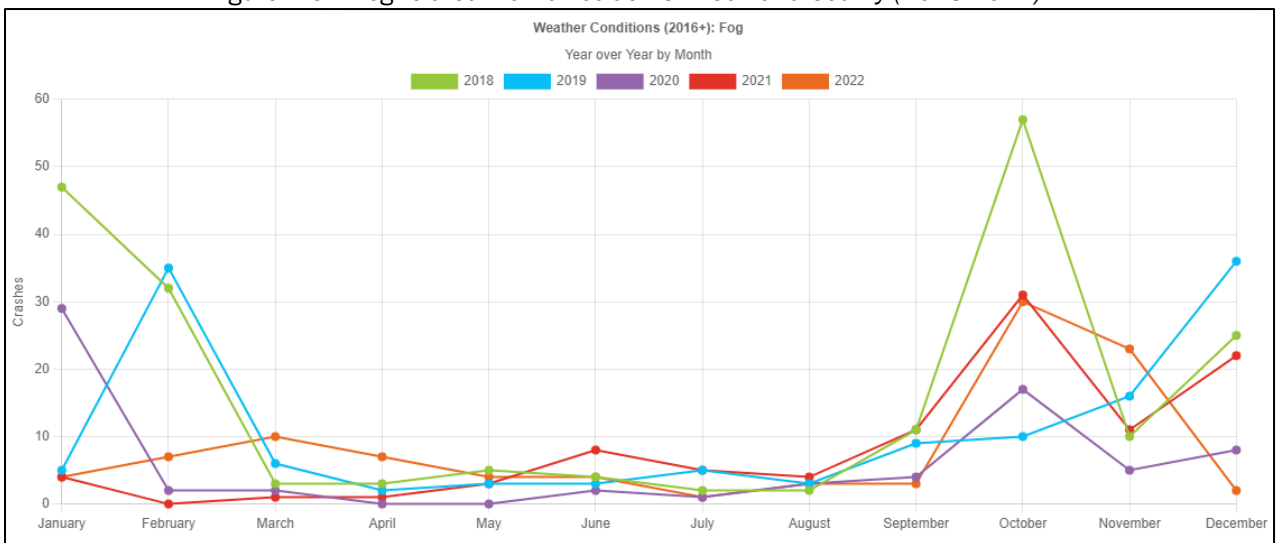
NOAA measures the extent or intensity of fog based on the visibility range. Fog is classified as "Dense Fog" when visibility is less than 1/4 mile (402 meters), "Fog" when visibility ranges from 1/4 to 1 mile (402 to 1609 meters), and "Haze" when visibility ranges from 2 to 5 miles (3218 to 8046 meters). The extent or intensity of fog can be further classified based on the severity of its impact on transportation, aviation, and other activities.

Probability and Frequency

Michigan has approximately one major fog event every two years. NOAA lists one Dense Fog event for Oakland County since 1950. While only one major fog event has been recorded by NOAA, fog occurs regularly and can cause disruption, specifically with regard to transportation and major roadways. It is estimated that there is a 50% annual probability of occurrence for a major fog event.

Past Events

Figure 4-62. Fog-related Traffic Accidents in Oakland County (2018-2022)



Weather Conditions (2016+)	2018	2019	2020	2021	2022	Total
Fog	201	133	73	101	98	606
Total Crash Count	201	133	73	101	98	606

Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

2005: Approximately 200 cars collided during a heavy fog in Ingham County. Two people were killed, 37 were injured, and both lanes of I-96 were closed for hours.

2000: On October 26, 2000, dense fog hovered over the metro Detroit area. This event caused significant delays for morning commuters and delayed dozens of flights at Detroit Metropolitan Airport.

1995: Dense fog lasted for over 24 hours, resulting in numerous traffic accidents with four deaths. School was cancelled and flights were delayed, cancelled, or diverted.

Vulnerability and Impacts

Life Safety and Public Health: Fog can impact life safety and public health in several ways. First, fog reduces visibility, making it more difficult for drivers to see road signs, other vehicles, and pedestrians. This can increase the risk of accidents and injuries. Second, fog can also affect air travel by reducing visibility for pilots and causing flight delays and cancellations. Lastly, fog can worsen air quality by trapping pollutants close to the ground, leading to respiratory problems, especially for people with pre-existing conditions like asthma. This can result in moisture on surfaces, making them slippery and increasing the risk of falls and injuries.

Overall, the impact of fog on life safety and public health depends on its severity and duration, as well as the vulnerability and exposure of the affected population.

Property Damage and Critical Infrastructure: Fog can have an impact on property damage and critical infrastructure through various means. First, reduced visibility caused by fog can lead to accidents, damaging property, vehicles, and critical infrastructure. For example, highway or railroad accidents can be caused by fog, leading to property damage and infrastructure disruption. Next, fog can cause moisture deposition on surfaces, resulting in the deterioration of buildings, vehicles, and other infrastructure over time. Fog can also contribute to corrosion and the breakdown of infrastructure components, such as metal structures, electrical equipment, and communication systems.

Regarding critical infrastructure, fog can disrupt power transmission and distribution systems, leading to power outages due to moisture deposition on power lines. Reduced visibility may also impede maintenance and repair activities. Additionally, communication infrastructure, including cellular networks, satellite communication, and broadcast systems, can be affected by fog.

Economy: No data exists demonstrating the economic impact of past dense fog events on Oakland County.

Changes in Development and Impact of Future Development: Future development or changes in development are not anticipated to increase the probability, magnitude, or vulnerability to this hazard.

Effects of Climate Change on Severity of Impacts: According to the NOAA, climate change can impact the severity of dense fog events in several ways. As the climate warms, the amount of moisture in the atmosphere is expected to increase, leading to more frequent and intense fog events in some areas. In addition, changes in wind patterns and atmospheric circulation associated with climate change can impact the frequency and intensity of fog events in different regions. For example, changes in the frequency and intensity of storms and hurricanes can alter the amount and distribution of moisture in the atmosphere, affecting fog formation and dissipation. Climate change can also impact the timing and duration of fog events. This can lead to more frequent and prolonged coastal fog events, impacting shipping, transportation, and coastal ecosystems (NOAA, 2023).

Understanding that precipitation can impact fog in several ways. Table 4-43 illustrates 25-year precipitation projections for Oakland County.

Table 4-65. 25-Year Precipitation Projections for Oakland County

25-YEAR PRECIPITATION PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 13% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.3 more days of heavy precipitation per year (from 2.5 days to 2.8 days per year).
LOWER EMISSIONS (RCP4.5)

Oakland County is expected to experience a 7% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.17 more days of heavy precipitation per year (from 2.44 days to 2.61 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

FEMA NRI Expected Annual Loss Estimates and Hazard-Specific Risk

The FEMA NRI does not assess fog.

4.11 Severe Summer Storms

Hazard Description

In this plan, severe storms are considered thunderstorms, lightning, microbursts/high winds, and hailstorms.

Thunderstorms affect relatively small areas when compared to hurricanes and winter storms. However, despite their small size, all thunderstorms are dangerous. A typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, or a tornado. Every thunderstorm needs three essential components: (1) moisture to form clouds and rain, (2) unstable air, which is warm air that rises rapidly, and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms (NOAA, 2023).

Lightning, although not considered criteria for a severe thunderstorm by the National Weather Service definition, can accompany heavy rain during thunderstorms. Lightning develops when ice particles in a cloud move around and collide with other particles. These collisions cause a separation of electrical charges. As a result, positively charged ice particles rise to the top of the cloud, while negatively charged particles fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder (NOAA, 2023).

Microbursts (Damaging Winds): A **microburst** is a small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 2.5 miles across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground (NOAA, 2023).

Hailstorms: Hail is a form of precipitation that occurs when thunderstorm updrafts carry raindrops upward into extremely cold areas of the atmosphere, where they freeze into ice balls. Hail can damage aircraft, homes, and cars and kill livestock and people. Table 4-45 outlines potential hail sizes and describes physical items for comparison (NOAA, 2023).

Hailstones grow by colliding with supercooled water drops. Supercooled water will freeze in contact with ice crystals, frozen raindrops, dust, or some other nuclei. Thunderstorms with a strong updraft keep lifting the hailstones to the top of the cloud, where they encounter more supercooled water and continue to grow. The hail falls when the thunderstorm's updraft can no longer support the weight of the ice, or the updraft weakens. The stronger the updraft, the more significant the hailstone can grow (NOAA, 2023).

"Hailstones can have layers like an onion if they travel up and down in an updraft, or they can have few or no layers if they are "balanced" in an updraft. Counting the layers, one can tell how many times a hailstone traveled to the top of the storm. In addition, hailstones can begin to melt and re-freeze together – forming large and very irregularly shaped hail (NOAA, 2023).

High Winds: High winds are defined as "sustained winds with speeds of 40 miles per hour (mph) or greater, or wind gusts with speeds of 58 mph or greater (NOAA, 2023)". High winds can have a significant impact on weather conditions and can cause damage to structures, trees, and power.

Hazard Location

Severe summer storms could occur anywhere in Oakland County.

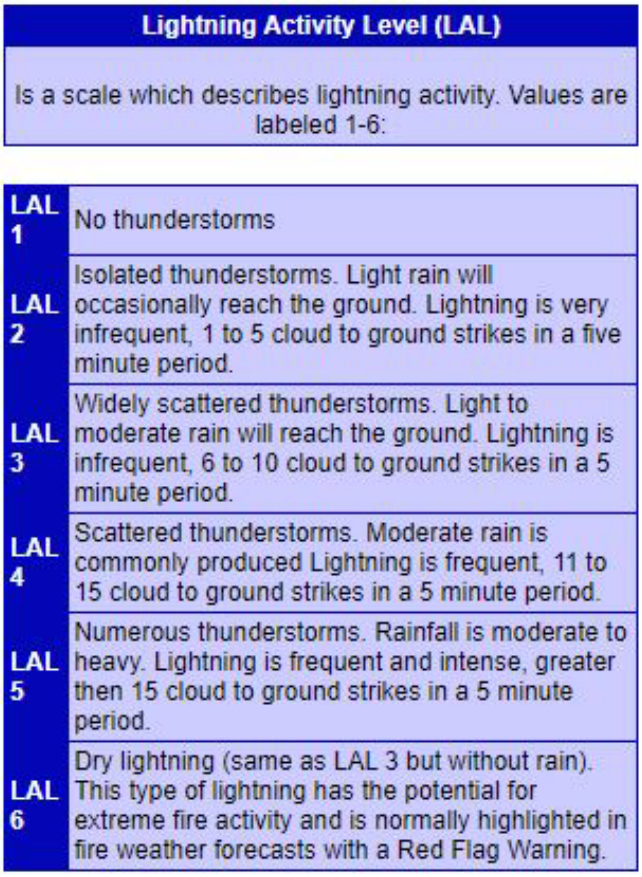
Hazard Extent/Intensity

Oakland County experiences a range of intensities and magnitudes of severe summer storms. On average, around five storms each year are categorized as severe thunderstorms due to their high winds and hail.

Lightning: A lightning flash is created by a transfer of significant charge between two charged objects. Lightning discharges can occur inter-cloud, cloud-to-cloud, cloud-to-air, and cloud-to-ground. Cloud-to-ground (CG) lightning has the greatest risk to society. A CG stroke can kill, destroy equipment, start fires, and disturb power delivery systems.

Lightning is commonly measured using the Lightning Activity Level (LAL), which is a scale that describes the frequency of lightning strikes in a specific area (NWS, 2023).

Figure 4-63. NWS Lightning Activity Level



Lightning Activity Level (LAL)
Is a scale which describes lightning activity. Values are labeled 1-6:

LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater then 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

Microbursts (Damaging Winds)/ High Winds: The Beaufort Wind Scale explains different wind speeds based on how they would affect land conditions and sea conditions (NOAA, 2023).

Table 4-66. Beaufort Wind Scale

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects on Land
0	Less than 1	Calm	Calm, smoke rises vertically
1	1–3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4–6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7–10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11–16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17–21	Fresh Breeze	Small trees in leaf begin to sway
6	22–27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28–33	Near Gale	Whole trees moving, resistance felt walking against wind
8	34–40	Gale	Twigs breaking off trees, generally impedes progress
9	41–47	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	48–55	Storm	Seldom experienced on land, trees broken or uprooted, “considerable structural damage”
11	56–63	Violent Storm	
12	64+	Hurricane	
Source: NOAA, 2023			

Hailstorms:

The TORRO Hailstorm Intensity Scale was developed by Jonathan Webb to measure and categorize hailstorms (TORRO, 2023). It extends from H0 (hard hail, no damage) to H10 (super hailstorm, extensive structural damage, risk of severe/fatal injuries) with its increments of intensity or damage potential related to hail size (distribution and maximum), texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind. The scale could be modified depending on factors such as building materials and types (e.g., whether roofing tiles are predominantly slate, shingle, or concrete). See the scale in the figure below (TORRO, 2023).

Figure 4-64. TORRO Hailstorm Intensity Scale

Scale	Intensity category	Typical hail diameter (mm)*	Probable kinetic energy J m^{-2}	Typical damage impacts
H0	Hard hail	5	0-20	No damage
H1	Potentially damaging	5-15	>20	Slight general damage to plants, crops
H2	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-75		Severe roof damage, risk of serious injuries
H8	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Table 4-67. National Weather Service Hail Descriptions

NATIONAL WEATHER SERVICE HAIL DESCRIPTIONS	
DESCRIPTION	**DIAMETER (INCHES)**
Pea	0.25”
Marble or Mothball	0.5”
Penny or Dime	0.75”
Nickel	0.88”
Quarter	1.0”
Half Dollar	1.25”
Walnut or Ping Pong Ball	1.5”
Golf Ball	1.75”
Hen’s Egg	2.0”
Tennis Ball	2.5”
Baseball	2.75”
Teacup	3.0”
Grapefruit	4.0”

Softball	4.5”
SOURCE: National Weather Service (2023)	

As demonstrated below, the National Weather Service also defines the local threat of severe hail for specified areas based on the likelihood that severe hail will occur combined with the anticipated size or diameter of the largest hailstones (NWS, 2023).

Figure 4-65. Severe Hail Threat Level

Severe Hail Threat Level	Threat Level Descriptions
Extreme	**"An Extreme Threat to Life and Property from Severe Hail."** Within 12 miles of a location, a moderate likelihood or greater (16% probability or greater) of severe hail, with storms capable of baseball to softball sized stones. *See diameter description below.* AND/OR...a high likelihood or greater (26% probability or greater) of severe hail, with storms capable of golf ball to baseball sized hail stones. *See diameter description below.* AND/OR...a very high likelihood (36% or greater) of severe hail, with storms capable of nickel to golf ball sized hail stones. *See diameter description below.*
High	**"A High Threat to Life and Property from Severe Hail."** Within 12 miles of a location, a low likelihood (6% to 15% probability) of severe hail with storms capable of baseball to softball sized stones. *See diameter description below.* AND/OR...a moderate likelihood (16% to 25% probability) of very large hail (golf ball to baseball sized hail stones). *See diameter description below.* AND/OR...a high likelihood (26% to 35% probability) of large hail (nickel to golf ball sized hail stones). *See diameter description below.*
Moderate	**"A Moderate Threat to Life and Property from Severe Hail."** Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of baseball to softball sized stones. *See description below.* AND/OR...a low likelihood (6% to 15% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones. *See description below.* AND/OR...a moderate likelihood (16% to 25% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones. *See diameter description below.*
Low	**"A Low Threat to Life and Property from Severe Hail."** Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of golf ball to baseball sized hail stones. *See diameter description below.* AND/OR...a low likelihood (6% to 15% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones. *See diameter description below.*
Very Low	**" A Very Low Threat to Life and Property from Severe Hail."** Within 12 miles of a location, a very low likelihood (2% to 5% probability) of severe hail, with storms capable of nickel to golf ball sized hail stones. *See diameter description below.* AND/OR...a low likelihood or greater (6% or greater) of small hail (less than 3/4 inch). *See diameter description below.*
Non-Threatening	**" No Discernable Threat to Life and Property from Severe Hail."** Within 12 miles of a location, environmental conditions do not support the occurrence of severe hail.

Note: To be considered severe, hail stones must be at least 3/4 inch in diameter.

Probability and Frequency

Oakland County averaged 21.0 **Thunderstorm Wind** events annually between 2013 and 2023. Figure 4-57 provides an event summary for this timeframe (NOAA, 2023). It is estimated that there is a 100% annual probability of occurrence.

Figure 4-66. Oakland County Thunderstorm Wind Events Summary (2013-2023)

Event Types: Thunderstorm Wind

214 events were reported between 01/01/2013 and 05/04/2023 (3776 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	65
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	1
Number of Days with Event and Property Damage:	17
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Oakland County averaged 0.1 **Lightning** events annually between 2013 and 2023. Figure 4-58 provides an event summary for this timeframe (NOAA, 2023). It should be noted that lightning strikes occur more frequently than what is typically recorded by NOAA. It is estimated that there is a 100% annual probability of occurrence even though NOAA records fewer events per year.

Figure 4-67. Oakland County Lightning Events Summary (2013-2023)

Search Results for Oakland County, Michigan

Event Types: Lightning

1 events were reported between 01/01/2013 and 05/04/2023 (3776 days)

Summary Info:

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

Oakland County averaged 1.1 **Hailstorm** events annually between 2013 and 2023. Figure 4-59 provides an event summary for this timeframe (NOAA, 2023). It is estimated that there is a 100% annual probability of occurrence.

Figure 4-68. Oakland County Hailstorm Events Summary (2013-2023)

Search Results for Oakland County, Michigan

Event Types: Hail

41 events were reported between 01/01/2013 and 05/04/2023 (3776 days)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	18
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	1
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	1

Oakland County averaged 1.1 **Microburst/High Wind** events annually between 2013 and 2023. Figure 4-60 provides an event summary for this timeframe. It is estimated that there is a 100% annual probability of occurrence.

Figure 4-69. Oakland County Microburts/High Wind Events Summary (2013-2023)

Search Results for Oakland County, Michigan

Event Types: High Wind

Oakland county contains the following zones:
Oakland

11 events were reported between 01/01/2013 and 05/04/2023 (3776 days)

Summary Info:

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

Past Events

Thunderstorm Wind:

As Figure 4-57 noted, Oakland County recorded 214 Thunderstorm Wind events between 2013 and 2023. During this time, there was one injury and no deaths. NOAA narrative from select incidents during this timeframe (resulting in injury/death) are as follows:

- **2019:** A few severe thunderstorms developed, producing isolated wind damage. A tree fell onto the top of a truck, resulting in a minor injury to the driver.

Lightning:

As Figure 4-58 noted, Oakland County recorded one Lightning event between 2013 and 2023. Lightning strikes occur more frequently than what is noted by NOAA. NOAA's narrative from the incident is as follows:

- **2021:** Lightning struck a tree and transferred to a parked car. A fire was started, and the exit energy created a hole in the ground by one of the wheels. This incident caused approximately $5,000 of property damage.

In August of 2020, fires were reported in Commerce Township, Rochester Hills and Bloomfield Townships with lightning being the likely cause. On August 18, 2019, an apartment fire in Rochester Hills was caused by a lightning strike. Another facility in Bloomfield Hills was reportedly struck by lightning in August of 2023 causing a garage to burn.

Hailstorms:

As Figure 4-59 noted, Oakland County recorded 41 Hailstorm events between 2013 and 2023. NOAA's narrative of a significant incident causing property damage is as follows:

- **2014:** A powerful upper-level low-pressure system dropped southward into the Great Lakes on Sunday, July 27, sparking a good deal of severe thunderstorms in the warm, moist, and unstable air in advance of the system. Between 2 p.m. and 8 p.m., severe weather affected nearly all of southeast Michigan. The initial storm that affected portions of Midland and Bay counties from around 2:15 to 3:15 p.m. was a prolific hail producer, with hail up to 3 diameters (greater than baseball size) recorded near Midland. Later, another powerful storm moved across Oakland County between 4:30 and 5:15 pm, dropping hail up to 2.50 in diameter (tennis ball size) near the Highland/White Lake area, with wind damage reported over central and eastern portions of the county. The storms also produced heavy rainfall, with a 1-2” swath recorded over southern Oakland County. Wyandotte, in south Wayne County, picked up 2.67 in 4 hours. In addition, a mobile home park was damaged, with 80 percent of the homes suffering broken windows. Total damage across south Michigan was estimated to be 100 million dollars from the storm.

Microbursts/High Winds:

Figure 4-60 noted that Oakland County recorded 11 Microburst/High Wind events between 2013 and 2023. During this time, there was one injury and one death. NOAA narrative from incidents resulting in injury/death and/or property/crop damages are as follows:

- **2021:** An intense low-pressure system and attendant cold front tracked across the central Great Lakes on December 11th. Widespread 50-60 mph gusts were observed, with isolated higher gusts up to 64 mph (measured at both Harbor Beach and Detroit Metro Airport). Trees, tree limbs, and power lines were reported down across Southeast Michigan, with at least 150,000 electric customers without power at the peak of the wind event—property damage estimated at $600,000.

- **2021:** A well-organized line of strong to severe thunderstorms developed early afternoon on Tuesday, September 7th, along and ahead of an advancing cold front. Most of the damage was observed north of I-69 in cities such as Midland and Saginaw, where extensive tree damage, power outages, and one hail were observed; however, less widespread reports were received south of the I-69 corridor. The line of storms farther south was followed by a swath of high winds, where sustained winds (not associated with thunderstorms) were observed to be 40-50 mph, with gusts up to 60 mph. Between the severe thunderstorms and high winds, approximately 150,000 customers lost power. As a result, scattered power outages occurred from downed tree limbs and wires. A fire station in West Bloomfield measured a 54 mph wind gust—property damage estimated at $25,000.

- **2020:** Strong low pressure tracking through the northern Great Lakes produced long strong winds to southeast Michigan late in the morning of the 15th through the afternoon and into the evening. Wind gusts of 40-60 mph were common, with even isolated reports of 65 mph winds enhanced by thunderstorms and heavy showers. As a result, over 200,000 customers lost power from downed tree limbs and wires. Property damage is estimated at $1,000.

- **2019:** A low-pressure system quickly intensified over the weekend of February 23-24th as it crossed the Great Lakes region. This system brought blizzard warnings to western portions of the Great Lakes and high regional winds. A well-mixed boundary layer led to high winds over the region, with gusts around 60 mph range. Widespread downed tree limbs with sporadic structural damage were reported. One such report was roof damage at Adrian College. In addition, downed power lines led to close to 200,000 customers without power across southeast Michigan, with some outages lasting into Monday. Here are some of the higher wind gusts reported: Saginaw... 61 mph Detroit... 61 mph Pontiac... 56 mph Flint... 55 mph Ann Arbor... 55 mph; Adrian... 55 mph; Lapeer... 53 mph—property damage estimated at $1 million.

- **2018:** An intense low-pressure system tracked through northern Lower Michigan, swinging a strong cold front through southeast Michigan early in the afternoon. Sustained winds ranged between 30 - 40 mph, with frequent gusts in the 45 to 60 mph range, with scattered thunderstorms that developed to enhanced winds near 70 MPH. Downed large trees, branches, telephones, and power lines were reported across all counties in Southeast Michigan, with around 230,000 customers without power during the peak. In Independence Township, a large tree fell onto a car, killing the 36-year-old man inside. A postal employee in South Lyon was also seriously hurt when a tree fell on him. A semi was also blown over in the strong winds on US 23, blocking all southbound lanes—property damage for this incident was estimated at $5 million.

- **2017:** A non-thunderstorm event occurred over the state on Wednesday, March 8, 2017, as high winds brought wind gusts over 60 mph! The high winds took out power lines and trees, along with numerous reports of structural damage to buildings. There were also reports of brush fires, and tractor-trailers flipped over around the area. Due to the extensive damage, many areas lacked power for several days. Approximately 800,000 DTE customers and about 300,000 Consumers Energy customers were affected. The highest wind gust reported across Southeast Michigan was 68 mph at both Saginaw and Detroit Metro Airport—property damage for this incident was estimated at $35 million.

- **2016:** Strong southwest winds of 50 to 60 mph brought down trees...tree limbs...and power lines...mainly along the M-59 corridor and I-94 corridors of Southeast Michigan. DTE reported 117,000 customers were affected during the peak early Friday evening, with 75,000 customers remaining without power into Saturday the next day—property damage for this incident was estimated at $10 million.

- **2014:** High winds occurred across Southeast Michigan on November 24. These winds occurred as a powerful and deepening low-pressure system moved from near the Straits of Mackinac to Quebec, dragging a strong cold front through Lower Michigan. Peak winds gusted between 55-65 mph over Metro Detroit and points south, with 45-58 mph gusts occurring to the north. Numerous downed trees and power lines were reported, which led to power outages reaching close to 200,000 at the peak of the wind event—property damage for this incident was estimated at $250,000.

- **2014:** A strong low-level jet within the warm sector allowed southwest winds to gust between 55 and 61 mph across much of Metro Detroit during the morning hours. Numerous trees, fences, carports, and power lines were reported blown down—property damage for this incident was estimated at $50,000.

- **2013:** A powerful low-pressure system strengthened and tracked northeast from the western Great Lakes towards James Bay during the afternoon of November 17th through the overnight hours. Southerly winds out ahead of the cold front allowed

temperatures to soar into the lower to middle 60s during the afternoon hours across southeast Michigan. A line of thunderstorms developed with the cold front that swept through the area during the evening hours. Several storms produced severe wind gusts and damage as they moved through the area. Behind the cold front, gradient winds gusted to 55 to 65 mph during the evening and overnight hours, producing additional damage across southeast Michigan. Widespread trees and power lines downed by the winds led to over 400,000 homes and businesses losing power—property damage for this incident estimated at $3 million.

- **2013:** An intense Arctic Front swept through southeast Michigan around Midnight of January 19th, with westerly winds gusting around 60 mph across much of the area during the early morning hours of January 20th. Dozens of trees and power lines were downed across individual counties, leading to power outages for over 120,000 DTE customers during the peak of the winds—property damage for this incident was estimated at $1.5 million.

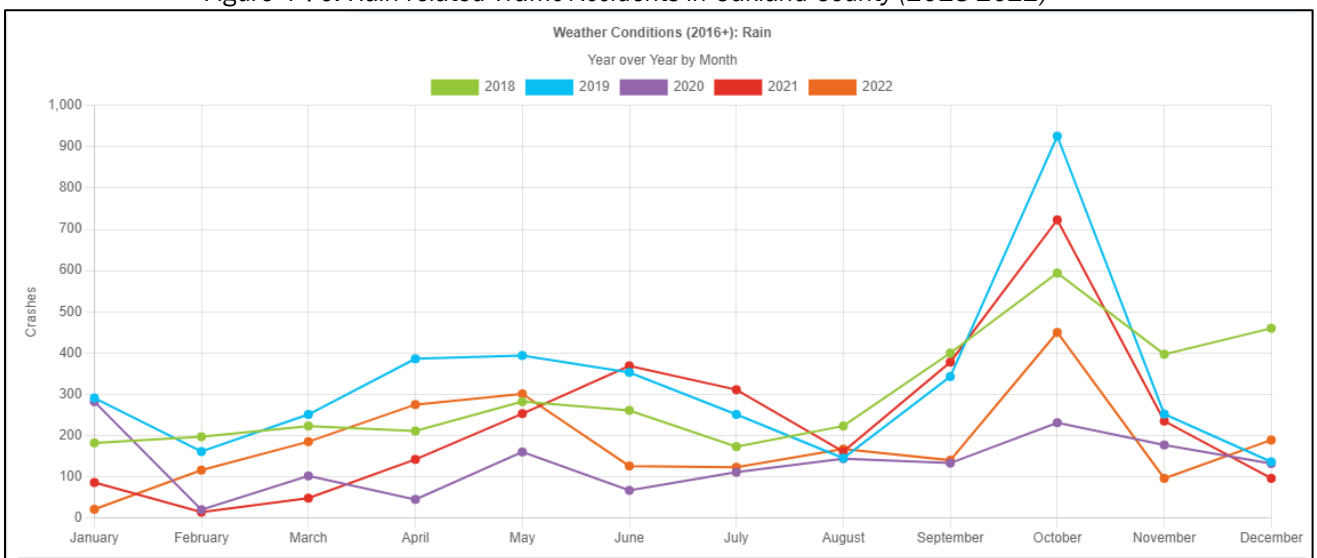
Vulnerability and Impacts

All assets located in Oakland County can be considered at risk from severe summer storms. This includes 100 percent of the county's population and all buildings and infrastructure.

Life Safety and Public Health: Severe summer storms can significantly impact life safety and public health. First, lightning strikes are a significant hazard during thunderstorms and can cause severe injury or even death. People outside during thunderstorms are at risk of being struck by lightning, which can result in burns, cardiac arrest, and other life-threatening injuries. Next, thunderstorms can cause flash flooding, which can also be deadly. Flash floods can occur quickly and without warning and trap people in their homes or vehicles, leading to drowning and other injuries. Thunderstorms can also produce high winds that can cause damage to buildings, vehicles, and other structures. Finally, flying debris and falling trees can significantly harm people outside during a storm.

Hailstones can vary in size from small pellets to large chunks of ice, and they can cause injury to people and animals caught outside during a storm. This factor poses risks to life safety. People injured by hailstones may require medical attention. In addition, hailstones can cause cuts, bruises, and other injuries, mainly if they are large or accompanied by high winds.

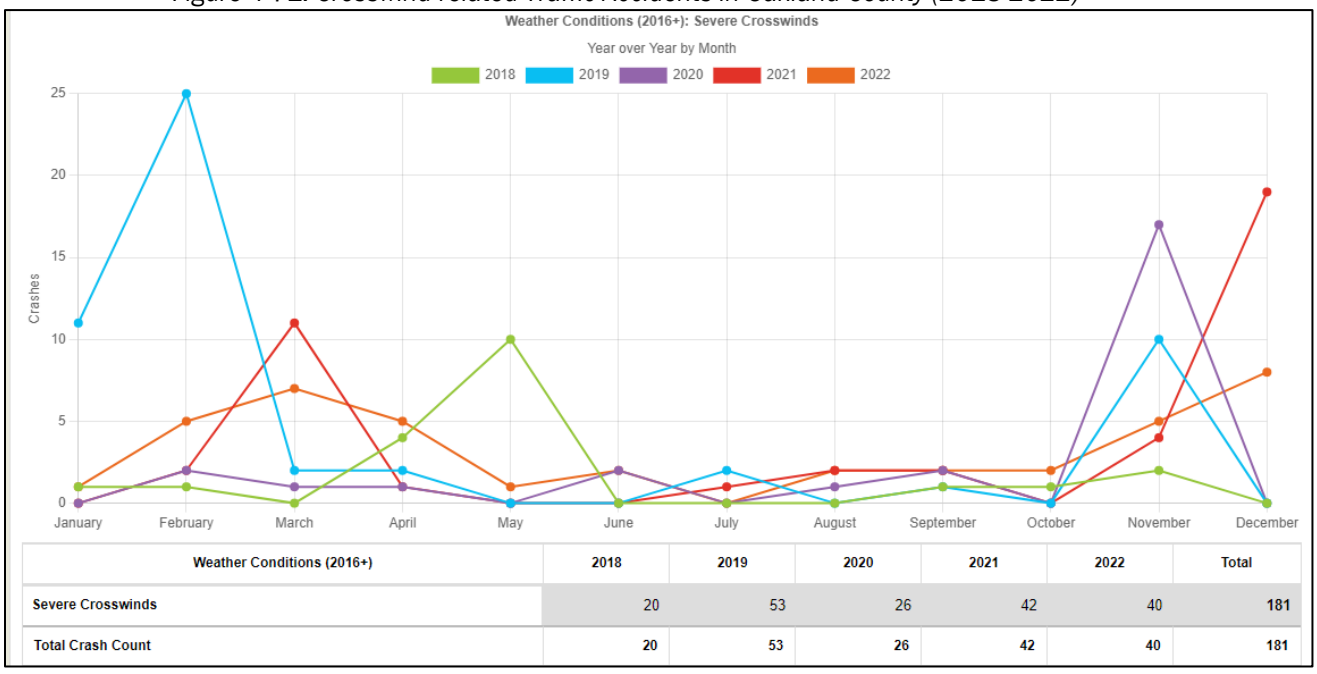
Figure 4-70. Rain-related Traffic Accidents in Oakland County (2018-2022)



Weather Conditions (2016+)	2018	2019	2020	2021	2022	Total
Rain	3,603	3,889	1,604	2,816	2,189	14,101
Total Crash Count	3,603	3,889	1,604	2,816	2,189	14,101

Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

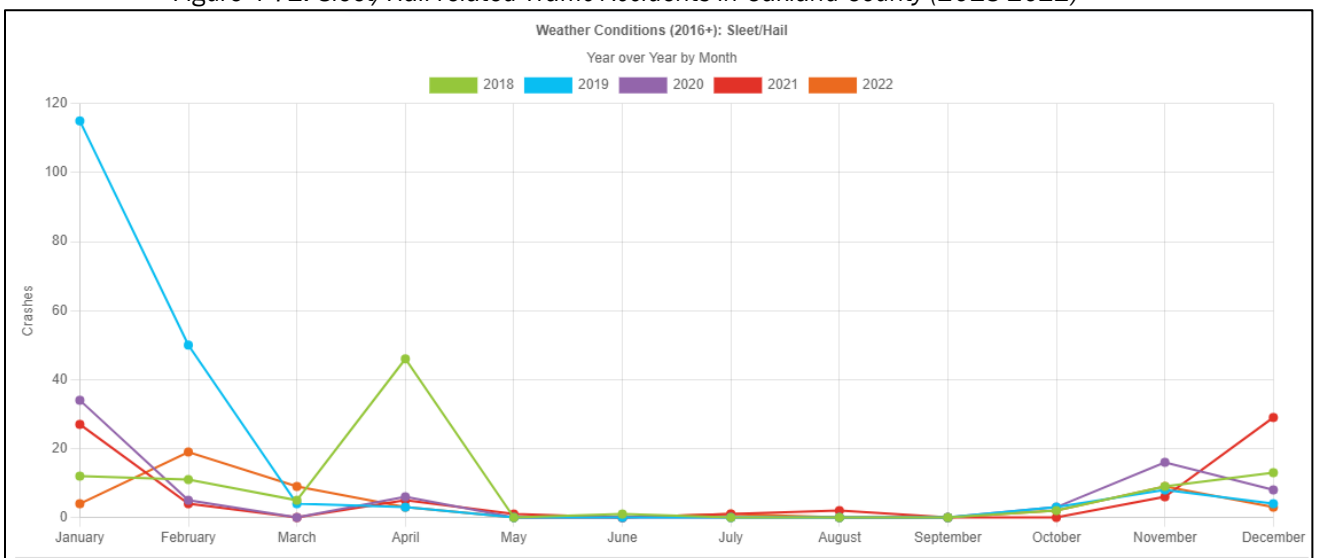
Figure 4-71. Crosswind-related Traffic Accidents in Oakland County (2018-2022)



Weather Conditions (2016+)	2018	2019	2020	2021	2022	Total
Severe Crosswinds	20	53	26	42	40	181
Total Crash Count	20	53	26	42	40	181

Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

Figure 4-72. Sleet/Hail-related Traffic Accidents in Oakland County (2018-2022)



Weather Conditions (2016+)	2018	2019	2020	2021	2022	Total
Sleet/Hail	99	187	72	75	50	483
Total Crash Count	99	187	72	75	50	483

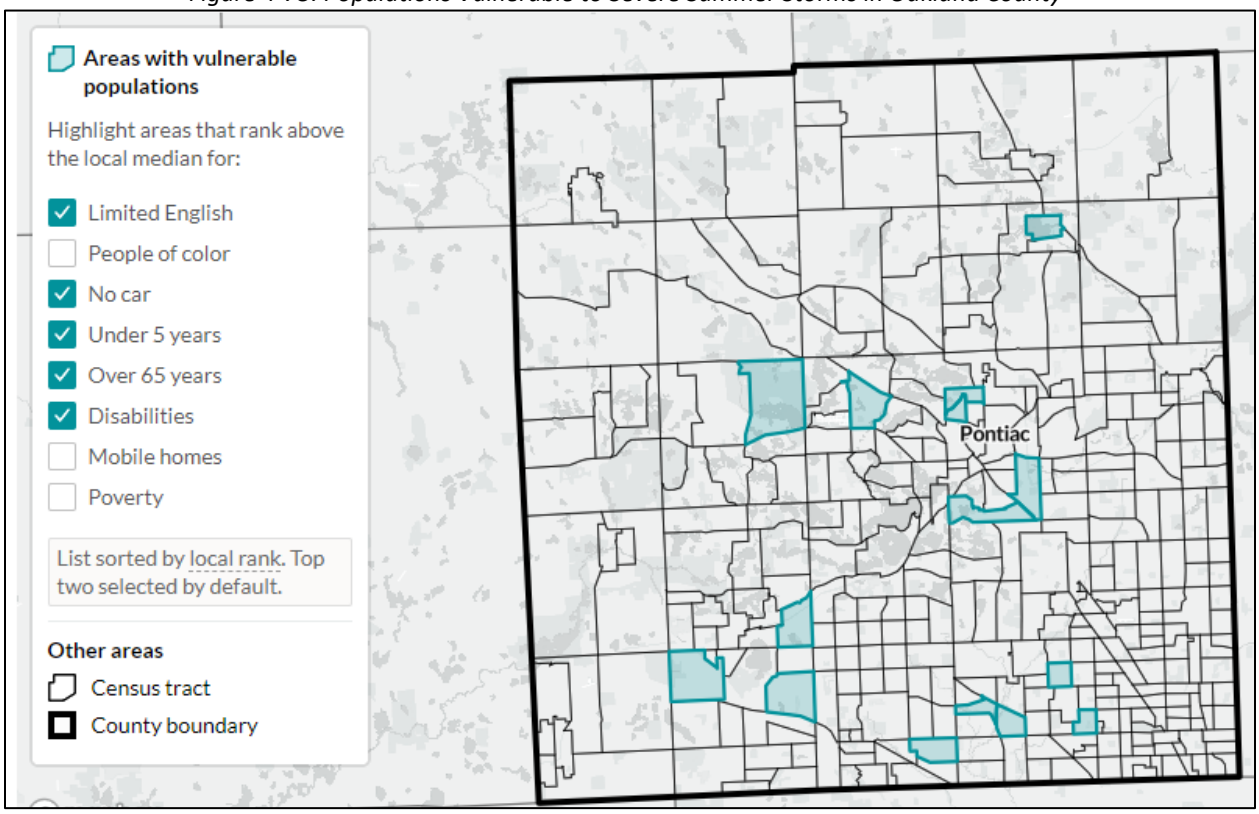
Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

Property Damage and Critical Infrastructure: Severe summer storms can significantly impact property and critical infrastructure. Potential effects of different weather phenomena include:

- **Thunderstorms**: Thunderstorms can cause flooding, power outages, and damage to buildings, vehicles, and other infrastructure. The strong winds associated with thunderstorms can uproot trees and cause damage to roofs and other structures. Additionally, lightning strikes can damage electrical equipment and start fires, threatening property and public safety.
- **Hail**: Hail can cause significant damage to crops, buildings, and vehicles. Large hailstones can break windows and dent or puncture metal surfaces, resulting in costly repairs and potential safety hazards.
- **Lightning**: Lightning strikes can cause damage to electrical equipment, including power lines and transformers. This can lead to power outages and disrupt communication and transportation systems, impacting public safety and economic activity.
- **High winds**: High winds can cause significant damage to property and infrastructure, including knocking down trees and power lines, damaging roofs, and other structures, and causing debris to fly around and potentially harm people and property.

Economy: No data exists demonstrating the economic impact of past severe summer storm events on Oakland County.

Figure 4-73. Populations Vulnerable to Severe Summer Storms in Oakland County



Source: U.S. Census Bureau, American Community Survey

Changes in Development and Impact of Future Development: Changes in development and future development are not anticipated to increase the probability, magnitude, or vulnerability to this hazard.

Effects of Climate Change on Severity of Impacts: climate change is expected to impact summer storms in various ways, resulting in potential impacts such as increased frequency and intensity of thunderstorms, changes in lightning patterns, larger and more frequent hailstorms, and more frequent and intense high winds. Warmer temperatures can result in a rise in the amount of moisture in the atmosphere, leading to more frequent and severe thunderstorms. Additionally, temperature changes can lead to changes in the distribution and frequency of lightning strikes, resulting in areas currently too cool for thunderstorms experiencing lightning strikes. With the stronger updrafts caused by warmer temperatures, hailstones in thunderstorms may become larger and more frequent. Furthermore, climate change may increase high wind events in frequency and intensity (NOAA, 2023).

Understanding that precipitation can impact severe summer storms in many ways, Table 4-46 illustrates 25-year precipitation projections for Oakland County while Table 4-47 shows future climate indicators.

Table 4-68. 25-Year Precipitation Projections for Oakland County

25-YEAR PRECIPITATION PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 13% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.3 more days of heavy precipitation per year (from 2.5 days to 2.8 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 7% increase in heavy precipitation within 25 years.
By 2048, Oakland County is expected to experience 0.17 more days of heavy precipitation per year (from 2.44 days to 2.61 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-69. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Temperature Thresholds							
Annual Days With Maximum Temperature >90°	**6 days**	**19 days**	**21 days**	**46 days**	**34 days**	**35 days**	**64 days**
	6-10	9-35	11-35	14-49	16-54	17-67	30-95
Annual Days With Maximum Temperature >95°	**1 day**	**4 days**	**6 days**	**8 days**	**12 days**	**13 days**	**33 days**
	1-1	1-13	1-17	2-24	4-32	3-38	7-70
Annual Days With Maximum Temperature >100°	**0 days**	**1 day**	**1 day**	**1 day**	**3 days**	**3 days**	**13 days**
	0-0	0-7	0-8	0-16	1-24	1-16	2-69
Annual Days With Maximum Temperature >105°	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**4 days**
	0-0	0-1	0-0	0-1	0-3	0-2	0-29
Annual Temperature							
Annual Single Highest Temperature °F	**94°F**	**98°F**	**98°F**	**99°F**	**101°F**	**101°F**	**105°F**
	93-95	94-101	95-101	96-104	97-106	97-105	99-114
Annual Highest	**89°F**	**92°F**	**93°F**	**94°F**	**95°F**	**96°F**	**100°F**

Maximum Temperature Averaged Over a 5-Day Period	88-90	89-96	90-96	91-99	92-101	92-101	94-109
Cooling Degree Days (CDD)	**654 degree-days**	**938 degree-days**	**980 degree-days**	**1,094 degree-days**	**1,247 degree-days**	**1,269 degree-days**	**1,866 degree-days**
	607-716	749-1,237	776-1,146	835-1,474	963-1,548	921-1,819	1,247-2,590
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates

Table 4-70. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR HAIL EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
3.0 events per year	0.02	$231,902	$898,862	$140	$1,130,904	90.9	Relatively Moderate
OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR STRONG WIND EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
5.7 events per year	0.24	$2,770,820	$7,630,098	$380	$10,401,297	90.9	Relatively Moderate
OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR LIGHTNING EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
36.6 events per year	0.07	$820,116	$211,203	N/A	$1,031,319	95.4	Relatively High
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2023)							

FEMA Hazard-Specific Risk Index Table

Table 4-71. Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – HAIL EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
88.9 / 100	Very Low	Very High
OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – STRONG WIND EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
99.3 / 100	Very Low	Very High
OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – LIGHTNING EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
94.2 / 100	Very Low	Very High

Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*

Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*

Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2023)

4.12 Severe Winter Storms

Hazard Description

This plan considers severe winter storms as blizzards, extreme cold, and winter storm events.

Blizzard:

A blizzard is a winter storm with sustained winds or frequent gusts of 35 mph or higher, accompanied by considerable falling and/or blowing snow that frequently reduces visibility to less than a quarter mile, lasting at least three hours (NOAA, 2023).

Extreme Cold:

Extreme cold is a temperature significantly lower than the average for a particular location at a specific time of year. This can vary widely depending on the location and time of year. Still, extreme cold is generally defined as temperatures well below freezing, often accompanied by strong winds, that can result in dangerous and potentially life-threatening conditions, such as frostbite and hypothermia (NOAA, 2023).

Winter Storm:

A winter storm combines heavy snow, freezing rain, sleet, or strong winds that can produce hazardous and dangerous weather conditions, such as reduced visibility, power outages, transportation disruptions, and damage to infrastructure and property (NOAA, 2023).

Hazard Location

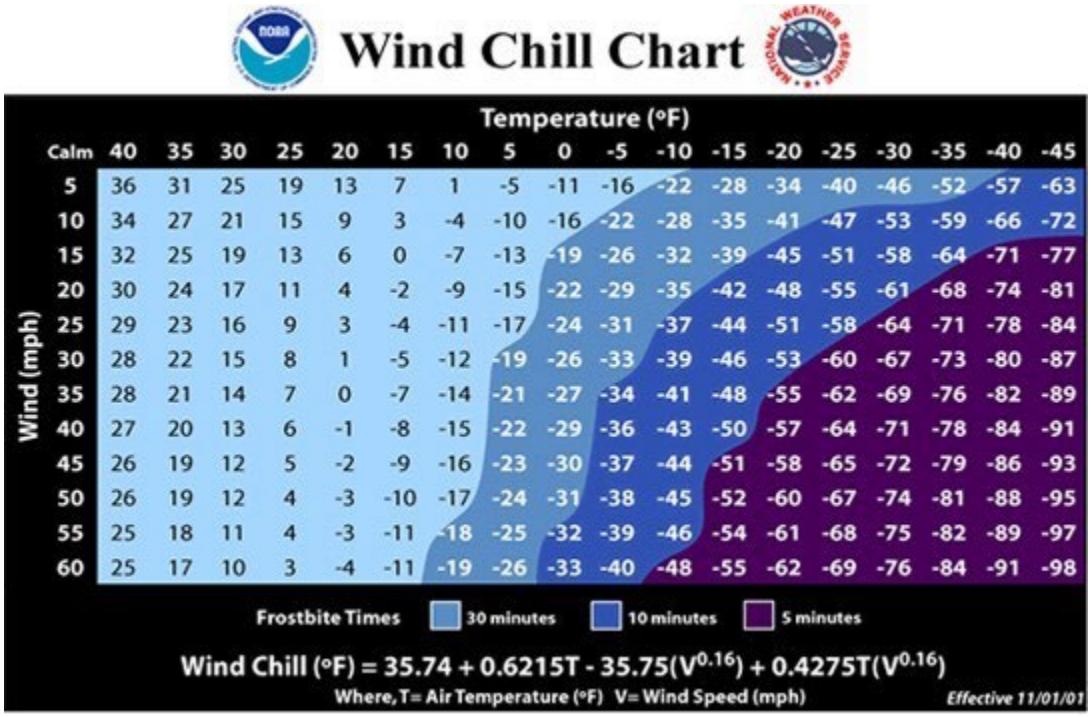
Severe winter storms could occur anywhere in Oakland County.

Hazard Extent/Intensity

The magnitude or severity of a severe winter storm depends on several factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day and week (e.g., weekday versus weekend), and time of season.

Extreme Cold: The NWS has developed a formula for calculating wind chill based on temperature and wind speed and issues wind chill advisories in this region when the wind chill temperature is predicted to be -10°F or less with winds of 10 mph or higher for one hour or more. Wind chill warnings are issued when wind chill temperature will be -20°F or less with winds of 10 mph or higher for one hour or more.

Figure 4-74. National Weather Service Wind Chill Chart



Winter Storm: The magnitude or severity of a severe winter storm depends on several factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day and week (e.g., weekday versus weekend), and time of season. Typically, the NOAA produces the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population.

Figure 4-75. NOAA National Center for Environmental Information Regional Snowfall Index (RSI)

Category	RSI Value	Description
1	1–3	Notable
2	3–6	Significant
3	6–10	Major
4	10–18	Crippling
5	18.0+	Extreme

The National Weather Service uses the following terms when talking about winter weather threat to the public:

- **Winter Weather Advisory**: Snow, blowing snow, ice and/or sleet is expected to produce potentially dangerous travel conditions within the next 12 to 36 hours.
- **Winter Storm Watch**: Issued for potentially significant winter weather, including heavy snow ice, sleet, and/or blowing snow within the next day or two. Now is the time to prepare!
- **Winter Storm Warning**: Indicates heavy snow, blowing snow, sleet or a combination of winter weather hazards are expected to cause a significant impact to life or property. Stay indoors and adjust travel plans.
- **Snow Squall Warning**: Sudden whiteout conditions with near zero visibility and flash freezing of road surfaces resulting in potentially life threatening conditions for travelers.
- **Blizzard Warning**: Strong winds (35 mph or greater) will produce blinding snow and near zero visibility, resulting in potentially life-threatening conditions – particularly for travelers. Blizzards can occur with minimal accumulations of snow.
- **Ice Storm Warning**: Heavy accumulations of ice are expected to cause a significant impact to life or property, resulting in hazardous travel conditions, tree damage and extended power outages.

Ice Storms: The Sperry–Piltz Ice Accumulation Index, or SPIA® Index, is a forward-looking, ice accumulation and ice damage prediction index that uses an algorithm of researched parameters that, when combined with National Weather Service forecast data, predicts the projected footprint, total ice accumulation, and resulting potential damage from approaching ice storms. It is a tool to be used for risk management and/or winter weather preparedness.

The SPIA® Index is to ice storms what the Enhanced Fujita Scale is to tornadoes, and what the Saffir–Simpson Scale is to hurricanes. Previous to this hazard scale development, no such 'forward-looking' ice accumulation and ice damage index had ever been utilized to predict – days in advance – the potential damage to overhead utility systems, along with outage duration possibilities, from freezing rain and/or ice storm events.

Figure 4-76. The Sperry–Piltz Ice Accumulation Index, or SPIA® Index

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

Probability and Frequency

Blizzards:

Oakland County did not record a significant blizzard event between 2013-2023; however, the probability of future occurrence should be expected. It is estimated that there is a 5% annual probability of occurrence.

Extreme Cold:

Oakland County averaged 0.20 extreme cold/wind chill events annually between 2013-2023. It is estimated that there is a 30% annual probability of occurrence based on data from 1996 to 2023.

Winter Storms:

Oakland County averaged 0.40 severe winter storm events annually between 2013-2023. It is estimated that there is an 80% annual probability of occurrence based on data from 1996 to 2023.

Past Events

Blizzards:

Oakland County did not record a significant blizzard event between 2013-2023.

Extreme Cold:

Table 4-72. Extreme Cold Events in Oakland County, Michigan (2013-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**0.00K**	**0.00K**
OAKLAND (ZONE)	OAKLAND	MI	02/14/2015	21:00	EST-5	Extreme Cold/Wind Chill	0	0	0	0.00K
OAKLAND (ZONE)	OAKLAND	MI	02/19/2015	00:00	EST-5	Extreme Cold/Wind Chill	0	0	0	0.00K
Totals:							**0**	**0**	**0.00K**	**0.00K**

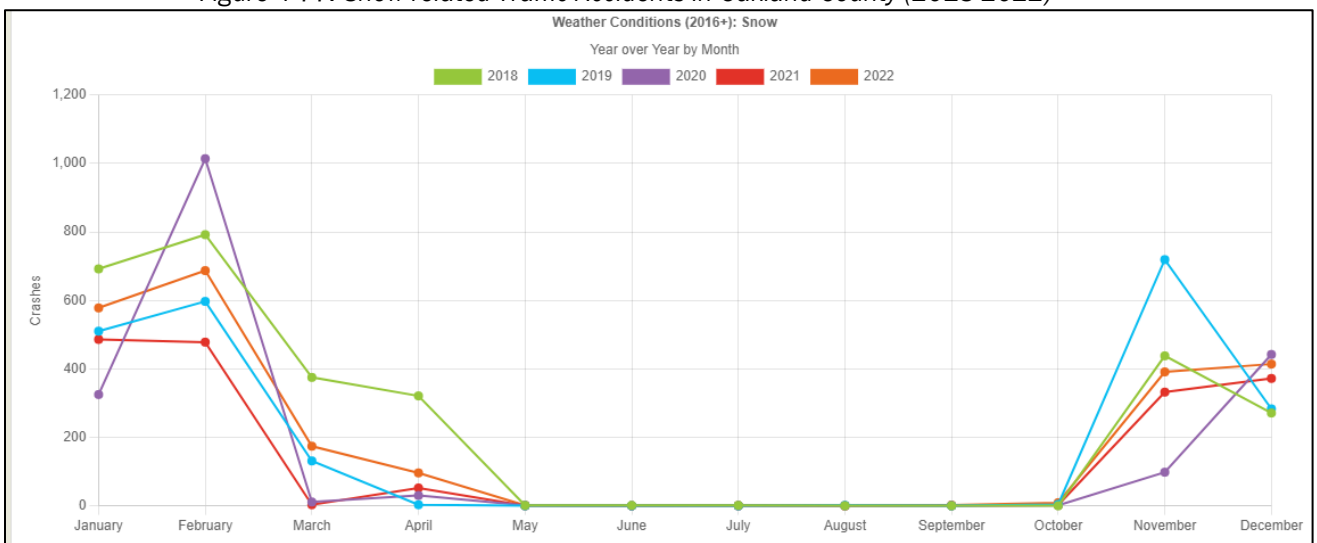
Winter Storms:

Table 4-73. Winter Storm Events in Oakland County, Michigan (2013-2023)

Location	County	State	Date	Time	T.Z.	Type	Dth	Inj	PrD	CrD
Totals:							**0**	**0**	**6.00M**	**0.00K**
OAKLAND (ZONE)	OAKLAND	MI	03/12/2014	00:00	EST-5	Winter Storm	0	0	0.00K	0.00K
OAKLAND (ZONE)	OAKLAND	MI	03/01/2018	12:00	EST-5	Winter Storm	0	0	0.00K	0.00K
OAKLAND (ZONE)	OAKLAND	MI	04/14/2018	00:00	EST-5	Winter Storm	0	0	6.000M	0.00K
OAKLAND (ZONE)	OAKLAND	MI	12/23/2022	02:00	EST-5	Winter Storm	0	0	0.00K	0.00K
Totals:							**0**	**0**	**6.00M**	**0.00K**

2018: An extensive, complex low-pressure system impacted the Great Lakes region. Southeast Michigan saw heavy rain, snow, sleet, and freezing rain that began on Friday (April 13) and lasted through Sunday (April 15). This system brought two main periods of precipitation, with a short break in between on Saturday. Total rainfall of 1 to 2 inches was typical in many locations in Southeast Michigan, with 2-3 of snow and sleet north of I-69 and about 1/4 to 1/2 of ice from freezing rain between the I-94 and I-96 corridors. Widespread tree damage and power outages from the snow, sleet, and freezing rain occurred. DTE and Consumers Energy reported power outages for nearly 500,000 customers due to the event. Intense and persistent northeast winds also lead to lake shore flooding around Saginaw Bay and on the Lake Erie shoreline. Wind gusts at or above 50 MPH were reported in Bay County on the 14th—property damage for this incident was estimated at $6 million.

Figure 4-77. Snow-related Traffic Accidents in Oakland County (2018-2022)



Weather Conditions (2016+)	2018	2019	2020	2021	2022	Total
Snow	2,892	2,248	1,922	1,725	2,353	**11,140**
Blowing Snow	318	311	189	177	404	**1,399**
Total Crash Count	**3,210**	**2,559**	**2,111**	**1,902**	**2,757**	**12,539**

Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

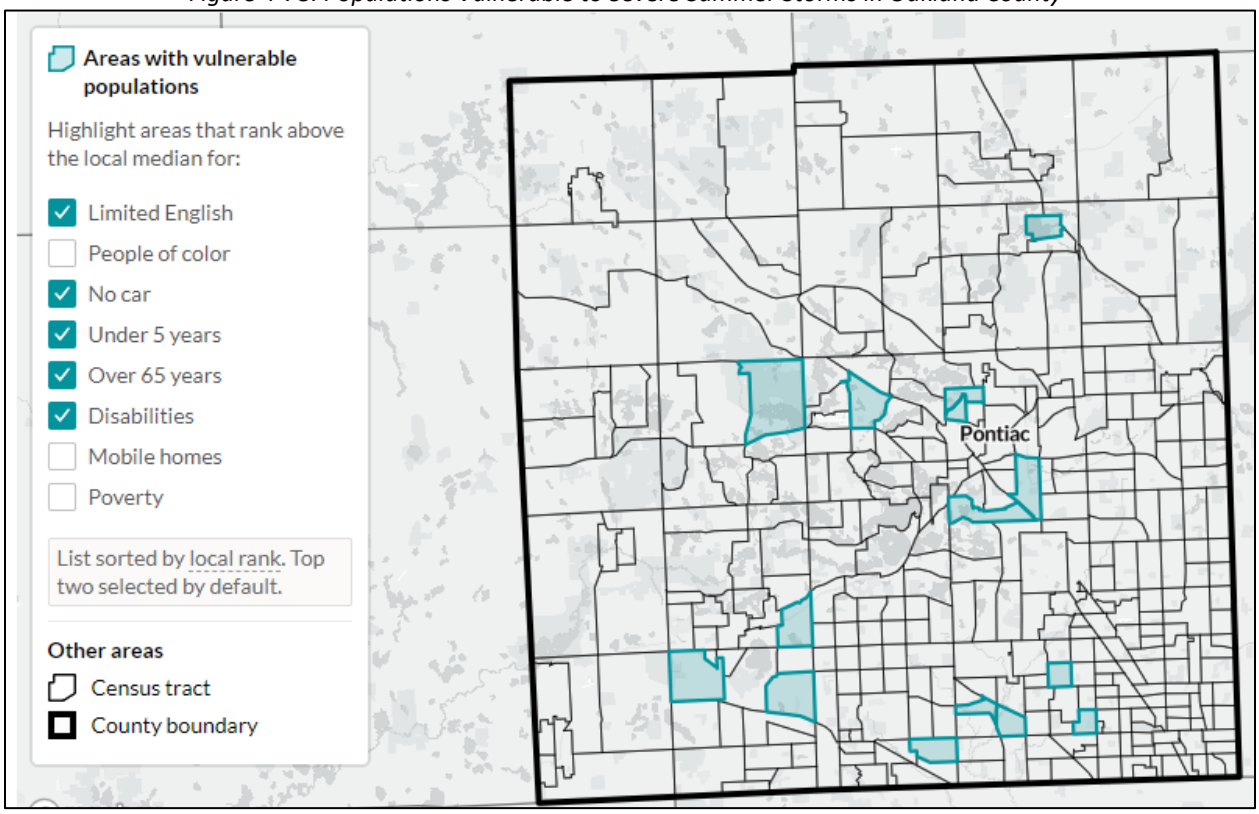
Vulnerability and Impacts

All of Oakland County is vulnerable to severe winter storms. Severe winter storms can lead to power outages, downed trees and branches, hypothermia, injuries, and loss of life. In addition, severe weather storms can immobilize large areas, with rural areas particularly impacted by impassable roads.

Life Safety and Health: Blizzards and winter storms can threaten life safety and public health significantly. Extreme cold and wind chill can lead to hypothermia and frostbite, which can be life-threatening if left untreated. Additionally, winter storms can create slippery and icy conditions, increasing the risk of slips, trips, and falls, resulting in fractures and head trauma. The hazardous driving conditions caused by heavy snowfall and icy roads increase the risk of car accidents, which can lead to injuries and fatalities. Using fuel-burning appliances such as heaters and generators during power outages can result in carbon monoxide poisoning, which can be fatal. Winter storms can also cause power outages, leading to food spoilage, loss of heat, and other hazards. Emergency services can also be disrupted during winter storms, making it difficult for first responders to reach those in need and for hospitals to provide care.

Furthermore, winter storms can exacerbate health conditions such as asthma and heart disease and increase the risk of respiratory infections.

Figure 4-78. Populations Vulnerable to Severe Summer Storms in Oakland County



Source: U.S. Census Bureau, American Community Survey

Property Damage and Critical Infrastructure: Blizzards and winter storms can impact property damage and critical infrastructure. Heavy snow and ice accumulation can cause significant damage to roofs and buildings, leading to potential collapses. Additionally, snow and ice can weigh down trees, causing them to break or fall and potentially damaging power lines and other infrastructure. This can cause power outages, leaving people without electricity for extended periods.

Winter storms can also cause transportation disruptions, such as flight cancellations, highway closures, and train delays, potentially leading to economic impacts. In addition, extreme cold temperatures can cause pipes to freeze and burst, leading to water damage and potentially contaminating water supplies. Lastly, snow and ice can damage communication infrastructure such as cell towers and fiber-optic cables, potentially disrupting communication systems. These impacts on property damage and critical infrastructure can also have long-lasting effects on individuals and communities.

Economy: While no data exists demonstrating the economic impact of past severe winter storms on Oakland County, loss of power means businesses and manufacturing concerns must close. Loss of access due to snow or ice-covered roads has a similar effect. There are also impacts when people need help getting to work, school, or the store.

Changes in Development and Impact of Future Development: Changes in development and future development are not anticipated to increase the probability, magnitude, or vulnerability to this hazard.

Effects of Climate Change on Severity of Impacts: According to the Environmental Defense Fund (EDF), more snowfall during snowstorms is an expected effect of climate change. EDF further explains that a warmer planet evaporates more water into the atmosphere, resulting in more precipitation in heavy snowfall or downpour (Environmental Defense Fund, 2023).

According to GLISA, there are clearer patterns of shorter winter seasons, but more frequent heavy snow events due to changing climate patterns.

Table 4-52 illustrates 25-year precipitation projections for Oakland County, while Table 4-53 illustrates future climate indicators for Oakland County.

Table 4-74. 25-Year Climate Projections for Oakland County

25-YEAR CLIMATE PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 164% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 7 more days that reach above 95°F (from 4 days to 11 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 112% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 4 more days that reach above 95°F (from 4 days to 7 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-75. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Annual Average Total Precipitation	**32”**	**33”**	**33”**	**34”**	**34”**	**34”**	**35”**
	30-33	31-37	30-35	31-38	30-37	30-39	31-40
Days Per Year With Precipitation (Wet Days)	**194 days**	**192 days**	**191 days**	**191 days**	**189 days**	**190 days**	**187 days**
	191-198	179-200	178-198	179-203	172-201	177-202	157-201
Maximum Period of	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**	**12 days**
	11-13	11-13	10-13	10-13	10-13	11-13	10-13

Consecutive Wet Days							
Annual Days With:							
Annual Days With Total Precipitation > 1 inch	**2 days**	**2 days**	**2 days**	**3 days**	**3 days**	**3 days**	**3 days**
	1-2	2-3	2-3	2-4	2-4	2-4	2-6
Annual Days With Total Precipitation > 2 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days With Total Precipitation > 3 inches	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**	**0 days**
	0-0	0-0	0-0	0-0	0-0	0-0	0-0
Annual Days That Exceed 99th Percentile Precipitation	**4 days**	**5 days**	**5 days**	**5 days**	**6 days**	**6 days**	**7 days**
	4-5	5-6	5-6	5-6	5-6	5-6	6-8
Days With Maximum Temperature Below 32°F	**49 days**	**36 days**	**35 days**	**31 days**	**27 days**	**25 days**	**13 days**
	45-53	18-47	24-45	13-42	11-38	8-40	1-29
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates

Table 4-76. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR COLD WAVE EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
0.7 events per year	0.37	$4,238,105	$2,413	$104	$4,240,621	99.5	Very High
OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR ICE STORM EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
1.8 events per year	0.01	$93,311	$8,038,094	N/A	$8,131,405	99.8	Very High
OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR WINTER WEATHER EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**

2.9 events per year	0.00	$20,527	$197,160	$86	$217,773	83.4	Relatively High

Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.*
Population: *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.*
Expected Annual Loss *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*

Source: FEMA National Risk Index (2023)

FEMA Hazard-Specific Risk Index Table

Table 4-77 Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – COLD WAVE EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
99.2 / 100	Very Low	Very High
OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – ICE STORM EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
99.8 / 100	Very Low	Very High
OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – WINTER WEATHER EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
79.4 / 100	Very Low	Very High

Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*
Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*
Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2023)

4.13 Subsidence

Hazard Description

Subsidence is depressions, cracks, and sinkholes in the ground surface that can threaten people and property. When there is a collapse or lowering of a land surface, it can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities due to the dissolution of limestone or other soluble materials, such as salt and gypsum, by groundwater. Over time, the dissolution of rock into groundwater can create a void that may be subject to sudden and catastrophic collapse, causing a sinkhole.

Human induced subsidence is caused mainly by groundwater withdrawal, drainage of organic soils, and underground mining. In the U.S., these activities have caused more than 17,000 square miles of surface subsidence, with groundwater withdrawal as the primary culprit.

Subsidence can lead to the sinking of buildings, infrastructure, and land, which can have significant impacts on the environment and communities. For the purposes of the Oakland County plan, both natural and mining-related subsidence risks are included.

In Michigan, the greatest risk of subsidence is associated with underground mining. Mine subsidence is a geologic hazard that can occur with little or no warning. It occurs when the ground surface collapses into underground mine areas. Strain from geological movements, additional surface loading, and vibrations from truck traffic and other industrial machinery can cause the ground above and around old mines to sink and collapse. Industrial or residential developments that are near or above active or abandoned mines are threatened by subsidence due to their proximity to underground cavities. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life.

Hazard Location

More analysis and future updates of this plan should explore the likely locations and impacts of natural subsidence in Oakland County. Although subsidence cannot be entirely discounted, it is not considered a serious threat in Oakland County due to the stable bedrock and distance from susceptible areas. However, there have been a few recent incidents of small-scale sinkholes caused by the aging infrastructure.

The legacy of underground mining can be felt throughout the state, especially in the Upper Peninsula, and not necessarily in Oakland County. Oakland County is not known for significant mining activities, and there are no active mines listed in the county. Oakland County is primarily an urban and suburban area with a focus on residential, commercial, and industrial development rather than mining. However, many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. Unfortunately, records of abandoned mines are often unreliable and sometimes non-existent; it is often difficult to

determine exactly where the mines were located. In some cases, mine locations are not publicly available to prevent people from visiting these locations to reduce potential injuries. Many areas throughout the state may have been developed over abandoned mines and may not be aware of it.

Hazard Extent/Intensity

The specific method used to measure subsidence depends on the type of subsidence being studied and the available data and resources. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) measure the extent and intensity of subsidence, both natural and mining-related, using a variety of methods, including:

- **LiDAR (Light Detection and Ranging) technology**: LiDAR is a remote sensing method that uses lasers to create highly detailed maps of the Earth's surface. LiDAR can be used to create high-resolution digital elevation models (DEMs) that can be used to identify areas of subsidence.
- **GPS (Global Positioning System) surveys**: GPS surveys can be used to measure changes in the elevation of the ground surface over time, which can indicate subsidence.
- **Aerial photography**: Historical aerial photographs can identify areas where the ground surface has subsided over time.
- **Borehole surveys**: Borehole surveys involve drilling holes into the ground and measuring the depth of bedrock or other geological features. These surveys can help identify areas where subsidence has occurred.
- **Geophysical surveys**: Geophysical surveys involve using instruments to measure the physical properties of the subsurface, such as electrical conductivity or magnetic susceptibility. These surveys can help identify areas where subsidence has occurred or is likely to occur.

Probability, Frequency, and Past Events

July 2021: A human-made sinkhole incident was caused by groundwater and soil disturbance during tunnel construction in Oakland County. This incident resulted in the freeway closure of northbound I-75 between I-696 and 12 Mile Road for several days.

More analysis and future updates of this plan should explore the future probability of subsidence in Oakland County. Currently, it is estimated that there is less than a 1% annual probability of occurrence based on limited data.

Vulnerability and Impact

Natural or mining subsidence can cause various vulnerabilities and impacts. Among these, infrastructure damage is a significant concern as subsidence can cause damage to buildings, roads, bridges, and other structures. This is often characterized by cracks in foundations, walls, and floors which can lead to structural problems. Another significant impact of subsidence is on

water quality. Changes in the hydrology of an area can occur due to subsidence, which can affect water quality. For instance, the ground sinking and shifting can disrupt natural drainage patterns and increase the risk of flooding, contaminating surface water and groundwater. Subsidence can also limit land use for certain activities, such as construction or agriculture. Areas with a subsidence history may be designated as high-risk zones and subject to restrictions or regulations, which can further impact land use.

Changes in development and future development are not anticipated to increase the probability, magnitude, or vulnerability to this hazard. The implications of climate change on natural subsidence needs to be further explored for Oakland County.

FEMA NRI Expected Annual Loss Estimates and Hazard-Specific Risk

The FEMA NRI does not assess subsidence.

4.14 Tornado

Hazard Description

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Since wind is invisible, tornadoes are hard to see unless one forms from water droplets, dust, and debris. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be more than one mile wide and 50 miles long. Most tornadoes have wind speeds of 112 mph or less.

Hazard Location

A tornado could occur anywhere in Oakland County.

Hazard Extent/Intensity

The Enhanced Fujita Scale, or the "EF-Scale," measures tornado strength and associated damages. This Enhanced Fujita Scale is illustrated in Table 4-56. The EF-Scale is an update to the earlier Fujita scale published in 1971. It classifies tornadoes in the United States into six intensity categories based on the estimated maximum winds within the wind vortex. The EF-Scale has become the definitive metric for assessing wind speeds within tornadoes based on the damage done to buildings and structures since it was implemented through the National Weather Service in 2007.

Table 4-78. Enhanced Fujita Scale and Associated Damage

EF-Scale Number	Wind Speed (MPH)	Type of Damage Possible
EFO	**65-85**	**Minor damage**: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	**86-110**	**Moderate damage**: Roofs severely stripped; manufactured homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	**111-135**	**Considerable damage**: Roofs torn off well-constructed houses; foundations of frame homes shifted; manufactured homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	**136-165**	**Severe damage**: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.

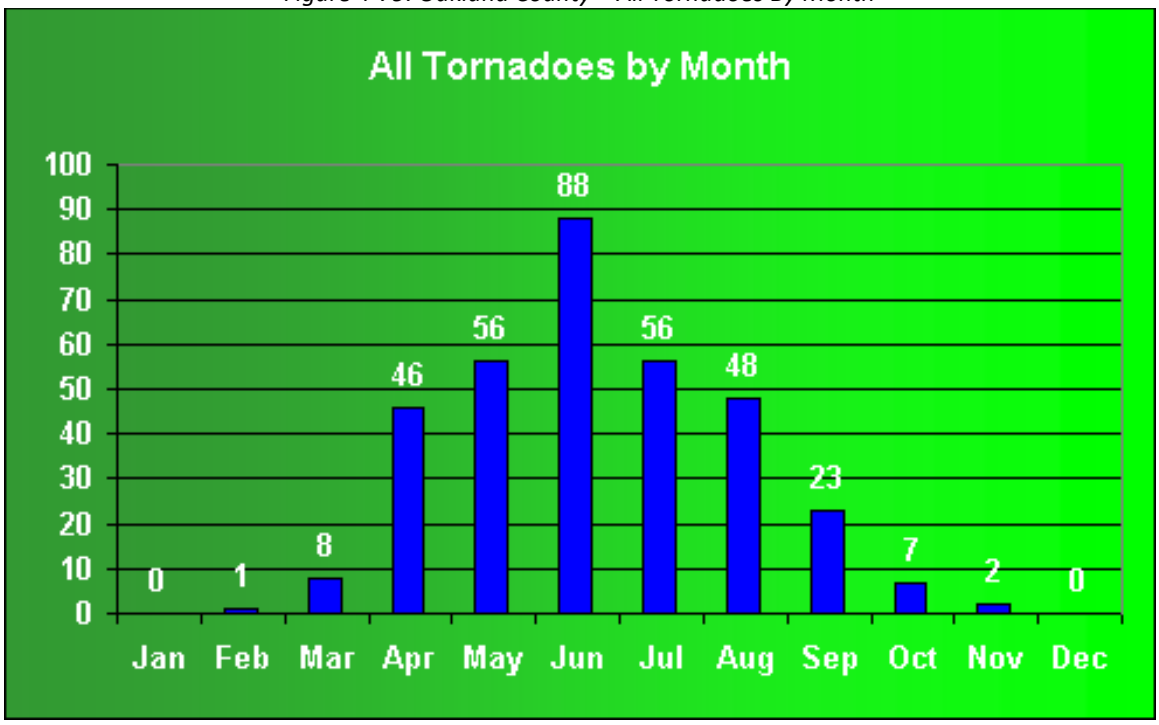
EF4	**166-200**	**Devastating damage**: Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF5	**>200**	**Extreme damage**: Sturdy frame houses leveled off foundations and swept away; automobile-sized missiles fly more than 100 m (300 ft.); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Based on historical and probabilistic models, the most severe and intense tornado was an F4. Given the geographic location and probabilistic models, this would suggest that an EF5 would be possible in Oakland County.

Probability and Frequency

It's important to note that tornadoes can occur at any time and location. Figure 4-70 shows that most tornadoes occur between April and August in Oakland County. In Oakland County, tornadoes have been recorded in every month but January and December (NOAA, 2023). In total, Oakland County has recorded 35 tornadoes from the year 1950 to 2023. It is estimated that there is a 50% annual probability of occurrence.

Figure 4-79. Oakland County – All Tornadoes By Month



Source: National Weather Service (2023)

Past Events

Table 4-57 illustrates tornadic events in Oakland County from 1950 to 2023. During this timeframe, there were 35 events recorded, with 78 injuries and three deaths. It should be noted there is no narrative recorded (within the NOAA database) for any historical event in Table 4-57 causing injury, death, or damage (property or crop) (NOAA, 2023).

Table 4-79. Tornadic Activity in Oakland County, Michigan (1950-2023)

Location	County/Zone	St	Date	Time	T.Z.	Type	Mag	Dth	Inj	PrD	CrD
Totals:								**3**	**78**	**55.215M**	**0.00K**
OAKLAND CO.	OAKLAND	MI	06/08/1953	18:35	CST	Tornado	F3	0	4	2.500M	0.00K
OAKLAND CO.	OAKLAND	MI	07/15/1955	08:00	CST	Tornado	F1	0	0	2.50K	0.00K
OAKLAND CO.	OAKLAND	MI	05/12/1956	17:12	CST	Tornado	F2	0	0	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	05/12/1956	17:12	CST	Tornado	F2	0	0	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	04/27/1957	09:30	CST	Tornado	F0	0	0	2.50K	0.00K
OAKLAND CO.	OAKLAND	MI	07/04/1957	18:55	CST	Tornado	F4	0	2	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	05/08/1964	15:33	CST	Tornado	F2	0	1	25.00K	0.00K
OAKLAND CO.	OAKLAND	MI	08/02/1972	14:23	CST	Tornado	F3	0	0	2.500M	0.00K
OAKLAND CO.	OAKLAND	MI	06/26/1973	15:00	CST	Tornado	F2	0	0	2.50K	0.00K
OAKLAND CO.	OAKLAND	MI	07/14/1974	15:23	CST	Tornado	F1	0	0	25.00K	0.00K
OAKLAND CO.	OAKLAND	MI	04/18/1975	17:42	CST	Tornado	F1	0	2	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	03/20/1976	18:15	CST	Tornado	F4	1	55	25.000M	0.00K
OAKLAND CO.	OAKLAND	MI	05/02/1976	13:30	CST	Tornado	F1	0	0	25.00K	0.00K
OAKLAND CO.	OAKLAND	MI	09/10/1986	17:58	EST	Tornado	F2	0	0	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	09/26/1986	17:45	EST	Tornado	F0	0	0	2.50K	0.00K
OAKLAND CO.	OAKLAND	MI	05/14/1987	16:10	EST	Tornado	F1	0	8	250.00K	0.00K
OAKLAND CO.	OAKLAND	MI	06/21/1987	13:45	CST	Tornado	F2	1	6	2.500M	0.00K
OAKLAND CO.	OAKLAND	MI	04/03/1988	16:19	CST	Tornado	F1	0	0	2.50K	0.00K
OAKLAND CO.	OAKLAND	MI	04/03/1988	16:38	EST	Tornado	F1	0	0	0.03K	0.00K
OAKLAND CO.	OAKLAND	MI	07/22/1988	16:00	EST	Tornado	F0	0	0	0.00K	0.00K
OAKLAND CO.	OAKLAND	MI	08/05/1988	14:07	CST	Tornado	F0	0	0	0.00K	0.00K
OAKLAND CO.	OAKLAND	MI	08/17/1988	16:30	CST	Tornado	F1	0	0	25.00K	0.00K
OAKLAND CO.	OAKLAND	MI	09/14/1990	12:10	EST	Tornado	F3	0	0	2.500M	0.00K
OAKLAND CO.	OAKLAND	MI	09/14/1990	12:15	EST	Tornado	F1	0	0	2.500M	0.00K

OAKLAND CO.	OAKLAND	MI	07/07/1991	19:00	EST	Tornado	F2	0	0	250.00K	0.00K
NOVI	OAKLAND	MI	06/12/1996	11:15	EST	Tornado	F0	0	0	2.00K	0.00K
HOLLY	OAKLAND	MI	07/02/1997	16:32	EST	Tornado	F1	1	0	2.000M	0.00K
MILFORD	OAKLAND	MI	05/21/2001	12:23	EST	Tornado	F0	0	0	75.00K	0.00K
CLYDE	OAKLAND	MI	10/24/2001	19:10	EST	Tornado	F1	0	0	750.00K	0.00K
LEONARD	OAKLAND	MI	05/05/2003	19:00	EST	Tornado	F1	0	0	90.00K	0.00K
HOLLY	OAKLAND	MI	08/24/2007	17:00	EST-5	Tornado	EF1	0	0	4.000M	0.00K
GOODISON	OAKLAND	MI	09/21/2014	04:47	EST-5	Tornado	EF1	0	0	400.00K	0.00K
WHITE LAKE	OAKLAND	MI	07/24/2021	18:54	EST-5	Tornado	EF1	0	0	8.500M	0.00K
DAVISBURG	OAKLAND	MI	10/03/2021	17:19	EST-5	Tornado	EF0	0	0	0.00K	0.00K
NEWARK	OAKLAND	MI	07/11/2022	22:35	EST-5	Tornado	EF0	0	0	35.00K	0.00K
Totals:								**3**	**78**	**55.215M**	**0.00K**

August 24, 2023: Rapidly developing thunderstorms began to pop up over Central and Southwest Lower Michigan by the early evening hours of August 24th. The storms quickly grew upscale and became severe, leading to a west-east line of severe thunderstorms which dropped south through southeast Michigan during the evening hours.

Strong winds in the mid-levels allowed for damaging winds to be the primary hazard, with areas of southeast Michigan seeing 60-80 MPH wind gusts which led to extensive tree damage and power outages. At the peak, close to 500,000 customers lost power in southern lower Michigan. A surface low tracking through southern Lower Michigan was able to help spawn tornadoes, with an EF-2 developing over northeast Ingham. This tornado weakened and tracked into Livingston county near Fowlerville before dissipating. This 12 mile track tornado was by far the strongest and longest duration one of the day, and also resulted in 1 fatality as cars were flipped on I-69 in Ingham county.

While Oakland County did not experience as much storm damage as other areas such as the Williamston/Fowlerville area, South Lyon reported trees and power lines were downed by the storm, with damage to numerous homes and vehicles, especially on the west side of Lafayette Street/Pontiac Trail and south of Lake Street/10 Mile.

Figure 4-80. Damage from Storm

Vulnerability and Impacts

Life Safety: People can inadvertently put their lives in danger during a tornado or have little or no warning. Some of the ways tornadoes can impact life safety include the following:

- Injuries and Fatalities: Tornadoes can cause injuries and fatalities due to flying debris, collapsing buildings, and the sheer force of the winds. These injuries and casualties can occur to people caught in the tornado's path or those in poorly constructed or unprotected buildings.
- Structural Damage: Tornadoes can destroy or severely damage buildings, making them unsafe for occupants. People may become trapped in collapsed structures, leading to life-threatening situations.
- Power Outages: Tornadoes can disrupt power lines and electrical infrastructure, causing widespread power outages. This can impact medical facilities, emergency services, and the ability to communicate during and after a tornado.
- Communication Disruptions: Tornadoes can damage communication infrastructure, including cell towers and landline networks. This can hinder emergency responders' ability to coordinate and provide assistance.
- Transportation Disruptions: Tornadoes can block roads with debris, making it challenging for emergency responders to reach affected areas quickly. Limited transportation options can also hinder the evacuation of residents in the tornado's path.
- Displacement and Homelessness: Tornadoes can render homes uninhabitable, leading to the displacement of residents. Finding temporary shelter for those affected becomes a critical concern for local authorities.
- Health Risks: After a tornado, there may be health risks related to exposure to the elements, contaminated water, and other hazards. Injuries sustained during the tornado may also lead to secondary health issues without prompt medical attention.
- Psychological Impact: Tornadoes can have a lasting psychological impact on survivors, causing stress, anxiety, and trauma. Mental health support becomes essential for affected individuals and communities.

According to FEMA, tornadoes can also disproportionately impact disadvantaged or challenged communities in the following ways:

- Lack of Preparedness: Low-income communities may lack the resources and infrastructure necessary for effective disaster preparedness and response. This can include limited access to early warning systems, emergency shelters, or communication tools.
- Inadequate Shelter: Many disadvantaged communities may have substandard housing or lack access to safe and sturdy buildings. This can lead to a higher risk of injury or death during tornadoes, as inadequate shelter may not provide adequate protection from the storm's fury.

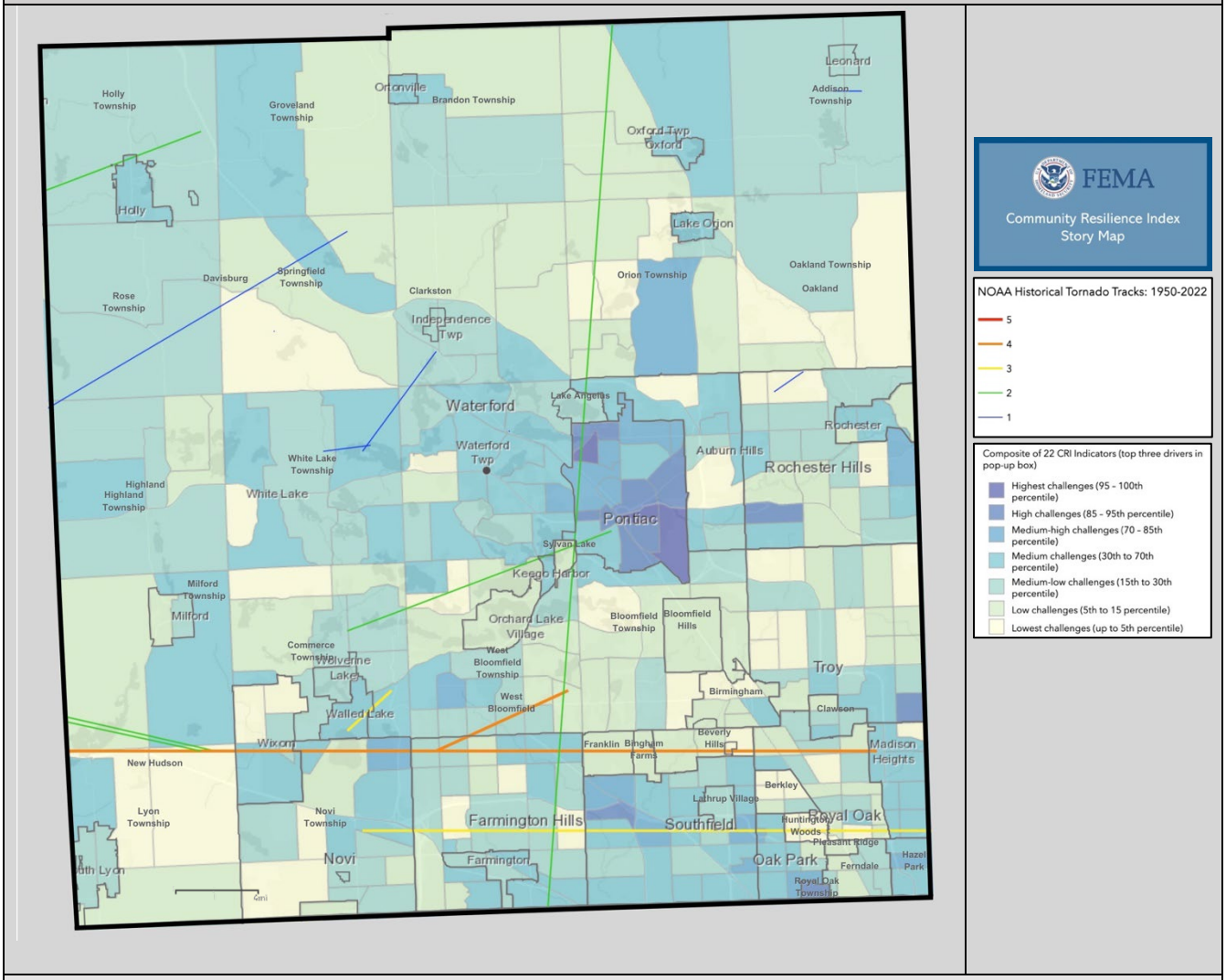
- Limited Mobility: Some residents of disadvantaged communities may have limited mobility due to disabilities, lack of transportation, or other factors. This can make it more challenging for them to seek shelter or evacuate quickly when tornado warnings are issued.
- Health Vulnerabilities: Individuals with pre-existing health conditions or those who rely on medical equipment that requires electricity may face greater risks during tornadoes, especially if power outages occur.
- Language and Cultural Barriers: Communities with a significant non-English-speaking population or cultural differences may face challenges in receiving and understanding emergency alerts and instructions, which can hinder their ability to respond effectively.
- Economic Impact: Tornadoes can devastate local economies, and disadvantaged communities may have fewer resources to recover and rebuild. This can result in prolonged hardships and displacement for residents.

The FEMA Community Resilience Challenges Index (CRCI) provides a relative assessment of a community's potential resilience and gives insights into population and community characteristics from which to build emergency operations plans and targeted outreach strategies. Figure 4-72 illustrates the impact of EF1 to EF5 tornadoes to CCRI tracts in Oakland County.

Figure 4-81. Tornadic Impacts to CRCI Tracts in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2023

Property Damage and Critical Facilities: According to FEMA, tornadoes can impact property damage and critical infrastructure in different ways. Some of the most common impacts are as follows:

- Structural Damage: Tornadoes have the potential to cause extensive structural damage to residential, commercial, and industrial buildings. High winds and flying debris can lead to roofs being torn off, walls collapsing, and the destruction of entire structures. This can result in severe property damage and financial losses.

- Debris Accumulation: Tornadoes often leave behind a trail of debris, including trees, vehicles, and building materials. This debris can obstruct roads, making it difficult for emergency responders to access affected areas and delaying recovery efforts.
- Infrastructure Damage: Tornadoes can damage critical infrastructure, such as power lines, water and sewage systems, transportation networks (roads, bridges, and airports), and communication systems (cell towers, telephone lines). Disruptions to these systems can have cascading effects, hindering emergency response and recovery.
- Power Outages: Tornadoes frequently cause power outages by knocking down electrical lines and damaging substations. Extended power outages can affect not only residents but also essential services like hospitals, emergency response centers, and water treatment plants.
- Water Supply Issues: Tornadoes may damage water treatment facilities and distribution systems, leading to water supply disruptions or contamination concerns. This can impact public health and further complicate disaster response efforts.
- Transportation Disruptions: Tornadoes can block or damage roads, bridges, and railways, making transportation challenging. This can impede the movement of emergency vehicles, supplies, and personnel.
- Environmental Impact: Tornadoes can cause environmental damage by releasing hazardous materials, damaging ecosystems, and contaminating soil and water sources. Cleanup and mitigation of these environmental hazards can be costly and time-consuming.

Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

- Manufactured homes,
- Homes on crawlspaces (more susceptible to lift), and
- Buildings with large spans include airplane hangars, gymnasiums, and factories.

Residents living in manufactured homes are more vulnerable than people in permanent homes. Oakland County has approximately 14,345 manufactured homes that could be impacted by a tornadic event (Neighborhoods At Risk, 2023). Figure 4-73 illustrates tornadic impact to manufactured home areas in Oakland County.

In areas subject to extreme wind events, those responsible for public safety—including building owners, schools, hospitals, and neighborhood associations—should consider building accessible community safe rooms. In addition, people who live or work in structures with inadequate protection, such as manufactured homes or buildings with long-span roofs, also should discuss the option of building a community safe room or shelter (FEMA, 2021).

Because a tornado can hit anywhere in the county, all structures are susceptible to being hit. Schools are a particular concern, though, for two reasons:

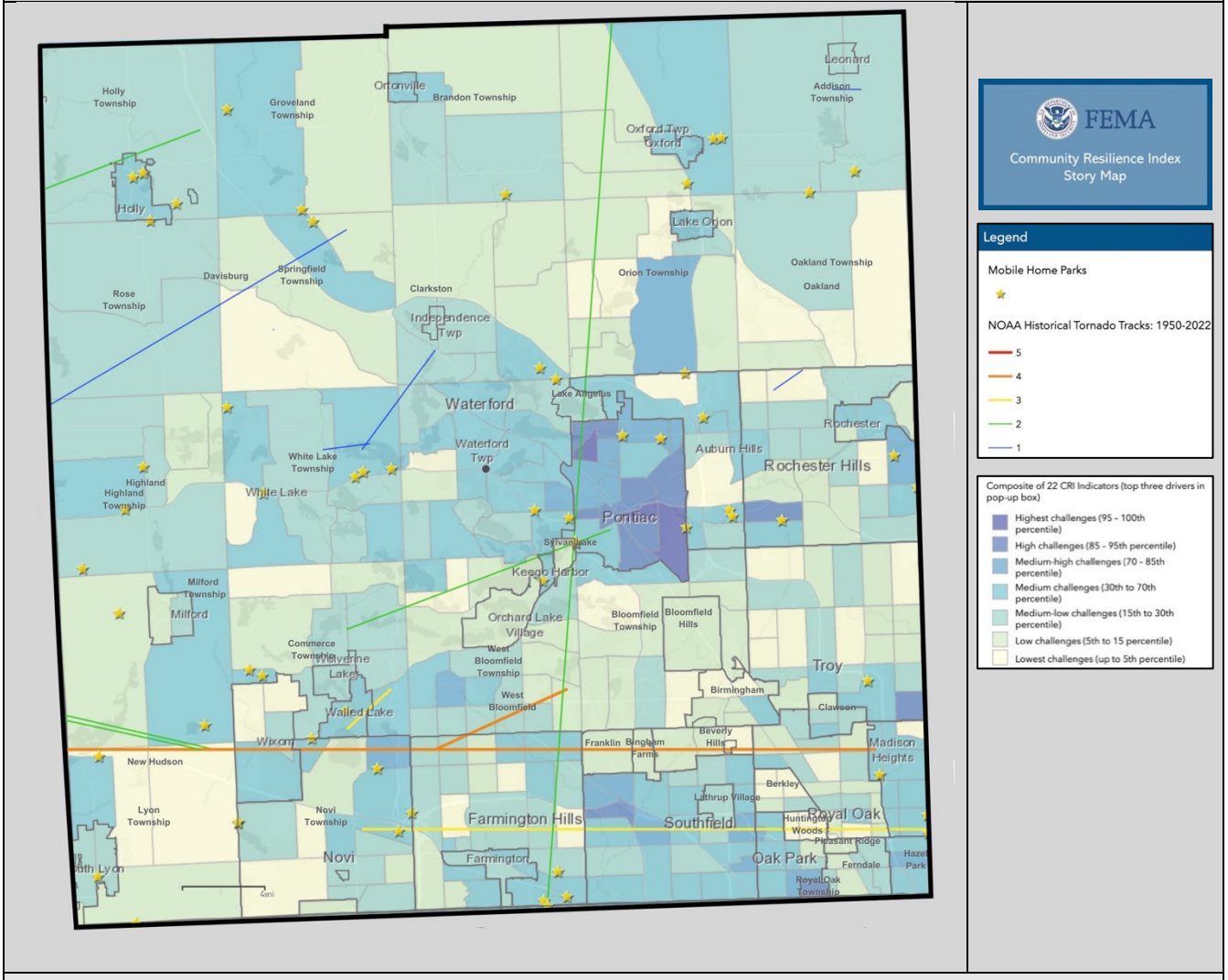
- Many people are present, either during school or as a storm shelter.
- They have large span areas, such as gyms and theaters.

Figure 4-74 illustrates tornadic impact to critical infrastructure in Oakland County. Figure 4-75 illustrates tornadic impacts to schools and universities (key resources) in Oakland County.

Figure 4-82. Tornadic Impacts to Manufactured Homes in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP

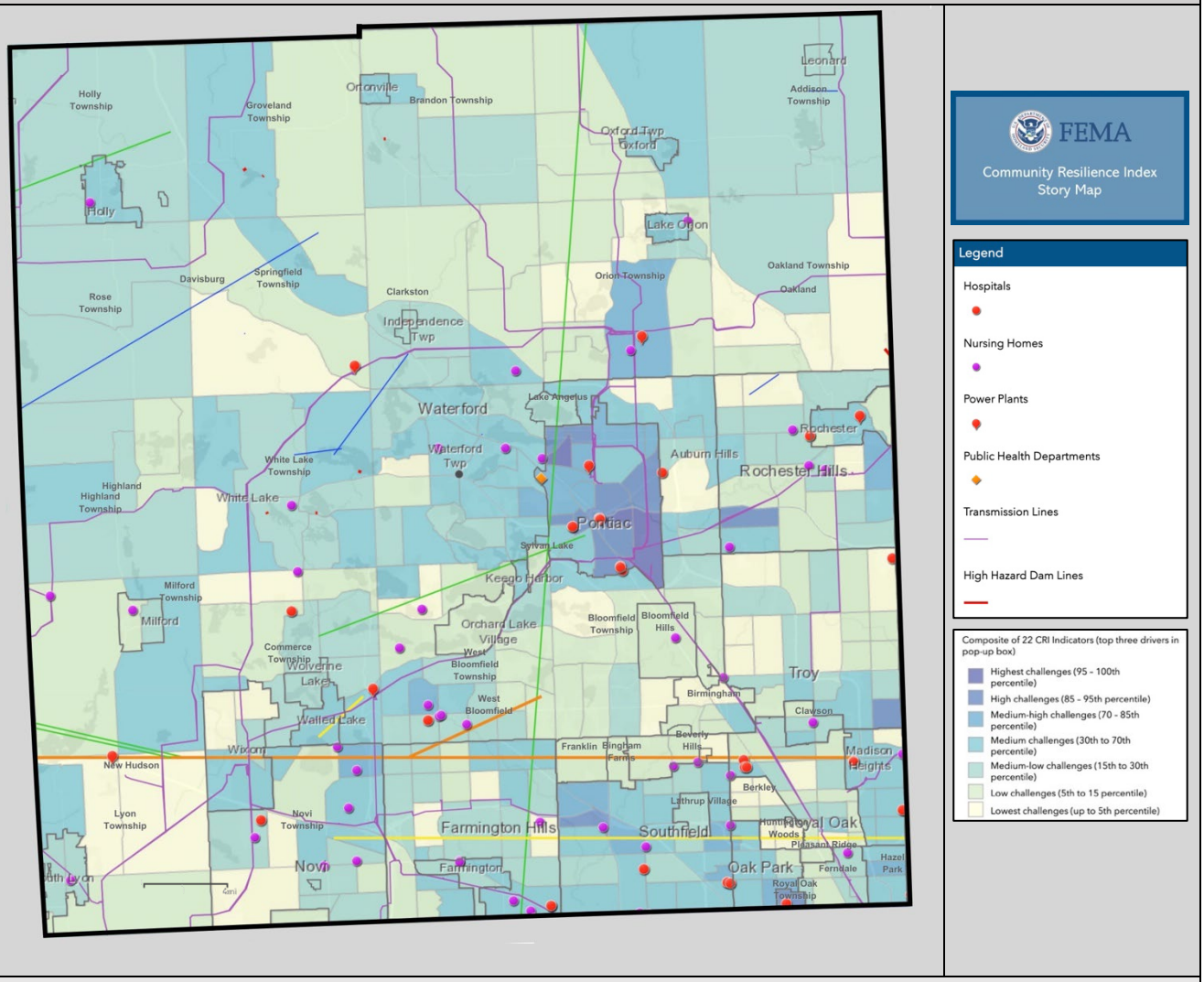


Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2023

Figure 4-83. Tornadic Impacts to Critical Infrastructure in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP

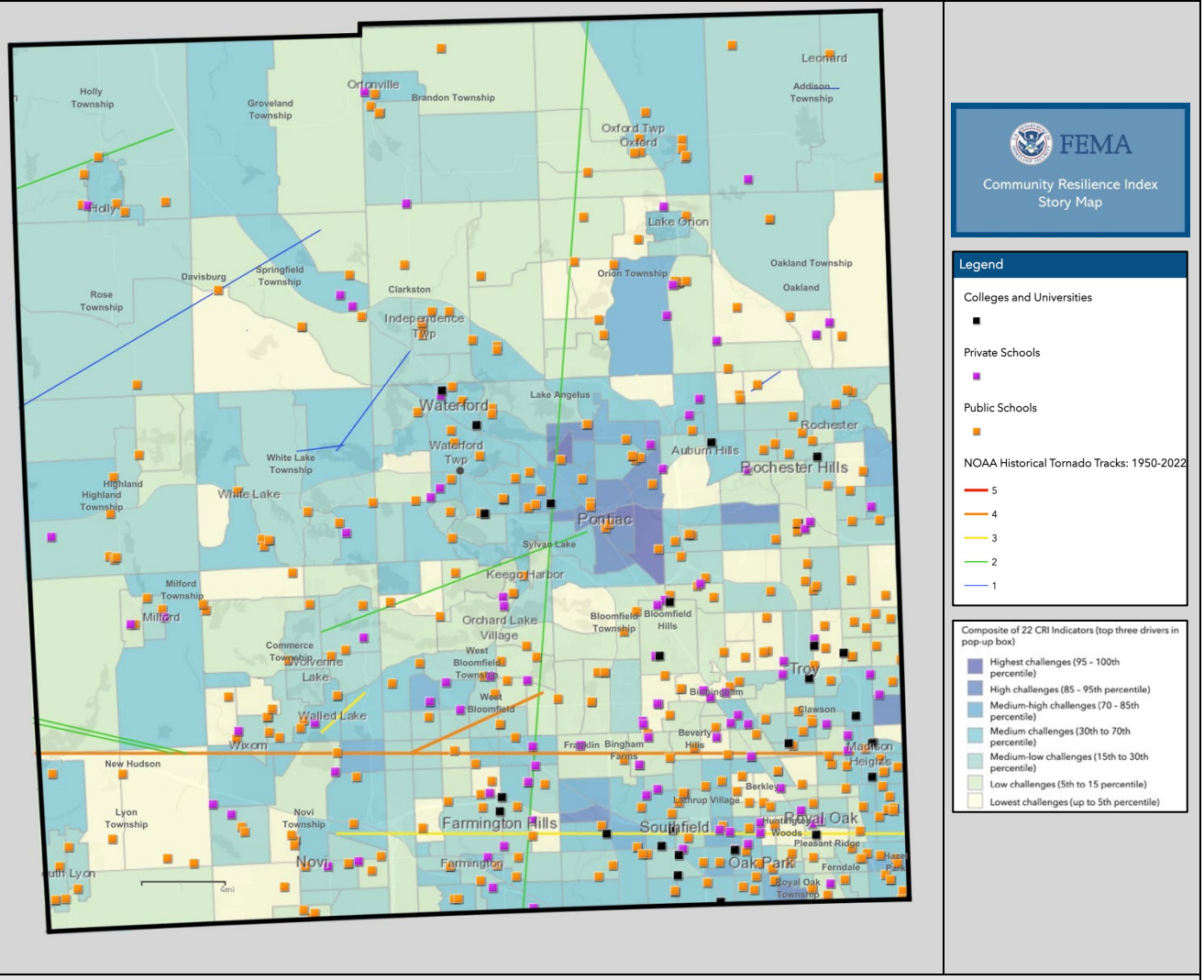


Source: [FEMA Resilience Analysis and Planning Tool](#) (RAPT) 2023

Figure 4-84. Tornadic Impacts to Schools and Universities in Oakland County

OAKLAND COUNTY, MI

FEMA COMMUNITY RESILIENCE INDEX STORY MAP



Source: FEMA Resilience Analysis and Planning Tool (RAPT) 2023

Economy: No data exists demonstrating the economic impact of past tornadoes on Oakland County. However, significant historical events in Michigan and the U.S. have been shown to impact stores and small businesses, including excessive loss of revenue.

Changes in Development and Impact of Future Development: No data exists demonstrating the impact of tornadoes on future development in Oakland County. Similarly, changes in development and future development are not anticipated to increase the probability, magnitude, or vulnerability to this hazard except that more people and infrastructure may be exposed to this hazard. However, tornadoes in Michigan and the U.S. have been shown to influence changes in building codes and zoning laws to ensure that structures are built to withstand high winds and other severe weather events. Additionally, tornadoes can lead to changes in emergency management plans to better prepare for future disasters. For example, storm shelters and warning systems may be installed to better protect residents during severe weather.

Effects of Climate Change on Severity of Impacts: In a 2021 thesis study, pseudo-global warming (PGW) methodology was used to analyze two historical tornadic events within environments influenced by anthropogenic climate change (ACC). In the findings of this study, weather research and forecasting modeling (WRF) suggested that more convective and intense storms would occur under ACC. In addition, accumulated precipitation also generally increased, and more areas received measurable rainfall, where extreme rainfall – more than 100 mm – increased by more than 50% on average (Woods, 2021).

Climate Change Impact on Tornadic Events in Oakland County:

Table 4-80. 25-Year Climate Projections for Oakland County

25-YEAR CLIMATE PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 164% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 7 more days that reach above 95°F (from 4 days to 11 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 112% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 4 more days that reach above 95°F (from 4 days to 7 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Using Woods' thesis study and 25-Year climate projections in Table 4-58, it is possible to conclude that increasing climate conditions will impact the connectivity and intensity of future tornadic events in Oakland County.

FEMA NRI Expected Annual Loss Estimates

Table 4-81. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR TORNADO EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
0.4 events per year	4.10	$47,558,910	$42,620,190	$690	$90,179,789	99.8	Very High
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2023)							

FEMA Hazard-Specific Risk Index Table

Table 4-82 Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – TORNADO EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
99.7 / 100	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.* ***Social Vulnerability Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).* ***Community Resilience Ratings:*** *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*		
Source: FEMA National Risk Index (2023)		

4.15 Wildfire

Hazard Description

A wildfire is an uncontrolled fire within an open space, forested area, brush or grassed area or wild land.

Hazard Location

Figure 4-77 illustrates areas (Grasslands and Shrubs, Woodland and Wetland) in Oakland County, considered vulnerable to Wildfire.

Hazard Extent/Intensity

The Michigan Department of Natural Resources (DNR) measures the extent and intensity of wildfires using a variety of methods, including:

- **Fire behavior models**: The DNR uses computer models that consider factors such as fuel type, weather conditions, and topography to predict a wildfire's behavior. These models can help firefighters determine a fire's potential extent and intensity.
- **Aerial observations**: The DNR often uses aircraft to survey wildfires from above, allowing them to get a better understanding of the fire's size, shape, and behavior. This information can be used to decide fire suppression tactics and allocate resources.
- **Ground observations**: Firefighters on the ground use various tools to measure the extent and intensity of a wildfire, including GPS units, infrared cameras, and handheld weather stations. They may also use visual cues such as smoke columns and flame height to gauge the fire's behavior.
- **Remote sensing**: The DNR uses satellite imagery and other remote sensing tools to track wildfires and their spread. This information can be used to create maps and other visual aids that help firefighters and emergency managers decide on resource allocation and evacuation orders.

The National Wildfire Coordination Group’s data standard provides a standard code and definition for classifying a fire into one of several ranges of fire size based on the number of acres within the final fire perimeter.

Table 4-83 National Wildfire Coordination Group Data Standard

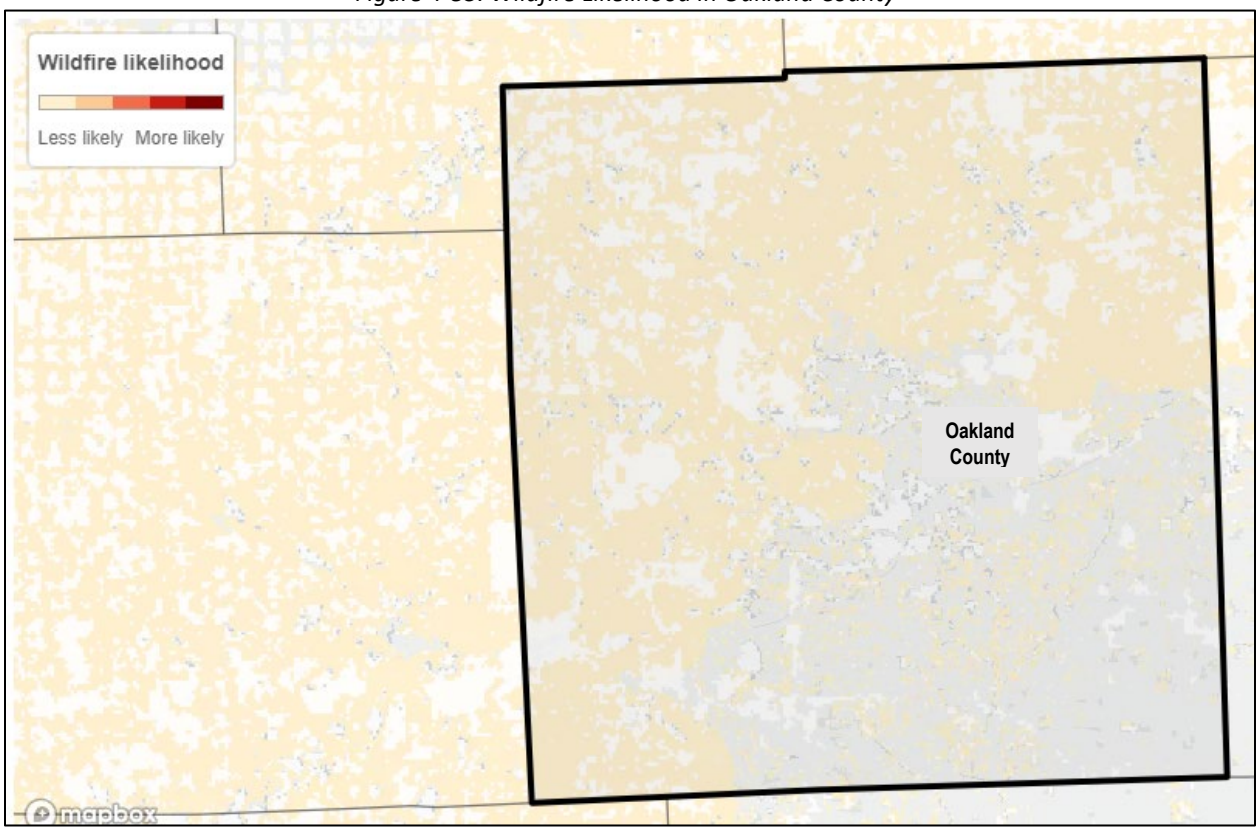
Value	Description
A	Greater than 0 but less than or equal to 0.25 Acres
B	0.26 to 9.9 Acres
C	10.0 to 99.9 Acres
D	100 to 299 Acres
E	300 to 999 Acres
F	1000 to 4999 Acres
G	5000 to 9999 Acres
H	10000 to 49999 Acres
I	50000 to 99999 Acres
J	100000 to 499999 Acres
K	500000 to 999999 Acres
L	1000000 + Acres

Source: https://www.nwcg.gov/data-standards/approved/fire-size-class

Probability and Frequency

Due to the urban and suburban nature of Oakland County, the probability of wildfires occurring in the county is relatively low compared to more rural areas of the state. However, wildfires have occurred in Oakland County in the past, and the frequency of future incidents will be predicated upon weather conditions and other factors. NOAA doesn't list any wildfires for Oakland County between 1950 and 2023. It is estimated that there is a 1% annual probability of occurrence of a major wildfire incident.

Figure 4-85. Wildfire Likelihood in Oakland County



Source: https://wildfirerisk.org/explore/wildfire-likelihood/26/26125/

As a state, Michigan averaged 246 wildfires annually between the years 2013 and 2022, as seen in Figure 4-78 (Michigan DNR, 2023).

Figure 4-86. Wildfire Vulnerability Map

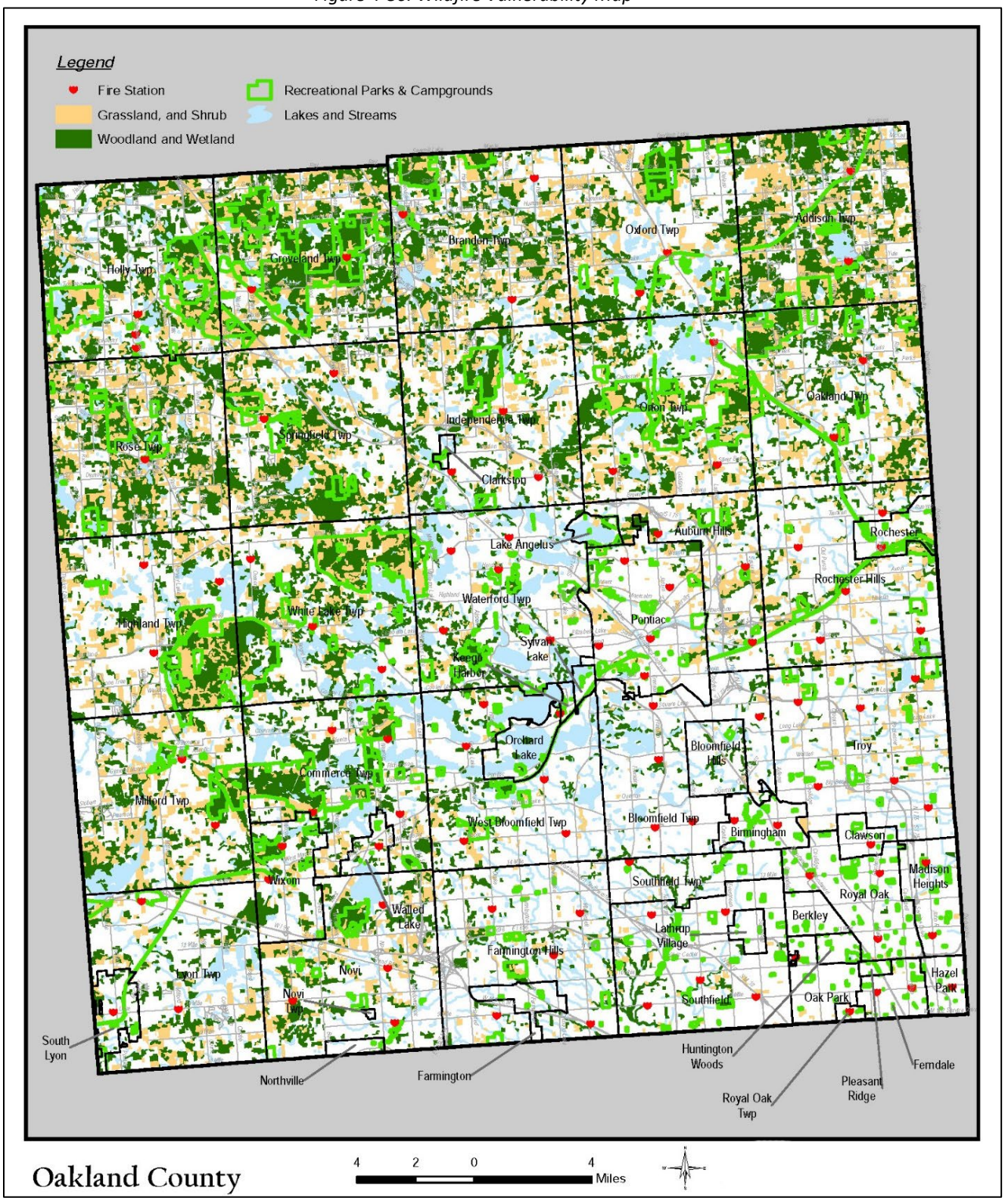
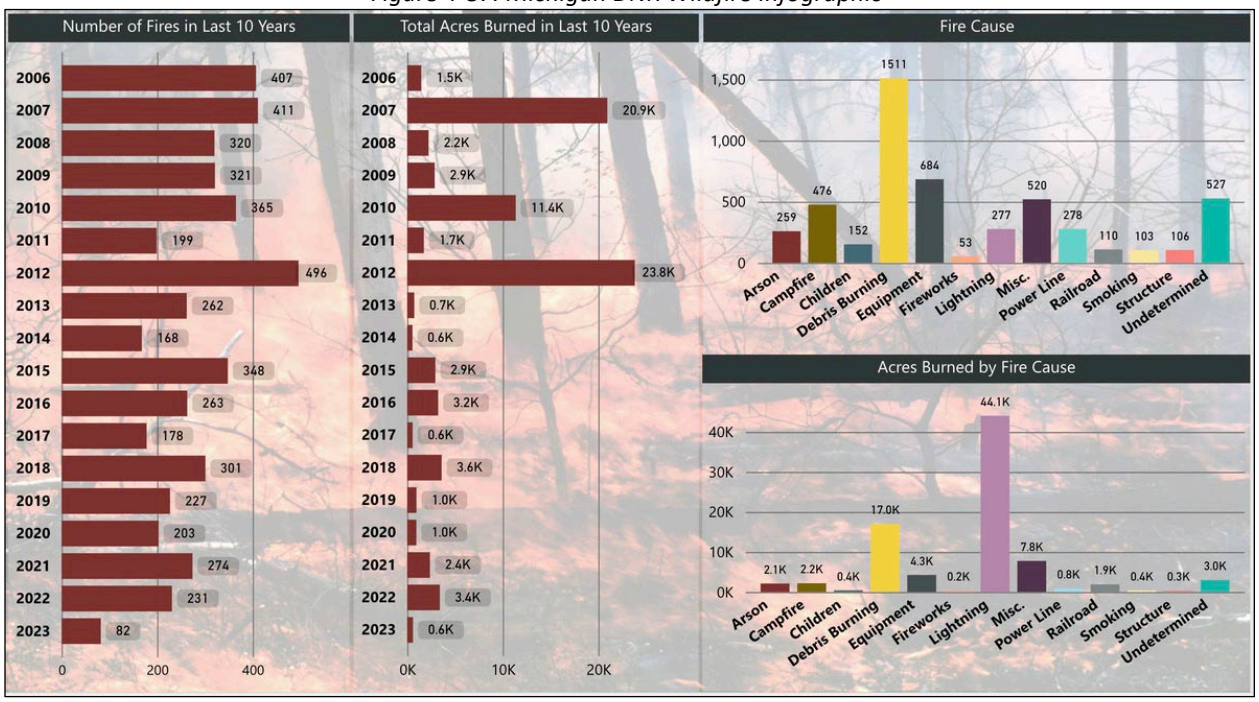


Figure 4-87. Michigan DNR Wildfire Infographic



Past Events

According to Michigan Bureau of Fire Services data, over the past decade, Oakland County has averaged 14 forest, woods, and/or wildland fires each year. There have been no significant wildfire events in that time.

Recent wildfires in Canada, however, have caused poor air quality conditions in counties across Michigan, prompting advisories by the National Weather Service. This is an emerging concern, which is indirectly related to the wildfire risk. Pollutants in the air can create unhealthy conditions for sensitive groups, like those with respiratory or heart conditions.

Vulnerability and Impacts

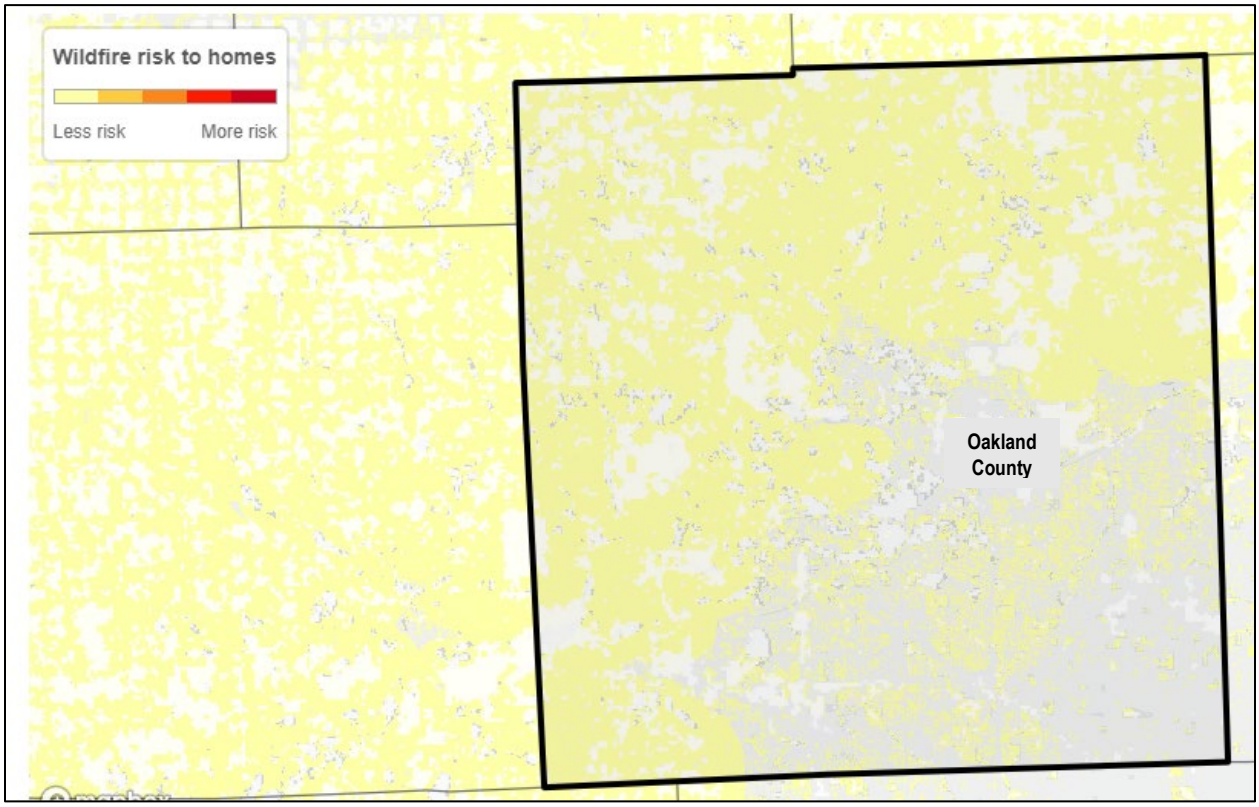
Life Safety: Wildfires can significantly impact human safety, including physical injury, death, and/or respiratory issues. Wildfires directly threaten human life due to the risk of injury or death. In addition, the smoke from wildfires can cause respiratory problems, particularly for individuals with pre-existing conditions such as asthma or chronic obstructive pulmonary disease (COPD).

Property Damage and Critical Facilities: Wildfires can significantly impact property damage and critical facilities in various ways. One way is through direct damage to structures, where wildfires can damage homes, businesses, and other structures, leading to property loss and potentially rendering them unsafe or unusable. In addition, wildfires can also damage critical

infrastructure such as roads, bridges, and utility lines, impacting access to affected areas and essential services.

Another impact is on emergency services, including fire departments, police, and medical personnel, as wildfires can strain these services, impacting response times and overall effectiveness. Additionally, wildfires can contaminate water sources with ash and other debris, impacting drinking water's safety and usability. Wildfires can also prompt evacuation orders for residents in affected areas, which can be disruptive and potentially dangerous.

Figure 4-88. Wildfire Risk to Homes in Oakland County



Source: https://wildfirerisk.org/explore/risk-to-homes/26/26125/

Economy: No data exists demonstrating the economic impact of past wildfires on Oakland County. However, wildfires can have broad economic effects on communities, including disruptions to tourism, agriculture, and other industries.

Changes in Development and Impact of Future Development: Wildfires can change current or future development in several ways. Wildfires can alter the landscape and change how land is used, making previously suitable areas for agriculture or residential development unsuitable after a wildfire. This change in land use can also impact the value of land in affected areas, as the potential for future wildfires can make the land less desirable for development.

In addition, wildfires can affect zoning and planning considerations for future development. Areas that are deemed high-risk for wildfires may be subject to additional regulations or restrictions, which can impact the ability of property owners and developers to use or develop the land in certain ways. Wildfires can also impact insurance considerations for property owners and developers in affected areas. Subsequently, insurance rates may increase in high-risk areas due to the potential for future wildfires.

Effects of Climate Change on Severity of Impacts: Climate change is expected to increase the frequency and severity of wildfires by creating conditions more conducive to wildfire. Warmer temperatures, drier conditions, and changes in precipitation patterns can create conditions that increase the likelihood of wildfires and make them more difficult to control (Michigan State University, 2023).

Climate Change Impact on Wildfire Events in Oakland County:

Table 4-84. 25-Year Climate Projections for Oakland County

25-YEAR CLIMATE PROJECTIONS FOR OAKLAND COUNTY, MI
HIGHER EMISSIONS (RCP8.5)
Oakland County is expected to experience a 164% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 7 more days that reach above 95°F (from 4 days to 11 days per year).
LOWER EMISSIONS (RCP4.5)
Oakland County is expected to experience a 112% increase in extremely hot days within 25 years.
By 2048, Oakland County is expected to experience 4 more days that reach above 95°F (from 4 days to 7 days per year).
Source: Neighborhoods at Risk (https://nar.headwaterseconomics.org/26125/explore/climate)

Table 4-85. Future Climate Indicators for Oakland County

FUTURE CLIMATE INDICATORS FOR OAKLAND COUNTY, MI							
Indicator	**Modeled History** (1976-2005)	**Early Century** (2015-2044)		**Mid Century** (2035-2064)		**Late Century** (2070-2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max	Min-Max
Precipitation:							
Days Per Year With No Precipitation (Dry Days)	**172 days**	**173 days**	**174 days**	**174 days**	**176 days**	**175 days**	**178 days**
	167-75	165-186	167-187	162-186	164-193	163-188	164-208
Maximum Number of Consecutive Dry Days	**11 days**	**11 days**	**11 days**	**11 days**	**12 days**	**12 days**	**12 days**
	10-12	10-13	10-13	10-13	10-14	10-13	10-16
	194 days	**192 days**	**191 days**	**191 days**	**189 days**	**190 days**	**187 days**

Days Per Year With Precipitation (Wet Days)	191-198	179-200	178-198	179-203	172-201	177-202	157-201
Temperature Thresholds:							
Annual Days With Maximum Temperature >90°F	**6 days**	**19 days**	**21 days**	**26 days**	**34 days**	**35 days**	**64 days**
	6-10	9-35	11-35	14-49	16-54	17-67	30-95
Annual Days With Maximum Temperature >100°F	**0 days**	**1 day**	**1 day**	**1 day**	**3 days**	**13**	**0 days**
	0-0	0-2	0-4	0-9	0-15	0-9	1-48
Source: Climate Mapping for Resilience and Adaptation (2023)							

FEMA NRI Expected Annual Loss Estimates

Table 4-864. Oakland County Expected Annual Loss Table

OAKLAND COUNTY, MI EXPECTED ANNUAL LOSS TABLE FOR WILDFIRE EVENTS							
Annualized Frequency	**Population**	**Population Equivalence**	**Building Value**	**Agriculture Value**	**Total Value**	**Expected Annual Loss Score**	**Rating**
0.001% chance	0.00	$21,131	$275,997	$1	$297,130	76.6	Relatively Low
Annualized Frequency: *The natural hazard annualized frequency is defined as the expected frequency or probability of a hazard occurrence per year. Annualized frequency is derived either from the number of recorded hazard occurrences each year over a given period or the modeled probability of a hazard occurrence each year.* ***Population:*** *Population exposure is defined as the estimated number of people determined to be exposed to a hazard according to a hazard type-specific methodology.* ***Expected Annual Loss*** *scores are calculated using an equation that combines values for exposure, annualized frequency, and historic loss ratios (Expected Annual Loss = Exposure × Annualized Frequency × Historic Loss Ratio). Source: hazards.fema.gov/nri/expected-annual-loss*							
Source: FEMA National Risk Index (2023)							

FEMA Hazard-Specific Risk Index Table

Table 4-87. Oakland County Hazard Specific Risk Index Table

OAKLAND COUNTY, MI FEMA HAZARD SPECIFIC RISK INDEX – WILDFIRE EVENTS		
Risk Index Score	**Social Vulnerability Rating**	**Community Resilience Rating**
73.2	Very Low	Very High
Risk Index Scores: *are a quantitative rating calculated using data for only a single hazard type. Risk Index Scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.*		

Social Vulnerability Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).*
Community Resilience Ratings: *are a qualitative rating that describe the community in comparison to all other communities at the same level, ranging from "Very Low" to "Very High." Community Resilience is measured using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).*

Source: FEMA National Risk Index (2023)

Manmade/Technological Hazards

Although FEMA does not require non-natural hazards for inclusion in a hazard mitigation plan, Oakland County wishes to rank and mitigate against a comprehensive list of hazard events that could impact the county. Due to the nature of non-natural hazards and the discretionary status regarding their inclusion, the following hazards of interest have been briefly and qualitatively assessed for public education and informing their inclusion within the hazard ranking and mitigation process:

- Active Shooter/Active Assailant
- Cybersecurity
- Fire (Structural)
- Gas/Oil Shortages or Supply Disruptions
    - Petroleum and Natural Gas Pipeline Accidents
- HAZMAT Incidents
    - Fixed Site
    - Transportation/Rail
- Infrastructure Failure
    - Bridges, Roads, Overpasses
    - Communications
    - Electrical Systems
    - Invasive Species
    - Sewer System
    - Storm Water System
    - Water System
- Nuclear Incidents
    - Power Plant Accidents
- Sociopolitical Hazards (Civil Disturbance, Social Unrest)
- Terrorism and Sabotage
- Transportation Accidents
    - Air
    - Highway
    - Marine
    - Rail
- Weapons of Mass Destruction

Other Hazards of Concern

- Public Health Emergencies

4.16 Active Shooter/Active Assailant

Hazard Description

The agreed-upon definition of active shooter by US government agencies (including the White House, US Department of Justice, FBI, US Department of Education, US Department of Homeland Security, and Federal Emergency Management Agency) is "an individual actively engaged in killing or attempting to kill people in a confined and populated area." In most cases, active shooters use firearms and there is no pattern or method to their selection of victims.

Active shooter situations are unpredictable and evolve quickly.

Hazard Location

An active shooter incident or mass shooting could occur anywhere in Oakland County. However, incidents tend to occur in places of (former) employment or at schools/universities. Mass Shootings can also occur in other crowded venues such as shopping centers and arenas. However, mass shootings in residential neighborhoods typically center around individuals the gunmen are familiar with.

In Oakland County, vulnerable soft targets include:

- K-12 Schools
- Courthouses and federal buildings
- Pine Knob Music Theatre
- Detention facilities
- Great Lakes Crossing Outlets
- Hazel Park Raceway
- Meadow Brook Hall & Theater
- Michigan State Fair
- Oakland Community College
- Oakland County Fair
- Oakland University
- Renaissance Festival
- Royal Oak Arts, Beats, & Eats
- Woodward Dream Cruise
- Somerset Collection Mall
- Private corporations and corporate headquarters

Probability and Frequency

The likelihood of mass shootings and active shooter incidents continues to increase.

Past Events

On November 14, 1991, Thomas Mcilvane killed four supervisors and wounded five other employees before killing himself at the Royal Oak Post Office after being fired for insubordination.

On November 14, 1996, a mass shooting occurred at the Ford Motor Company factory in Wixom. It did not result in four or more deaths or meet the technical definition of a mass shooting; however, one person was killed, and several others were injured including Ford employees, and two Oakland County Sheriff's deputies. This incident and September 11th are documented as the incidents which influenced Oakland County to implement the Oakland County Wireless Integrated (OakWin) System.

On June 11, 1999, in Southfield, Michigan, Joseph Brooks opened fire at his former psychiatrist's clinic, killing two people and injuring four others before committing suicide.

On June 11, 1999, in Southfield, Michigan, Joseph Brooks opened fire at his former psychiatrist's clinic, killing two people and injuring four others before committing suicide.

On February 20, 2016, an Uber Driver went on a several-hour rampage in Kalamazoo, selecting his victims randomly. As a result, six people were killed and two more injured during the six hours before his arrest - including five people who were shot in the parking lot of a Cracker Barrel restaurant.

On November 30, 2021, a mass shooting occurred at Oxford High School in the Detroit exurb of Oxford Township, Michigan, United States. A 15-year old male, armed with a 9 mm semi-automatic handgun, murdered four students and injured seven people, including a teacher. Authorities arrested and charged the 15-year old offender as an adult for 24 crimes, including murder and terrorism.

Vulnerability and Impacts

Health and Safety: Mass shootings can significantly impact public health and safety with physical and emotional injuries, including death, trauma, and long-term psychological effects on survivors, witnesses, and the wider community.

In addition to the immediate physical and emotional impacts, mass shootings can have broader societal impacts, including increased fear and anxiety, decreased sense of safety and security, and adverse effects on mental health and well-being.

Property Damage and Critical Infrastructure: Mass shootings can cause significant property damage and disrupt critical infrastructure. Depending on the location and circumstances of the shooting, property damage may include damage to buildings, vehicles, or other physical assets. In some cases, shootings may cause fires or explosions, further exacerbating the damage.

In addition to physical property damage, mass shootings can disrupt critical infrastructure, such as transportation systems, utilities, and communication networks. For example, a shooting in or near a transportation hub could cause delays or closures of train or bus lines, while a shooting near a utility facility could disrupt power or water supplies.

Economy: Mass shootings can have significant economic impacts, both short and long-term. In the short term, the cost of responding to and investigating a mass shooting can be substantial and may strain local and state budgets. In addition, businesses and tourism in the affected area may suffer, resulting in decreased economic activity and job losses. For example, a shooting in a tourist destination may lead to cancellations of trips and events, which can have a ripple effect on local businesses. In the long term, property values in the affected area may decline, making it more difficult for homeowners and businesses to sell or lease their properties.

4.17 Cybersecurity

Hazard Description

Cyber-attacks are "deliberate exploitation of computer systems, technology-dependent enterprises, and networks." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that, "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks.

Malware, or malicious software, can cause numerous problems once on a computer or network, from taking control of users' machines to discreetly sending out confidential information. Ransomware is a specific type of malware that blocks access to digital files and demands a payment to release them. Hospitals, schools, state and local governments, law enforcement agencies, businesses, and even individuals can be targeted by ransomware. A 2017 study found ransomware payments over a two-year period totaled more than $16 million. Even if a victim is perfectly prepared with full offline data backups, recovery from a sophisticated ransomware attack typically costs far more than the demanded ransom. However, according to a 2016 study by Kaspersky Lab, roughly one in five ransomware victims who pay their attackers are still not able to retrieve their data.

Cyber spying or espionage is the act of illicitly obtaining intellectual property, government secrets, or other confidential digital information, and often is associated with attacks carried out by professional agents working on behalf of a foreign government or corporation.

According to cybersecurity firm Symantec, in 2016 "…the world of cyber espionage experienced a notable shift towards more overt activity, designed to destabilize and disrupt targeted organizations and countries." A major data breach is when hackers gain access to large amounts of personal, sensitive, or confidential information and have become increasingly common. A 2018 report from the security firm Symantec found that more than seven billion identities have been exposed in data breaches over the last eight years. In addition to networked systems, data breaches can occur due to the mishandling of external drives.

Cyber-crime can refer to any of the above incidents when motivated primarily by financial gain or other criminal intent. The most severe type of attack is cyber terrorism, which aims to disrupt or damage systems in order to cause fear, injury, and loss to advance a political agenda.

Cyberattacks can be divided into two main categories: attacks against data, and attacks against physical infrastructure. Because our society is so dependent on technology, a large-scale cyberattack could overwhelm government and/or private-sector resources quickly, as well as threaten lives, property, the economy and national security.

Phishing is a technique employed in many of the above attacks and involves sending fraudulent emails purporting to be from known contacts or reputable companies to induce individuals to reveal personal information, such as passwords and credit card numbers, or to click on links that put the user at risk.

Hazard Location

Cyber disruptions are not central to one geographic area; they can occur anywhere across Michigan where technological systems exist or are utilized. A breach can originate at one computer and affect any other computer in the world. Targets include individual computers, networks, organizations, business sectors, or governments.

Hazard Extent/Intensity

The extent of a cybersecurity breach is dependent on various factors. These factors include the system that is attacked, protective measures put in place, training of the people involved, warning time, and the firewalls that exist to protect different levels of the system.

Probability and Frequency

Cyberattacks have increased nationwide in recent years, particularly targeting the energy sector. Cyberattacks have also increased in the banking and finance sectors. Hackers have attacked company computers by distracting employees and interfering with Internet Security Providers (ISP) to divert resources, to steal proprietary information and PII. Small devices can wreak havoc and disrupt systems. Some USBs have been manufactured with viruses or may become infected and spread viruses to multiple computers. Firewalls, access via signatures, and anti-virus are becoming antiquated security methods.

While specific data on the number of occurrences is not known, the probability of future cyberattacks is high.

Other jurisdictions have been impacted by ransomware attacks in recent years. The City of Atlanta was hit by a major ransomware attack in 2018, recovery from which wound up costing a reported $2.6 million, significantly more than the $52,000 ransom demand. A similar attack against the City of Baltimore in 2019 affected the city government's email, voicemail, property tax portal, water bill and parking ticket payment systems, and delayed more than 1,000 pending home sales. In March 2019, Orange County, North Carolina was attacked with a ransomware virus, causing slowdowns and service problems at key public offices such as the Register of Deeds, the sheriff's office and county libraries. The attack impacted a variety of county services, including disrupting the county's capability to process real estate closings, issue marriage licenses, process fees or permits, process housing vouchers, and verify tax bills.

Past Events

Cyberattacks occur daily through fraudulent phone calls or emails, generally to the elderly or other susceptible members of the public. A growing number of local public entities, such as township and village governments as well as school districts, are facing malicious cyber-attacks.

The University of Michigan determined that hackers gained access to unauthorized third party personal information relating to certain students and applicants, alumni and donors, employees and contractors, University Health Service and School of Dentistry patients, and research study participants between Aug. 23-27, 2023.

Vulnerability and Impacts

Cyberattacks can have a wide range of impacts, ranging from minimal to significant, depending on if the County or its jurisdictions are the main target for the attack or if they are one of many targets. Some of these attacks may be malicious and can result in catastrophic damage to the nervous system of a community's cyber infrastructure. Back-up systems, redundancy, heightened awareness, integrity restoration, and recovery will provide means to adequately manage the consequence of an attack.

Direct Damage
Cyberattacks can inflict damage on physical systems by manipulating the technology supporting the built environment.

Economic Damage
Cyberattacks can inflict huge amounts of economic damage in many different ways. Cyberattacks targeting financial institutions (banks, stock markets, etc.) can directly impact the overall economy while other attacks may target individual businesses. Large scale cyberattacks can greatly affect the economy. Symantec reports that in the last three years, businesses have lost $3 billion due to phishing email scams alone. In an electronic-based commerce society, any disruption to daily activities can have disastrous impacts to the economy. It is difficult to measure the true extent of the impact.

4.18 Fire: Structural

Hazard Description

A structural fire is a fire of any origin which ignites one or more structures and causes loss of life and/or property. According to the National Fire Protection Association, structural fires cause more loss of life and property damage than all other types of natural disasters combined. Direct property losses due to fire exceed $9 billion per year and much of that figure is the result of structural fire.

Hazard Location

Structural fire could occur anywhere in Oakland County.

Hazard Extent/Intensity

The most common method firefighters and other emergency responders use is to estimate the fire's size and intensity based on visual observations of the flames, smoke, and heat. Firefighters may also use thermal imaging cameras and other equipment to assess the temperature and thermal patterns of the fire. Lastly, firefighters may use gas detectors to measure the concentration of gases produced by the fire, which can provide an indication of the fire's intensity.

Probability and Frequency

In the last five years, there have been an average of 600 structural fires per year in Oakland County. Therefore, the occurrence of structural fires within Oakland County has a well-established history. This hazard will continue to occur in the future.

Past Events

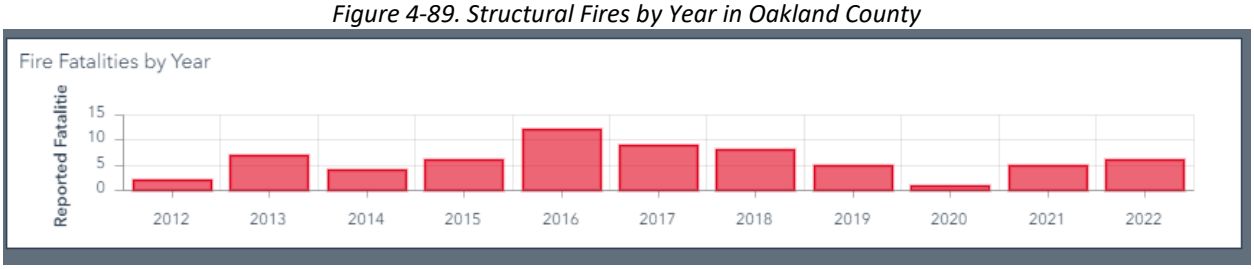
Notable structural fires in the last five years are:

- **February 26, 2019**: There was a major fire at the US Farathane Auburn Hills facility. There were no injuries or toxic chemical issues. The event occurred outside of the production facility in a storage area where primarily empty plastic and steel returnable containers were stored.
- **February 17, 2022**: A major fire swept through the century-old clubhouse at the Oakland Hills Country Club. It housed irreplaceable memorabilia and art from multiple major championships and the Ryder Cup that Oakland Hills has hosted over nearly a century. No injuries were reported. The 110,000-square-foot clubhouse was among the largest wood structures in Michigan. Approximately 17 fire departments were called in to assist Bloomfield Township on the morning of Feb. 17.

Vulnerability and Impacts

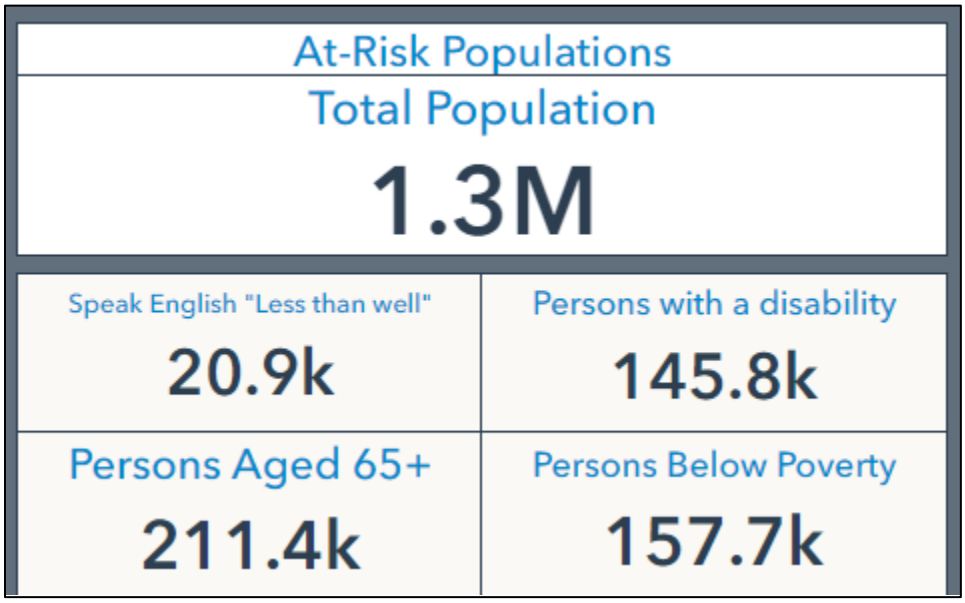
Health and Safety: Impacts include smoke inhalation, which can cause respiratory problems and even death due to inhaling smoke and toxic gases produced by the fire. Direct exposure to flames, hot gases, and hot surfaces can cause severe burns and other injuries to firefighters and occupants of a burning structure. Responding to and fighting fires can also be emotionally and physically challenging, leading to trauma and stress among firefighters and other emergency responders. Next, structural fires can weaken or collapse buildings and other structures, which can lead to injury or death among firefighters and occupants. Structural fires can also release toxic chemicals, such as asbestos and lead, into the environment, posing health risks to nearby residents and the environment. Lastly, firefighting efforts can lead to significant water damage to buildings and other structures, resulting in property damage and mold growth.

Figure 4-89. Structural Fires by Year in Oakland County



Source: FEMA Home Fire Fatalities & Social Vulnerability Explorer

Figure 4-90. At-Risk Populations to Structural Fires in Oakland County



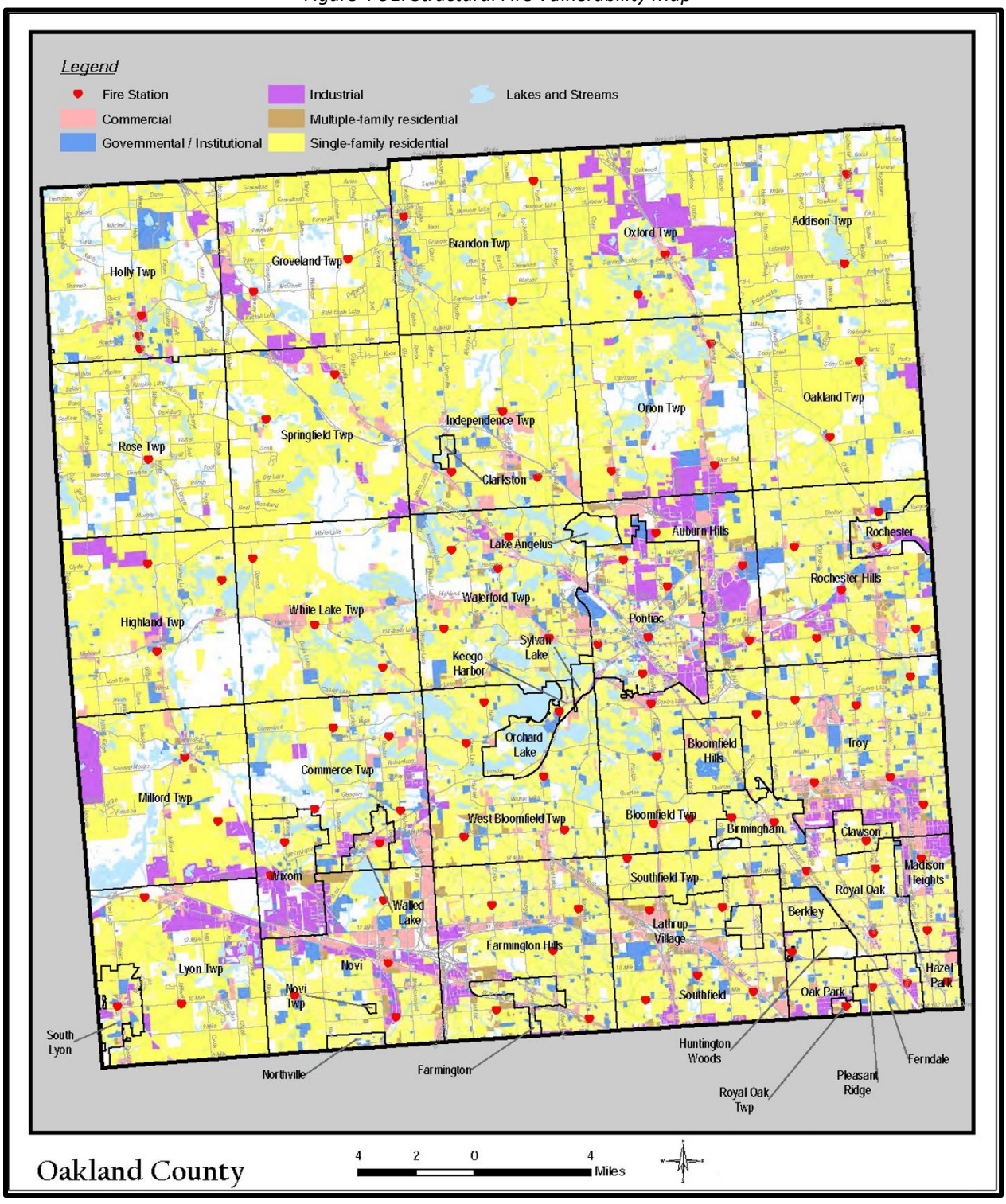
Source: FEMA Home Fire Fatalities & Social Vulnerability Explorer

Property Damage and Critical Infrastructure: Structural fires can cause extensive damage to nearby buildings and roads and lead to water damage resulting in property damage and mold growth. Structural fires can damage electrical systems, leading to power outages and other

disruptions to daily life. They can also weaken or collapse buildings and other structures, posing a risk of injury or death to firefighters and other occupants.

Economy: Historical incidents have shown the cost of extinguishing fires, property damages, business interruption cost, and the cost of rebuilding or repairing damaged structures to be significantly high.

Figure 4-91. Structural Fire Vulnerability Map



Source: Oakland County, MI, USDA, SEMCOG

4.19 Gas/Oil Shortages, Supply Disruptions, and Related Accidents

Hazard Description

A gas/oil shortage is when demand for gas/oil exceeds the available supply. An oil or gas well incident is an uncontrolled release of oil, natural gas, or hydrogen sulfide gas, a by-product of production wells.

A petroleum or natural gas pipeline incident would involve an uncontrolled release of petroleum, natural gas or hydrogen sulfide gas from a pipeline.

Hazard Location

A gas/oil shortage would impact all of Oakland County. Depending on the type of fuel, certain areas may be more affected than others. Propane shortages would impact rural areas while gasoline shortages would have a more significant impact on commuters and businesses.

Lands with oil and gas wells and surrounding areas are most at risk for impact from well accidents. The location of wells is concentrated in the southwestern portion of the county.

Michigan is a major producer and consumer of petroleum and natural gas products; therefore, transmission and distribution pipelines are commonly found throughout the State of Michigan. There are over 110,000 miles of pipelines that deliver natural gas to individual homes and businesses. Approximately 3% of the pipelines in Michigan transport hazardous liquids. This includes almost 600 miles of pipeline for highly volatile liquids (HVLs) (ethane, propane, ethylene, natural gas liquids), approximately 1,300 miles for refined petroleum products (gasoline, diesel fuel, jet fuel, condensate, etc.), and about over 1,500 miles of crude oil pipeline. The majority of pipeline infrastructure in Michigan is located in the Detroit Metro area in Wayne and Oakland Counties.

Oakland County has four pipeline terminals that could be impacted. In addition, natural gas processing plants and compression facilities can also be at risk of an incident. Smaller natural gas distribution lines can be found throughout the County with Consumers Energy, DTE Gas, and SEMCO providing natural gas service to the majority of the County.

Hazard Extent/Intensity

The extent/intensity of a gas/oil shortage can be measured by several factors, including the duration of the shortage, the geographic area affected, the amount of supply shortfall, and the impact on critical infrastructure and/or economic activity. Other factors to be considered include the cause of the disruption, the availability of alternative supply sources, and the response of industry and government to the situation.

The Pipeline and Hazardous Materials Safety Administration (PHMSA) uses several metrics to measure the extent and intensity of petroleum and natural gas pipeline accidents. One key metric is the volume of product released during the accident, typically measured in barrels or cubic feet. Another metric is the area of the spill or release, which can be measured in acres or square feet. The duration of the accident, or the amount of time it takes to control the situation, can also indicate the extent of the incident. Finally, the number of people or properties impacted by the accident can also be used to measure the incident's severity.

Probability and Frequency

Since 1965, seven major gas/oil shortages have impacted Oakland County. Political conflict and increased global demand can also impact future gas/oil shortages in the area.

According to the MDEQ, the most common problems associated with oil and gas wells in Oakland County are small spills and odor complaints.

Since 1990, there have been 33 pipeline incidents in Oakland County. Two of the accidents occurred to transmission lines, the remainder involved distribution lines which are more commonly found in the County. It is anticipated that this hazard will be more likely to occur in the future as the pipeline structures age.

Past Events

Gas/oil shortage:
In 2005, Hurricane Katrina disrupted oil refinery stations that affected Michigan's supply of fuel. Cold temperatures in 1976, 1977, and 2000 led to a fall in propane inventories. The propane industry found it difficult to maintain deliveries, causing propane prices to hit record highs. During the 1970s, the Middle East Oil Embargo halted the flow of oil causing an energy crisis followed by the eruption of the Iranian Civil War. This resulted in gas shortages and a significant increase in the cost of gasoline.

Oil or gas well incident:
As of 2012, 19 active or producing wells were within Oakland County. The most recent oil/gas well accident in Michigan was in 2019. Two men were burned in an explosion at a north-central Michigan oil well near Norwich Township, about 130 miles north of Grand Rapids.

In 2013, an explosion at an oil well in Jackson County placed a man in extremely critical condition, and he was airlifted to the University of Michigan hospital. Investigators believed a truck had struck some piping in the oil well, causing an explosion and natural gas fire.

Pipeline incident:

One of the most significant pipeline accidents in Oakland County occurred on May 20, 1992, when contractors were excavating a sidewalk and caused a service line to rupture. The gas ignited causing an explosion which killed 2 people and injured 17 others.

On November 20, 2017, a ruptured gas line caused an explosion and massive fire that left an 18-foot-deep crater in an area of Orion Township near the Great Lakes Crossing Outlets mall. The fire — which occurred in an area north of Brown Road near Joslyn Road, near the border with Auburn Hills — had flames 100- to 150-feet wide and up to 200-feet high. The flames could be seen from downtown Detroit, more than 30 miles away.

Figure 4-92. Gas Line Explosion (November 20, 2017)

Vulnerability and Impacts

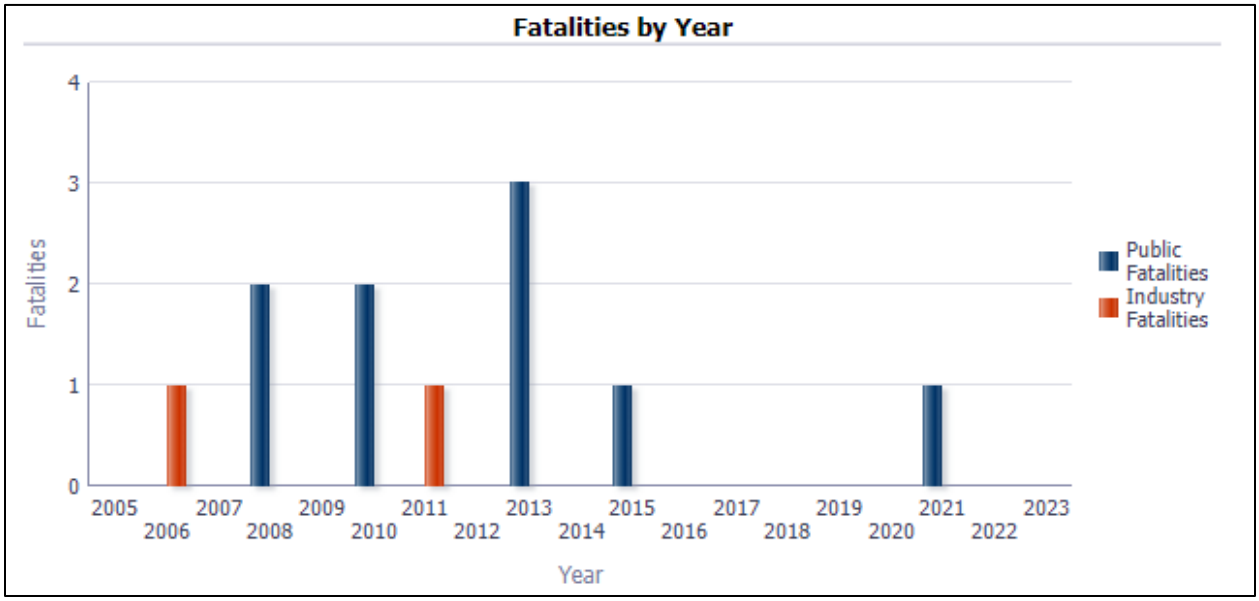
Health and Safety: Gas/oil shortages can lead to various indirect health and safety impacts, such as increased transportation and storage of fuel, which can increase the risk of accidents and spills. Additionally, gas/oil shortages or supply disruptions can lead to the use of alternative, less-safe heating sources, such as portable space heaters or propane stoves, which can increase the risk of fire and carbon monoxide poisoning.

Impacts of a petroleum and natural gas pipeline accident can be significant, depending on the nature of the accident and the materials involved. Impacts can include explosions, fires, and toxic releases that can cause injuries or fatalities to individuals near the accident. Additionally, pipeline accidents can result in significant environmental impacts, including soil and water contamination and damage to wildlife and habitats.

Property Damage and Critical Infrastructure: A gas/oil shortage or supply disruption can cause significant infrastructure impacts, such as transportation disruptions. In this case, shipping systems that rely on fuel such as trucking, rail, aviation, and shipping, control the movement of goods and can have cascading effects on the economy. Another impact is energy supply disruptions. For example, a gas/oil shortage can cause disruptions in the supply of energy to power plants and other critical infrastructure, leading to blackouts, brownouts, and other energy supply disruptions.

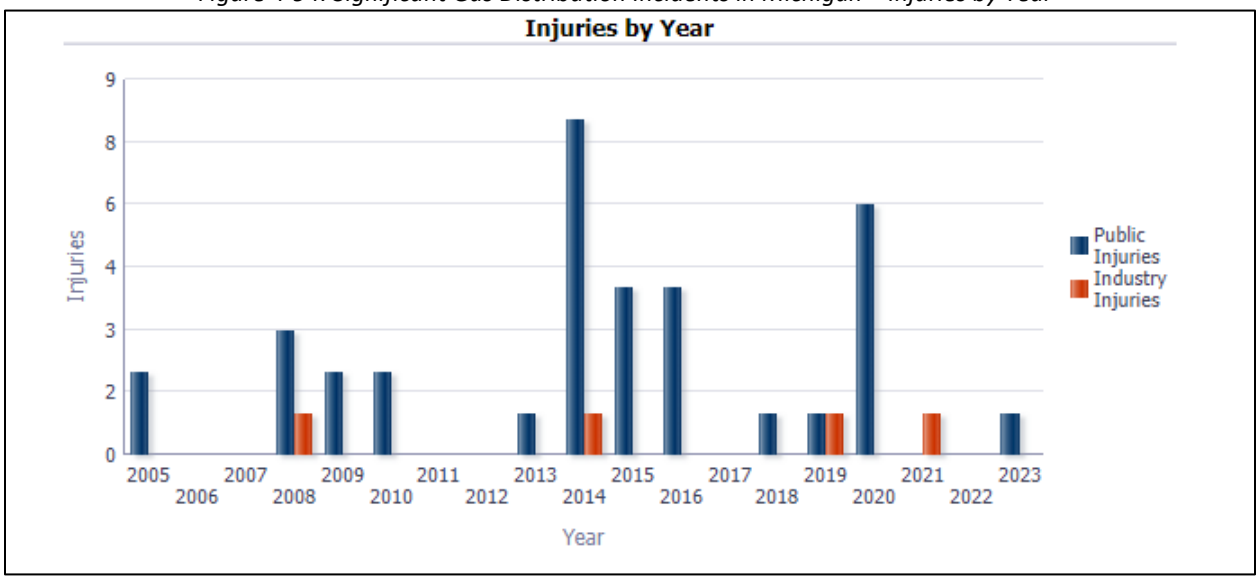
Petroleum and natural gas pipeline accident impacts can vary depending on the nature of the incident, the location, and the response efforts. Property damage can include damage to buildings, homes, vehicles, and other personal property. Critical infrastructure impacts can include damage to roads, bridges, and other transportation systems and disruption of utility services such as water, gas, and electricity. In addition, if the accident occurs in a densely populated area or near a sensitive ecological or cultural resource, the impacts can be more severe and long-lasting.

Figure 4-93. Significant Gas Distribution Incidents in Michigan – Fatalities by Year



Source: Pipeline and Hazardous Materials Safety Administration

Figure 4-94. Significant Gas Distribution Incidents in Michigan – Injuries by Year



Source: Pipeline and Hazardous Materials Safety Administration

Economy: Gas/oil shortages or supply disruptions can have significant economic impacts that affect various industries. These impacts include increased fuel prices, which can raise the cost of transportation, heating, and other energy-intensive activities. This can result in higher prices for goods and services, leading to reduced economic growth, decreased productivity, and increased unemployment. Industries such as transportation and manufacturing may experience reduced output, decreased profitability, and potential job losses. Lastly, gas and oil shortages can disrupt supply chains, causing delays in the delivery of goods and services, resulting in lost sales, reduced profits, and potential job losses.

There is no data demonstrating the impact of petroleum and natural gas pipeline accidents on Oakland County. Furthermore, accidents of this nature are uncommon in Michigan and have not resulted in significant property damage or other loss.

4.20 HAZMAT: Fixed Site

Hazard Description

Hazardous Material (Hazmat) Incident – Fixed Site is defined as an uncontrolled release of a hazardous material originating from a building, structure, or fixed equipment capable of posing a risk to life, health, safety, property, or the environment.

Hazard Location

The majority of hazmat material released in Oakland County are released into water, followed by land/soil and air. Environmental contamination from this hazard can extend to off-site locations, however, fixed-site hazmat incidents have rarely required an evacuation in the county.

See HAZMAT Fixed-Facility Vulnerability Map (FOUO) in Appendix E.

Hazard Extent/Intensity

The extent/intensity of a fixed-site HAZMAT release is based on the quantity and type of hazardous materials released, the duration of the release, the environmental conditions at the release site, and the potential for human and environmental exposure to the released hazardous materials. Other factors that may be considered include the location and accessibility of the release site, the potential for migration of hazardous materials to nearby water bodies, and the potential for secondary releases.

Probability and Frequency

Oakland County has over 500 active hazardous substance facilities. As the county continues to develop and attract new business and industry, it is anticipated that the probability of occurrence of this hazard will increase.

Table 4-88. Fixed-Site HAZMAT Incidents in Oakland County

Year	Fixed or Non Transportation-related HAZMAT Incident
2018	12
2019	12
2020	17
2021	14
2022	12

Source: National Response Center (https://nrc.uscg.mil/)

Past Events

Although most hazmat incidents occur at industrial facilities, this is not always true. For example, on May 29, 2004, a tank containing ethylene glycol for a refrigeration system ruptured at a fish market in Birmingham. Approximately 180 gallons of the material were released, with a portion entering the storm drain system. The spill required the evacuation of the building, and several people were exposed to the spilled material, six people required hospitalization.

Vulnerability and Impacts

Health and Safety: One of the most significant risks to health and safety is exposure, which can cause health effects from minor irritations to severe injuries or illnesses. Evacuations or shelter-in-place orders may be necessary to protect the public from exposure to hazardous materials. Additionally, hazardous materials can pose fire or explosion hazards, either alone or in combination with other substances, posing risks of injury or death to responders and nearby individuals. Lastly, hazardous materials released into the environment can contaminate soil, air, and water, which can have long-term effects on human health and the environment.

Property Damage and Critical Infrastructure: A fixed-site HAZMAT release can physically damage property, such as structures and vehicles, in the vicinity of the release. Hazardous materials released into the environment can also contaminate buildings and facilities, necessitating decontamination or even demolition in some cases. Lastly, a HAZMAT release can cause damage to critical infrastructure such as bridges, roads, and utility systems, disrupting essential services like water and power, which can impact the ability of residents and businesses to carry out daily activities.

Economy: The economic impact of this hazard can vary, especially when including the cost of environmental remediation. According to the U.S. EPA Hazmat Response Team, the costs for responding to a hazmat incident can range from $1,000 to $100,000. In addition, some property damage from this type of event can be expected, especially if the release results in a fire or explosion. Another impact in the form of lost business revenue can result if the incident causes a business to close.

Although major fixed-site hazmat incidents are not common in Oakland County, there is a potential for such an incident. A significant incident would likely involve response efforts from multiple agencies and departments. The additional impact could result from environmental remediation and restoring public confidence in the environmental health of the County.

4.21 HAZMAT: Transportation/Rail

Hazard Description

An uncontrolled release of a hazardous material during transport capable of posing a risk to life, health, safety, property, or the environment.

Hazard Location

There are 134 miles of freight railroads and approximately 62 miles of interstate and major state highways in Oakland County. Although large-scale, off-site impacts are not common with hazmat transportation incidents, they are certainly possible within Oakland County. Off-site effects can include evacuation, closure of roadways and environmental contamination.

Figure 4-86 illustrates HAZMAT transportation vulnerability in Oakland County.

Hazard Extent/Intensity

Extent/intensity can be measured by the volume of material released, the distance the material travels from the source, and the duration of the release. Other factors that can affect the extent/intensity of a transportation/rail incident include the material's properties, weather conditions, and topography of the area. Finally, the size of the affected area and the number of people exposed are also important measures of the extent of the release.

Probability and Frequency

Since 1978, Oakland County has had four significant hazardous material transportation incidents. Three of these incidents involved train derailments, and one involved a cargo van transporting radioactive materials. There have been 111 reported incidents involving mobile transport and 43 railroad incidents in Oakland County since 1992. The State of Michigan averages a reportable incident every 9.1 days. As the county continues to develop and attract new businesses and industry, it is anticipated that the probability of occurrence for this hazard will increase.

Past Events

One of the most significant responses required for a HAZMAT incident in Oakland County occurred on November 15, 2001. The incident involved the head-on collision of two trains near Clarkston. As a result of the crash, two of the rail crew members were killed, and two more were injured. In addition, a car carrying 4,000 gallons of fuel oil was derailed. The derailment required the response of local fire departments and hazmat teams, the Michigan Department of Environmental Quality, Michigan Department of Natural Resources, and the U.S. Environmental Protection Agency. A one-mile radius around the incident site was evacuated,

impacting approximately 719 people. After an investigation by the HAZMAT team, it was determined that there was no release from the rail car.

Over the past 5 years, the following incidents have been reported to the National Response Center in Oakland County.

Table 4-89. Transportation-related HAZMAT Incidents in Oakland County

Year	Number of Transportation-related HAZMAT Incidents
2018	3
2019	4
2020	3
2021	12
2022	11

Source: National Response Center (https://nrc.uscg.mil/)

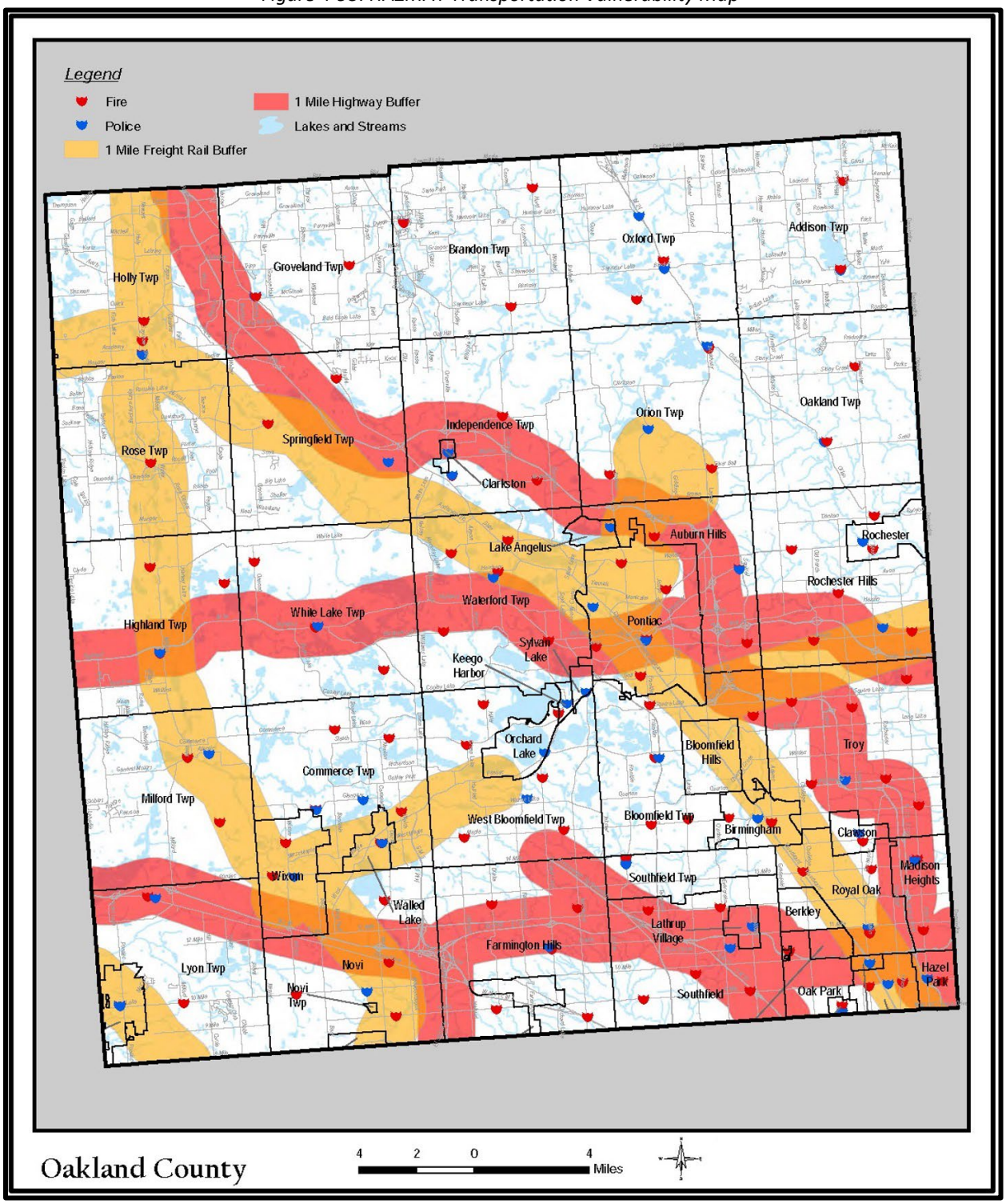
Vulnerability and Impacts

Health and Safety: Transportation/rail HAZMAT releases can significantly impact public health and safety. People near a release may be exposed to hazardous materials through inhalation, ingestion, or skin contact, resulting in various health effects, from minor irritations to severe injuries or illnesses. In some cases, evacuation or shelter-in-place orders may be necessary to protect the public from exposure to hazardous materials, which can disrupt daily life and have economic impacts on affected individuals and communities. Lastly, some hazardous materials can pose fire or explosion hazards, either alone or in combination with other substances, which can pose a risk of injury or death to responders and nearby individuals.

Property Damage and Critical Infrastructure: A transportation/rail HAZMAT release can cause property damage and critical infrastructure impacts in various ways, including physical damage to structures, vehicles, and other property in the release area. This can include damage to the transportation infrastructure itself. For example, hazardous materials released into the environment can contaminate buildings and facilities, necessitating decontamination or even demolition in some cases. The release can also cause damage to critical infrastructure such as bridges, roads, and utility systems, which can hinder emergency responders' ability to access the area and provide assistance.

Economy: The economic impact of this hazard can be highly variable, especially when including the costs of environmental remediation. According to the U.S. EPA HAZMAT Response Team, the costs of responding to a hazmat incident can range from $1,000 to $100,000. Damage to transportation equipment is expected with this event, however, these costs are the transporter's responsibility. Costs to the public can include response efforts, commuter delays, and damage to transportation infrastructure.

Figure 4-95. HAZMAT Transportation Vulnerability Map



Source: Oakland County, MI, USDA, SEMCOG

4.22 Infrastructure Failure: Bridges, Roads, and Overpasses

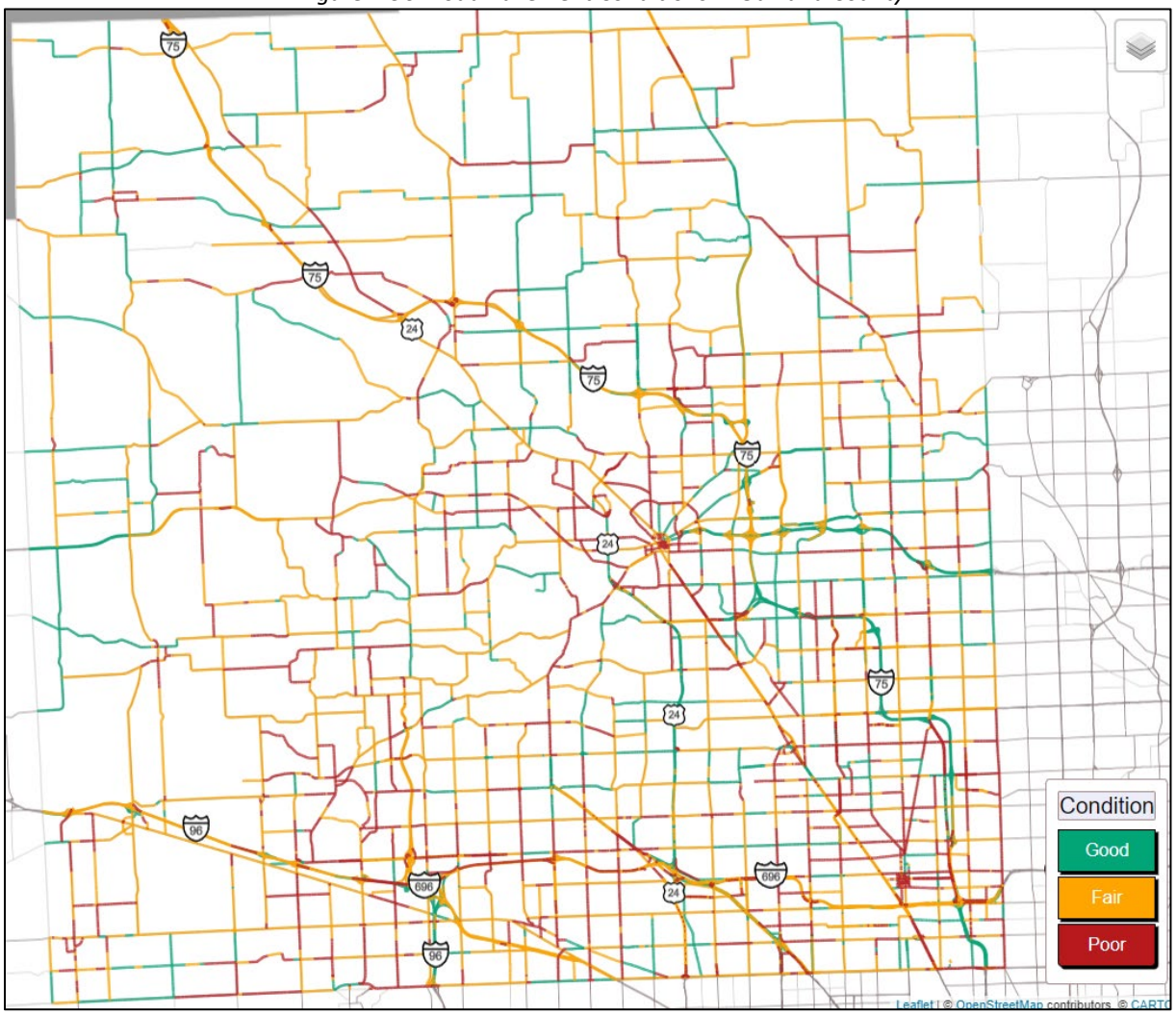
Hazard Description

An incident in which a bridge/road/overpass becomes structurally unsound, deteriorates, or collapses, damaging property and/or placing human life at risk. Infrastructure failure can be caused by aging, natural disasters, lack of maintenance, design flaws, or human error.

Hazard Location

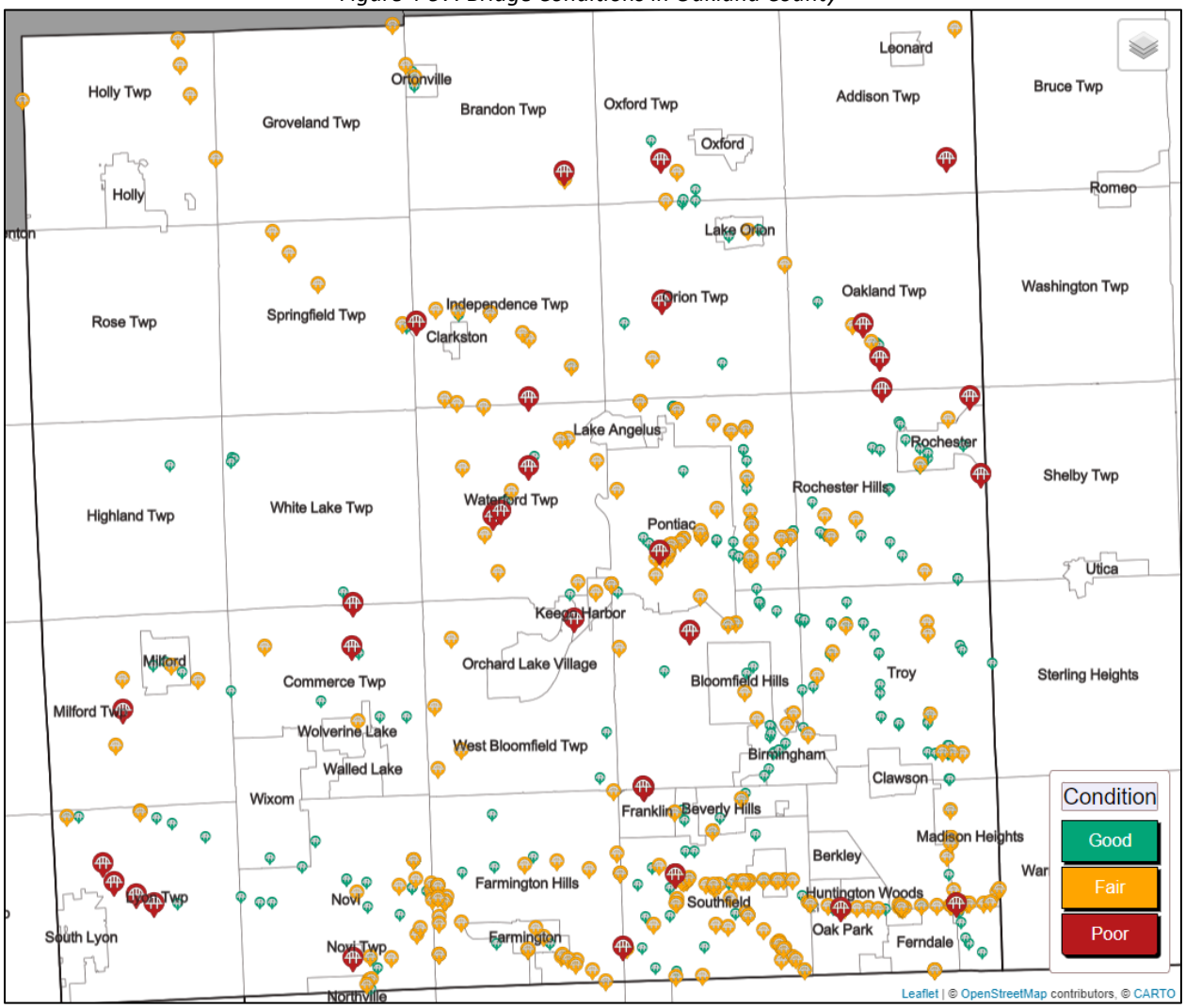
The following figures show the road pavement conditions and road bridge (includes culverts) conditions in Oakland County. There are 5,249 lane miles, 1,937 centerline miles, and 503 bridges included in this analysis.

Figure 4-96. Road Pavement Conditions in Oakland County



Source: SEMCOG

Figure 4-97. Bridge Conditions in Oakland County



Source: SEMCOG

Hazard Extent/Intensity

The extent of infrastructure failure can be measured using various methods, including physical inspections, non-destructive testing, and structural health monitoring systems. Physical inspections involve visual inspections of the infrastructure by trained professionals to identify signs of damage or deterioration. Non-destructive testing methods include ultrasonic testing, magnetic particle inspection, or radiography to detect infrastructure cracks or defects without damaging them. Finally, structural health monitoring systems involve using sensors to continuously monitor the structural behavior of the infrastructure and detect changes or anomalies that could indicate a potential failure.

Probability and Frequency

Although there has only been one bridge collapse, it is possible for other bridge/overpass failures in the future. According to 2021/2022 data from SEMCOG, Oakland County has 7,186 miles of public roads and 503 bridges.

	Good	Fair	Poor
Lane Miles 5,249	1,228 23%	2,736 52%	1,285 24%
Centerline Miles 1,937	478 25%	1,002 52%	457 24%

	Good	Fair	Poor
Bridges 503	207 41%	264 52%	32 6%
Deck Area (sqft) 4,202,893	1,605,874 38%	2,439,703 58%	157,316 4%

Source: SEMCOG

Past Events

There have been 85 significant bridge failures in the United States since 1940. In 2009, a tanker explosion in Hazel Park caused a bridge to collapse onto I-75.

Vulnerability and Impacts

Health and Safety: Infrastructure failures can result in accidents, injury, and death, impacting public health and safety. For example, a bridge collapse or a road failure can result in vehicle accidents, injuries, and death. In addition, infrastructure failure can disrupt transportation and emergency response services, making it difficult for people to access critical resources and services in a timely manner.

Property Damage and Critical Infrastructure: First, one impact is damage to vehicles and property, which can result in repair/replacement costs. The disruption of transportation is another impact of infrastructure failure that can cause delays, and inconvenience for travelers, and impact commerce and economic activity. In addition, infrastructure failure can create challenges for emergency responders, who may face difficulty accessing affected areas or transporting patients to hospitals. Lastly, infrastructure failures can affect critical infrastructure such as utilities, telecommunications, and transportation systems, which can have cascading effects on public health, safety, and economic activity.

Economy: Economic impact is dependent on the size and type of failure. Significant failures can cost hundreds of millions of dollars to clean up and repair. Property damage to passing vehicles and nearby buildings may also result from failure. Re-routing of traffic can cause traffic congestion and reduce revenue for area businesses.

4.23 Infrastructure Failure: Communications

Hazard Description

The inability of the communications system to perform its intended function due to a disruption in service, degradation of service beyond a specified level, or other conditions that the provider determines to warrant action. This can include issues such as dropped calls, slow data speeds, or complete outages of service.

Hazard Location

A failure of private telephone communications is limited to the service area network. However, a loss of the emergency communications system can impact the entire County.

Hazard Extent/Intensity

The FCC measures the extent of communications system failure based on the number of users, geographic area, duration of the outage, and the type of service affected. The agency also considers the impact on public safety, health, and welfare, as well as the ability of the service provider to restore service. Additionally, the FCC considers the nature and cause of the failure and the measures taken to prevent future outages. The agency may also gather information from affected consumers and service providers to better understand the impact of the outage and to develop strategies to improve communication systems in the future.

Probability and Frequency

Communications failures are most frequently a result of severe weather events or other interferences that affect phone lines, such as animals or automobiles striking utility poles. Very rarely does a communications failure result from a communication system problem. Communications failures, both public and private systems, are possible with any major storm event, such as ice storms, lightning, or high winds, which occur an average of 30-40 times annually. Power outages can also interrupt the operation of the 9-1-1 PSAP. As Oakland County continues to grow and the demand for communications services increases, it is anticipated that this hazard will occur more frequently and have more significant consequences.

Past Events

Oakland County operates internal communications systems such as a 9-1-1 Public Safety, Answering Point (PSAP), and an emergency public radio system. Local cities, townships, and villages operate 29 PSAPs within the county. Telephone service for Oakland County residents is available from numerous service providers. In April 2003, a significant ice storm affected Oakland County. The ice downed phone lines cutting service to numerous customers throughout the County. In addition, since 1987, construction projects within the County have caused at least two service interruptions in the 9-1-1 system.

Vulnerability and Impacts

Health and Safety: The failure of a communications system can have several public health and safety impacts, as identified by the FCC. These include delayed emergency response, limited access to emergency services, and the inability to receive critical information such as severe weather alerts or evacuation orders. A communications failure can also increase public anxiety and confusion during emergencies, leading to further disruptions and potential safety risks. Finally, the system can also impact the ability of healthcare providers to communicate with patients and provide medical services, which can have serious health consequences.

Property Damage and Critical Infrastructure: Communications system failure impacts include damage to property, such as fires or explosions caused by electrical or gas outages, as well as disruptions to transportation systems like traffic lights, GPS systems, and other infrastructure, which can lead to accidents and congestion. Communications system failure can also impact utilities, including power grids and water systems, resulting in outages and other issues.

Economy: First, one impact is a loss of revenue for businesses that depend on telecommunications systems to operate. Additionally, a communications failure can result in increased costs for both companies and individuals, such as the cost of repairs and replacements. Productivity can also be negatively impacted by a communications failure, as it can lead to delays and increased travel times. Lastly, a communications failure can also impact the stock market, especially for companies that heavily rely on telecommunications systems.

4.24 Infrastructure Failure: Electrical Systems

Hazard Description

A loss of one or more electrical system, component, or circuit, that leads to the interruption (or loss) of electrical supply; or complete failure of the electrical system to function properly.

Hazard Location

Electrical system failure could occur anywhere within Oakland County.

Hazard Extent/Intensity

The extent of electrical system failure can range from localized outages that affect a single home or building to widespread blackouts that impact entire regions. The severity of an electrical system failure depends on a variety of factors, including the cause of the failure, the size and complexity of the electrical system, and the duration of the outage.

Probability and Frequency

Electrical service for the majority of Oakland County is provided by DTE Energy, with the exception of a small area in the northwest portion of the County which is serviced by Consumers Energy. It is estimated that a significant power failure occurs in Oakland County once per year. Electrical failures, like the August 2003 blackout, although rare, can occur due to problems within the electrical system and from secondary causes such as weather and human/animal interference. Ice storms have an established history of causing electrical service interruptions. Electrical outages are often related to severe weather events, which occur 30-40 times per year within Oakland County.

Electrical service problem areas exist within the County. Problem areas are those areas that experience a power outage more than twice each year. When a problem area is identified, the cause is determined and remedied as quickly as possible. As a result, the identified problem areas are always changing.

As the County continues to grow and demand for electrical service increases, it is possible that this hazard will occur more frequently and with greater consequence.

Past Events

The largest, and arguably most infamous, electrical system failure in the United States occurred on August 14, 2003. This system failure started at 4:10 p.m. in southern Ohio and within seconds, 50 million people in North America were left without electricity. The blackout affected millions of customers in southeast Michigan, including Oakland County. In many ways, this event was a worst-case scenario electrical failure.

About one million Michigan residents lost power on March 8, 2017. Gov. Rick Snyder, in a press briefing with officials from the state's two biggest utilities, called the windstorm "the largest combined statewide" power outage event in Michigan history. At one point, approximately one-third of Michigan residents were affected by the power outage. More than 800,000 DTE customers were affected by the storm and more than 4,000 wires were downed by falling trees. 320,000 Consumers Energy customers lost power because of the storm. The outages were caused by near-hurricane force winds, which pounded the area for more than 12 hours. A warmer than normal winter created softer ground, making it easier for trees to uproot and knock down more power lines.

Vulnerability and Impacts

Health and Safety: Several public health and safety impacts can result from electrical system failure. One impact is the increased risk of fire hazards. Electrical system failures can lead to electrical fires that can threaten life, property, and the environment. Additionally, electrical system failures can create hazardous conditions that can result in electrocution, electric shock, and other injuries. Finally, electrical system failures can disrupt critical services such as hospitals, emergency response services, and water and wastewater treatment facilities. This can lead to serious public health and safety consequences, especially during emergencies.

Property Damage and Critical Infrastructure: There are several different vulnerabilities and impacts, including damaged equipment such as appliances, electronics, and machinery, resulting in costly repairs or replacements. Another impact is structural damage, where electrical system failures can cause structural damage to buildings, bridges, and other infrastructure, posing safety risks and requiring significant repair costs. Electrical system failures can also disrupt transportation systems, including traffic lights, train signals, and airport systems, leading to accidents and congestion. Lastly, they can impact utilities such as power grids, water systems, and gas pipelines, resulting in outages and other issues.

Economy: Electricity is a vital component to operating businesses and county services. Information regarding the economic impact of electrical outages is not available. It is anticipated that an outage can be extremely costly, depending on the number of affected customers and duration of the event.

4.25 Infrastructure Failure: Invasive Species

Hazard Description

An invasive species is a species that is not native to the ecosystem and whose introduction causes, or is likely to cause, harm to the economy, environment, and/or human health.

Hazard Location

Invasive species could impact anywhere in Oakland County.

Hazard Extent/Intensity

The extent and intensity of invasive species can be measured in various ways depending on the specific species and the context in which they are being studied. Some commonly used methods include distribution mapping, population habitat occupancy, genetic analysis, or satellite imaging. Distribution mapping involves mapping the geographic distribution of an invasive species to gain insight into its extent. Population density quantifies the density of invasive species using various methods, such as counting individuals in a given area or using mark-recapture methods to estimate population size. Habitat occupancy can be used to measure the percentage of occupied habitats by sampling methods such as transects or quadrats to determine the percentage of a habitat occupied by invasive species. Finally, genetic analysis involves DNA sequencing or genotyping to determine the source of the species and its potential for adaptation and spread. At the same time, satellite imagery can be used to monitor spread and distribution over large areas.

Probability and Frequency

At least 200 high-impact invasive species occur in the United States. In addition, a new invasive species is established every 2 to 5 years. Therefore, the probability of new invasive species becoming established in Oakland County is relatively high.

Past Events

Some of the most notable invasive species include emerald ash borer, Asian carp, gypsy moth, zebra mussels, Phragmites, and Japanese beetles. Each of these species has significantly impacted the environment and resulted in decreased revenue and profits.

Vulnerability and Impacts

Health and Safety: The National Invasive Species Information Center (NISIC) states that some invasive species can have public health and safety impacts, including (National Invasive Species Information Center, 2023):

- Emerald ash borer: This invasive beetle can cause ash trees to become brittle and unstable, posing a hazard to public safety when trees fall or lose branches. Additionally, removing and disposing of infested trees can be expensive and time-consuming.
- Asian carp: These invasive fish can jump out of the water and collide with boaters and other recreational water users, potentially causing injury or damage. In addition, Asian carp can outcompete native fish species, reducing the overall biodiversity of aquatic ecosystems and negatively impacting fishing opportunities.
- Gypsy moth: The hairs of gypsy moth caterpillars can cause allergic reactions in some people. In addition, large populations of gypsy moths can defoliate trees, increasing the risk of wildfires and decreasing property values.
- Zebra mussels: These invasive mussels can attach to boats, docks, and other structures in freshwater ecosystems, leading to reduced water flow and increased maintenance costs. In addition, zebra mussels can filter out plankton, which can impact the food web and potentially reduce fish populations.
- Phragmites: Dense stands of this invasive reed can increase the risk of wildfires and impede access to bodies of water for recreation and emergency response.
- Japanese beetles: These invasive beetles can feed on various plants, including crops and ornamental plants. This can lead to economic impacts on farmers and the horticulture industry.

Property Damage and Critical Infrastructure: According to the NISIC, invasive species can impact property damage and critical infrastructure as follows (NISIC, 2023):

- Emerald ash borer: The weakening and death of ash trees due to emerald ash borer infestations can result in falling limbs and trees, which can cause property damage and create hazards for people and structures.
- Asian carp: Large populations of Asian carp can damage boats and motors by colliding with them. These collisions can damage property and create hazards for boaters and other watercraft.
- Gypsy moth: Gypsy moth caterpillars can defoliate trees, impacting property values and increasing the risk of wildfires.
- Zebra mussels: Zebra mussels can attach themselves to water intake structures for power plants, water treatment facilities, and other infrastructure, which can reduce their efficiency and increase maintenance costs.
- Phragmites: Dense stands of Phragmites can impede access to bodies of water, creating hazards for emergency response personnel and impacting recreational activities. Phragmites can also increase the risk of wildfires, threatening nearby property.
- Japanese beetles: Japanese beetles can feed on various plants, including crops, ornamental plants, and trees. This can result in economic losses for farmers and damage to landscaped areas and property values in residential areas.

Economy: The economic impact of invasive species can be relatively high. It is estimated that the cost of invasive species is over 120 billion annually in the U.S. Invasive species can kill

desirable plant and animal species, cause disease, reduce crop production, kill fish, decrease biodiversity, change hydrology, reduce aesthetic value, and hurt tourism. Therefore, removing or controlling invasive species is costly and can be ineffective in certain species.

4.26 Infrastructure Failure: Sanitary Sewer Overflow (SSO)

Hazard Description

A Sanitary Sewer Overflow (SSO) is when untreated sewage is discharged from a sanitary sewer system before reaching the treatment facility. For example, SSOs can occur when pipes become blocked or excess water enters the system due to heavy rainfall or other factors. SSOs can also occur when the treatment facility's capacity is exceeded, which can happen during extreme weather events or when the facility is undergoing maintenance or repairs. The release of untreated sewage from an SSO can pose a risk to public health and the environment, cause property damage and impact critical infrastructure.

Hazard Location

OCWRC operates or maintains sanitary sewer systems in most Oakland County communities. Rural areas of the County have no municipal sewer service available. The sanitary sewer systems in Beverly Hills and Franklin Village communities have been identified as areas with the most frequent maintenance needs. The oldest parts of the system are in the Pontiac area, with the average construction date in the 1920s. The number of sewer users impacted by each failure depends upon the event's severity. Lakes or rivers could also be affected due to sewer overflow discharges, making them temporarily unsafe for recreational activity.

Hazard Extent/Intensity

The measurement of SSOs can depend on the specific nature of the disruption and the goals of the assessment. However, a visual inspection of the sewer system and the surrounding area can help identify the extent of the disruption. Flow monitoring can also help track wastewater flow and identify any anomalies or changes that may indicate a disruption. Flow monitoring can also help identify congested areas of the system. Finally, water quality testing and complaint tracking are also measures of extent.

Probability and Frequency

A major SSO event occurs within the county approximately once every 20 to 25 years. More minor problems are more frequent. During significant storm events, a loss of power can occur at certain pump stations. This can create the potential for an overflow discharge to local rivers or lakes. Problems are expected to become more frequent as the system structures age.

Past Events

In September 2010, a sanitary sewer pipe failed, resulting in a giant sinkhole on a high-traffic road. The sinkhole also affected nearby utilities such as gas and water. In addition, the sewer

and sinkhole repairs caused road closures for an extended period. The road closures significantly disrupted residents, businesses, and the general public for many months.

On August 11, 2014, a historic rainfall event unfolded over Southeast Michigan, leading to significant flooding and road closures. This event was caused by a strengthening low-pressure system moving over the area, focusing on the tropical moisture from the south. The hardest hit areas included Metro Detroit and surrounding communities. Southern Oakland, Wayne, and Macomb counties saw the worst flooding as four to six inches of rain fell over four hours. Around 75,000 homes and businesses suffered damage, with over 3000 suffering significant damage. There was also damage to the roads and bridges, along with the city sewer pumps, which were overwhelmed by the torrential rainfall. The total estimated dollar loss from the Detroit Metro area was $1.8 billion. In addition, Oakland County suffered an estimated $400 million in property damage.

Vulnerability and Impacts

Health and Safety: According to the Environmental Protection Agency (EPA), the public and safety impacts of a sewer system disruption can include exposure to raw sewage, contamination of drinking water, and the spread of waterborne diseases, such as cholera, typhoid, and hepatitis A. Additional impacts can include property damage and environmental effects, including reduced biodiversity and degraded habitat quality (US EPA, 2023).

Property Damage and Critical Infrastructure: According to the EPA, sewer system disruptions can significantly impact property damage and critical infrastructure. When a sewer system becomes overloaded or damaged, untreated wastewater can overflow and spill into streets, homes, and businesses. This can cause significant damage to property, including structural damage to buildings, damage to personal property, and harm to critical infrastructure such as roads, bridges, and underground utilities (US EPA, 2023).

In addition to the immediate damage caused by a sewer system disruption, there can also be long-term impacts on property and infrastructure. For example, untreated wastewater can seep into the ground and cause soil and groundwater contamination, which can lead to ongoing environmental damage and costly remediation efforts. Sewer system disruptions can also cause damage to critical infrastructure, such as water treatment plants and pumping stations, which can disrupt the entire water supply system and have far-reaching impacts on public health and safety (US EPA, 2023).

Economy: Information regarding the economic impact of sanitary sewer system failures is unavailable. The sanitary sewer system is a vital part of the operations system for many businesses. It is anticipated that a failure could be extremely costly, depending upon the number of affected customers and the event duration.

4.27 Infrastructure Failure: Stormwater System

Hazard Description

Any malfunction or disruption in a stormwater management system that leads to flooding, property damage, or environmental harm. This can include clogged or blocked stormwater drains, inadequate drainage infrastructure, and failure of detention or retention systems. Stormwater system failures can be caused by various factors, including heavy rainfall, improper maintenance/design, and/or aging infrastructure.

Hazard Location

The area impacted by flooding depends upon the stormwater system's drainage area. Drains are found throughout Oakland County, and the Water Resources Commissioner's Office (OCWRC) maintains the system. Areas with combined stormwater systems (sanitary and stormwater flow) are more frequently found in the southern portions of the county. These areas can be at increased risk for sewer backups and basement flooding. Storm water systems for the remaining parts of Oakland County are operated and/or maintained by the Road Commission of Oakland County, the Michigan Department of Transportation, and/or local municipalities.

Hazard Extent/Intensity

The extent and intensity of a stormwater system failure can be measured in several ways, including field observations, stream monitoring, GIS mapping, aerial imagery, and public reports.

Probability and Frequency

Oakland County has two primary types of stormwater systems: open drains and enclosed underground systems. The primary problems with open drains are log jams, plugged drains, siltation, and bank erosion. The major dilemma with the County's open and enclosed stormwater systems is that the County's drainage needs exceed system capacity when rainfall amounts exceed the design capacity. The open stormwater system was initially designed to manage stormwater for a specific design event. However, when the design event is exceeded, flooding often occurs.

Capacity limitations of the stormwater system are evident during periods of high rain or snowmelt. Therefore, stormwater system flooding can be expected with any significant rain or snowmelt event. This hazard is anticipated to become more frequent and more severe as future rainfall amounts increase as projected.

Past Events

In September 2000, extensive rains in southeast Michigan flooded municipal storm sewers causing sewer backups in thousands of Oakland County homes and businesses. The primary cause of the sewer backups was a temporary loss of power at pumping stations and insufficient storm sewer system capacity due to the high rains, which exceeded the design capacity. The flooding caused extensive damage to affected homes and businesses and created a public health hazard due to potential exposure to untreated sewage. On October 27, 2000, Oakland County was granted a Presidential Disaster Declaration to assist affected businesses and individuals.

A historic rainfall event over Southeast Michigan on August 11, 2014, led to significant flooding and road closures. This event was caused by a strengthening low-pressure system moving over the area, focusing on the tropical moisture from the south. The hardest hit areas included Metro Detroit and surrounding communities. Southern Oakland, Wayne, and Macomb counties saw the worst flooding as four to six inches of rain fell over four hours. Around 75,000 homes and businesses suffered damage, with over 3,000 suffering significant damage. There was also damage to the roads and bridges, along with the city sewer pumps overwhelmed by the torrential rainfall. The total estimated dollar loss from the Detroit Metro area was $1.8 billion. In addition, Oakland County suffered an estimated 400 million in property damage.

In September 2016, Heavy rain fell across the Detroit Metro Area during the morning hours (two to five inches). As a result, widespread urban flooding was reported, with many roads and interstates closed. In addition, many basements were also flooded. The flooding resulted in approximately $2 million in damages in the Detroit Metro Area, with $500,000 coming specifically from damages in Oakland County.

Vulnerability and Impacts

Health and Safety: The stormwater system is of great importance to protecting human health and safety. Flooding, which results during system failures or capacity exceedances, can create safety problems and sewer backups in both combined stormwater systems (sanitary and stormwater flow) and separated stormwater systems, presenting a health concern.

Property Damage and Critical Infrastructure: Stormwater system failures can significantly impact property damage and critical infrastructure. The excess water from a system failure can cause flooding, which leads to property damage (buildings, roads, and other infrastructure). Additionally, flooding can lead to soil and water contamination, posing risks to public health and the environment. Stormwater system failures can also lead to stream banks and shoreline erosion, which can cause sedimentation and loss of habitat for aquatic species. In urban areas, stormwater system failures can increase runoff, contributing to combined sewer overflows and other water pollution. In extreme cases, system failures can even pose risks to public safety, such as when flooding causes roads to become impassable or when combined sewer overflows cause raw sewage to overflow into streets and waterways (US EPA, 2023).

Economy: As demonstrated by the September 2000 system failure, flooding can result in significant property damage costs. Stormwater system upgrades can also be very costly to implement. Funding is available for maintaining many Oakland County drains; however, maintenance funding is limited to approximately 200 County drains established under the 1956 Drain Code. Each year claims are filed with OCWRC for property damage due to flooding caused by system backups and capacity exceedances.

4.28 Infrastructure Failure: Water System

Hazard Description

A water system failure refers to any situation that renders a public water system (PWS) incapable of providing safe drinking water to its customers. Examples of water system failures include chemical contamination, microbial contamination, a loss of pressure or flow in the distribution system, or any other situation that poses a risk to public health and safety.

Hazard Location

The Oakland County Water Resources Commissioner's Office (OCWRC) operates and maintains the water system for many of the communities of Oakland County. The OCWRC's water system has been designed to minimize the number of people impacted by service interruption.

The WRC operates and maintains the water systems for the following communities:

- Beverly Hills (emergency & as needed)
- Bingham Farms
- Bloomfield Hills
- Commerce Township
- Farmington Hills
- Highland Township
- Keego Harbor
- Oakland Township
- Orchard Lake Village
- Oxford Township
- Pleasant Ridge
- Pontiac
- Royal Oak Township
- Sylvan Lake
- Walled Lake

Hazard Extent/Intensity

The extent/intensity of a water system failure can be measured by the number of customers affected, the duration of the outage, and the cause of the failure. Water system disruptions can be attributed to causes such as construction/excavation activities, underground freezing, power outages, and system blockages.

Probability and Frequency

The vast majority of water line breaks do not create a water crisis situation. It is estimated that this hazard will be somewhat more likely to occur in the future as the water system structures age and countywide development continues.

Past Events

On June 7, 1999, a water main break in the City of Auburn Hills resulted in a week-long loss of water service to over 44,000 households in Auburn Hills, Orion Township, Lake Orion, and Rochester Hills. The break was caused when a drilling company accidentally struck a water main. The water emergency forced the temporary closures of hundreds of schools and businesses, including major industries within the affected area. In addition, local officials estimated that the water emergency resulted in economic losses in the tens of millions of dollars.

On October 23, 2017, a 48-inch water main broke in Farmington Hills, causing at least 50,000 people to lose water service and impacting over 300,000 people ultimately. Affected county areas were placed on a water boil until the break could be fixed and water pressure restored. The water boil lasted for up to nine days in the hardest-hit areas.

In August of 2022, Gov. Gretchen Whitmer declared a state of emergency for Lapeer, Macomb, Oakland, and St. Clair counties following a major water main break. A precautionary boil water notice was issued for 13 communities.

Other notable water main breaks have occurred impacting communities in Oakland County:

- March 2018
- November 2021
- August 2022
- October 2022
- June 2023
- August 2023

Vulnerability and Impacts

Health and Safety: When a public water system is unable to provide safe drinking water, it can result in the spread of waterborne diseases such as cholera, dysentery, and typhoid fever. Additionally, a water system failure can release harmful contaminants into the environment, contaminating groundwater and surface water sources and causing harm to aquatic life and other organisms. In extreme cases, a water system failure can also lead to losing access to water for sanitation and firefighting, increasing the risk of disease outbreaks and property damage.

Property Damage and Critical Infrastructure: A water system failure can significantly impact property damage and critical infrastructure. Water mains that break can flood streets and homes, potentially causing structural damage. In addition, the water supply to critical infrastructure such as hospitals, fire stations, and other emergency services may be compromised, leading to service disruptions and potentially life-threatening situations. Additionally, suppose water supply systems are not adequately maintained or repaired promptly. In that case, they may suffer from additional failures or damage, resulting in further property damage and increased costs for repairs and replacement.

Economy: Information regarding the economic impact of water system failures is unavailable. It is anticipated that an interruption in service can be extremely costly, depending upon the number of affected customers and the duration of the event.

4.29 Nuclear Incident: Power Plant Accident

Hazard Description

A nuclear power plant accident would involve an actual or potential release of radioactive material at a nuclear facility in a quantity sufficient to threaten off-site populations' health and safety.

Hazard Location

Approximately 460 square miles in the southern portion of Oakland County are within the Secondary Emergency Planning Zone of the Enrico Fermi-2 plant. However, the actual area impacted by a release would depend significantly on the type and amount of radioactive material released, weather conditions, and the location relative to wind direction following the release.

See Nuclear Power Plant Map (FOUO) in the Appendix E**.**

Hazard Extent/Intensity

Hazards related to a nuclear event are:

- **Bright FLASH** can cause temporary blindness for less than a minute.
- **BLAST WAVE** can cause death, injury, and damage to structures several miles from the blast.
- **RADIATION** can damage cells of the body. Significant exposures can cause radiation sickness.
- **FIRE AND HEAT** can cause death, burn injuries, and damage to structures several miles out.
- **ELECTROMAGNETIC PULSE (EMP)** can damage electrical power equipment and electronics several miles from the detonation and cause temporary disruptions.
- **FALLOUT** is radioactive, visible dirt and debris raining down from several miles up that can cause sickness to those outside.

Probability and Frequency

The probability of a nuclear event in Oakland County depends on various factors, including the presence of the Fermi 2 Power Plant, safety and security measures, and the overall risk of natural disasters or other events that could trigger a nuclear incident. While the risk of a nuclear event cannot be eliminated, measures can be taken to mitigate the risk and ensure the safety and well-being of individuals and communities.

Past Events

There has never been an off-site release of radioactive material from a nuclear power plant in Michigan. However, an onsite release did occur on October 5, 1966, at the Enrico Fermi-1 Atomic Power Plant in Monroe County, Michigan. The release resulted from a fuel meltdown; however, the radioactive material was contained within the reactor containment building. The Fermi-1 plant was shut down in 1972. In 1998, the Enrico Fermi-2 plant was opened next to the site of Fermi-1.

Vulnerability and Impacts

Health and Safety: Power plant accidents can result in exposure to harmful radioactive material, causing acute and chronic health effects, including radiation sickness, cancer, and genetic damage. Releasing radioactive materials can also contaminate the environment, making it unsafe for human habitation and wildlife. Additionally, the psychological impact of a nuclear incident on affected individuals and communities can be severe and long-lasting.

Property Damage and Critical Infrastructure: The release of radioactive materials can contaminate nearby buildings, roads, and farmland, rendering them unusable for extended periods. In addition, power plant accidents can lead to power outages and disruptions to transportation networks and communication systems, making it difficult for emergency responders to access the affected areas.

Economy: There is no data demonstrating the impact of nuclear power plant accidents on Oakland County. However, estimated costs associated with the loss of property and/or infrastructure can be substantial, and recovery efforts may take years. In addition, the long-term economic impacts of a power plant accident can also be severe, as industries and businesses in the affected region may suffer long-term financial losses.

4.30 Sociopolitical Hazards (Civil Disturbance, Social Unrest)

Hazard Description

A public gathering or inmate uprising that disrupts essential functions and results in unlawful behavior such as rioting or arson. This event involves a large number of people and requires a significant response effort by law enforcement and/or emergency responders.

Hazard Location

Public gathering places such as festivals, sporting and entertainment venues, colleges and universities, detention facilities, and government facilities are the most likely places for a civil disturbance. Oakland County features numerous public gathering places, including major entertainment venues, festivals, national events, major athletic facilities, places of political protest, and governmental facilities. The most vulnerable locations/events include the following.

- Courthouses and federal buildings
- Detention facilities
- Pine Knob Music Theatre
- Great Lakes Crossing Outlets
- Hazel Park Raceway
- Meadow Brook Hall & Theater
- Michigan State Fair
- Oakland Community College
- Oakland County Fair
- Oakland University
- Renaissance Festival
- Royal Oak Arts, Beats, & Eats
- Woodward Dream Cruise

Probability and Frequency

A sociopolitical hazard occurs in Michigan approximately once every ten years. Sociopolitical hazards are most common in areas of political gathering, sporting events, universities and colleges, and prisons. The most likely causes for an event in the County would result from a sociopolitical event, labor dispute, a sporting event, or a demonstration at a college, government, or military facility.

Although there is little history of civil disturbances within Oakland County, the potential for this hazard to occur is somewhat elevated due to the number of sports/entertainment venues, educational facilities, detention facilities, and government facilities within the County.

Past Events

In Michigan, significant civil disturbances are not common and typically are a result of the following causes:

- Labor disputes
- Controversial court judgments or government actions
- Resource shortages
- Demonstrations by special interest groups
- Unfair death or injury
- Celebrating a victory by a sports team.

Although not in Oakland County, the five-day 1967 Detroit Riot (from July 23rd to 27th) left 43 people dead and 1,189 injured. Over 7,200 people were arrested, and property damage reached hundreds of millions. Racial tensions sparked the cause of the Detroit Riot.

An anti-war demonstration at Memorial Park in Royal Oak, Michigan, occurred on May 6, 1970. Upon leaving the park, the protesters (many of whom were young) got into a confrontation with local police. As a result, five protesters were arrested, three were injured, and one policeman was injured.

The Memorial Park Riot occurred in Royal Oak, Michigan, between August 24th and 27th, 1970. Police shut down the park due to drug sales, drug use, and illegal parties. When the police went to shut down the park, 800 youths confronted the police officers and sparked a four-hour riot. Windows were broken, and barricades were built on Woodward Avenue. One hundred protesters were arrested on the second night of the riots, and a curfew was imposed. Due to the curfew, at least 1,000 young rioters moved north into Birmingham on the third night (some estimates have up to 2,000 rioters involved). Over 560 people were arrested on the third night, and a curfew was imposed in both Royal Oak and Birmingham. No violence occurred on the fourth night, although 90 people were arrested for breaking the curfew.

In 2008, approximately 100 people started rioting with police at what is now McLaren Hospital in Pontiac following a police investigation into the shooting of a local man. The Pontiac Police called for assistance from Michigan State Police and the Oakland County Sheriff's Office to bring the crowd under control. Neighboring areas, such as the City of Detroit, have a history of significant civil disturbances, primarily due to civil rights demonstrations and labor disputes.

In recent years, there have been many protests across the country that have escalated to rioting, looting, and other acts of violence. These riots are the result of civil unrest related to racial inequalities as well as political ideologies. In June of 2020, for example, more than 300 peaceful protesters marched through Oakland County’s government complex. Other protests related to COVID-19 also occurred in 2021.

Vulnerability and Impacts

Health and Safety: There were no reports of death or severe injury from the 2008 Pontiac riot. In Michigan statewide, there have been over 75 deaths and over 1,700 injuries from significant civil disturbances from 1943 through 2022.

Property Damage and Critical Infrastructure: Property damage can occur as a result of riots, looting, and arson, which can result in the destruction of buildings, vehicles, and other property. Critical infrastructure, such as power grids, telecommunications systems, and transportation networks, can also be disrupted during civil disturbances, seriously affecting public safety and the economy.

Economy: No data exists demonstrating the economic impact of previous civil disturbances in Oakland County. However, historical civil disturbances have been shown to impact the economy in several ways, including financial losses from property damage and lost sales for businesses forced to close during the disruption. In addition, civil disturbances can result in decreased property values, particularly in areas seen as unsafe or prone to unrest.

4.31 Terrorism and Sabotage

Hazard Description

Intentional, unlawful use of force, violence, or subversion against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political, social, or religious objectives.

The most recognized forms of terrorism include assassination, bombings, and extortion. These acts are often identified with particular groups or organizations. The Middle East and portions of Europe, South America, and Asia have significantly been impacted for many years by acts of terrorism and sabotage. In more recent years, the United States has been the victim of acts of terrorism.

The sabotage of computer systems, also known as hacking, is increasingly concerning. Organized hacking groups, such as "Anonymous," target specific organizations, corporations, and governmental agencies to bring down websites for a stated purpose. Other groups hack into and retrieve sensitive and confidential information to make a profit or expose it on the internet. Individual hackers may steal identities or personal credit card information. Other forms of sabotage to computer systems include the introduction of viruses, malware, or spyware that can cripple a computer network or steal private information.

Hazard Location

Terrorism can take many forms, and the aim of terrorist attacks can vary from destroying property to harming people to disrupting the quality of life. Depending on the type of terrorist attack, property damage can be extensive. Unfortunately, any information on this matter is law enforcement and homeland security sensitive and, therefore, unavailable to the general public.

Hazard Extent/Intensity

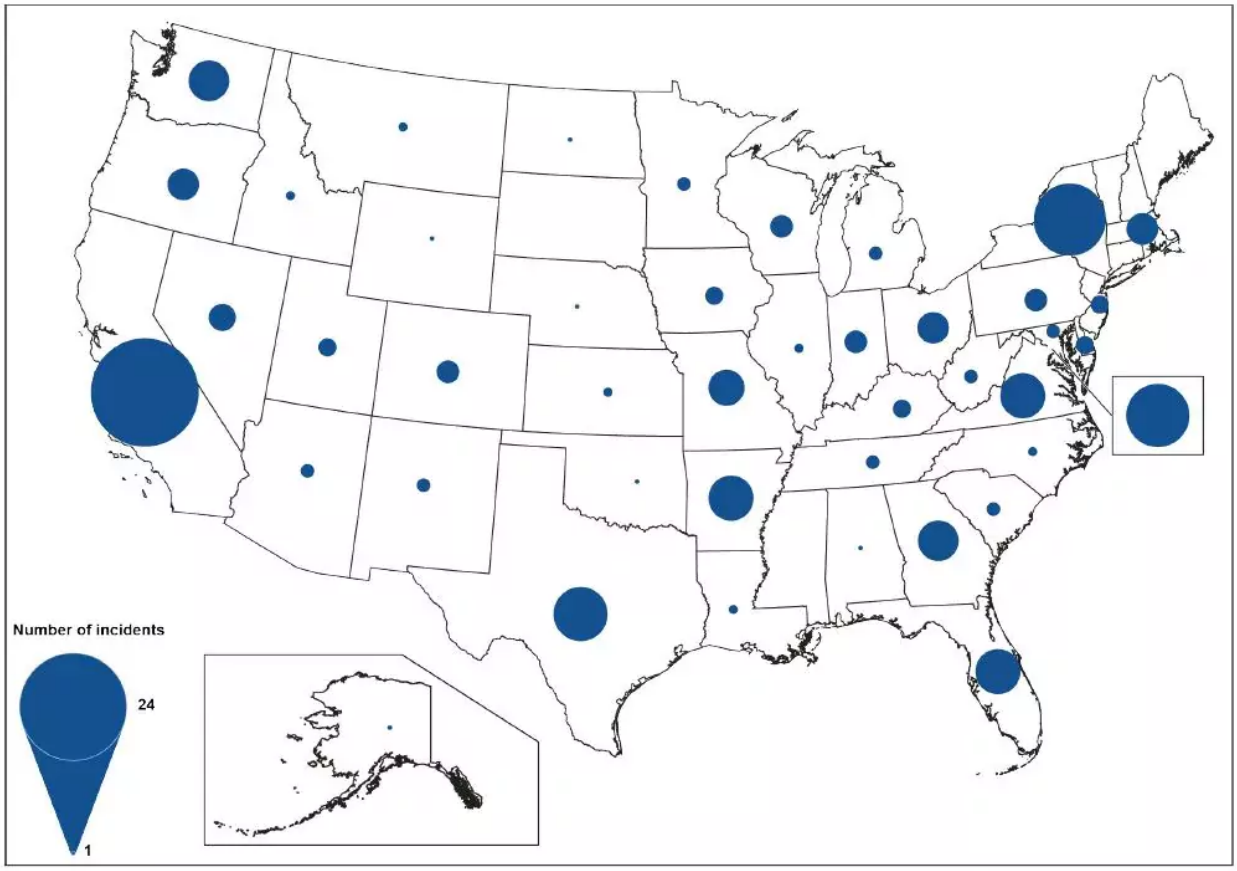
Incident data, including the number of incidents, casualties, and property damage, is collected and analyzed to identify trends and geographical hotspots of terrorist or sabotage activities. In addition, threat assessments consider factors such as group capabilities, intentions, and past actions to gauge potential risks and allocate resources effectively. Next, risk analysis evaluates vulnerabilities and possible consequences of attacks on critical infrastructure, transportation systems, and public spaces to develop appropriate response strategies. Intelligence gathering, including human intelligence, signals intelligence, and open-source intelligence, enables monitoring and tracking of terrorist or sabotage groups. And finally, comparative analysis on a global scale can assess the relative intensity of terrorism and sabotage by comparing data and statistics with other countries or regions.

Probability and Frequency

It is difficult to establish the frequency of terrorist activity in Oakland County based on historical events. However, acts of terrorism in Michigan have included bombings, shootings, and arson. Despite the unpredictable nature of this hazard, it is likely to occur in the future.

Domestic terrorism is also on the rise. Several attacks have been widely reported in the last few years. For example, in May 2022, a racially motivated individual shot and killed 10 people in Buffalo, New York. A 2018 attack on a Pittsburgh synagogue left 11 people dead. All but eight states across the U.S. experienced at least one incident of domestic terrorism between 2010 and 2021. And over the last 10 years, domestic terrorism-related investigations have grown by 357%.

Figure 4-98. Domestic Terrorism Incidents by State, 2010 through 2021



Source: GAO analysis of Department of Homeland Security Counterterrorism Mission Center data. | GAO-23-104720

Past Events

Unfortunately, Oakland County has experienced acts of terrorism. For example, on August 30, 1971, members of the Ku Klux Klan gained access to the school bus depot in Pontiac and used dynamite to bomb the buses. The crime was committed in response to court actions requiring a busing plan to integrate local schools.

El Debek was arrested in Livonia, Michigan, outside of Detroit, for providing, attempting, and conspiring to provide material support to Hizballah; receiving and conspiring to receive military-type training from Hizballah; use of weapons in connection with a crime of violence that is alleged to have involved, among other weapons, explosives, a rocket-propelled grenade launcher, and machine guns; and violating and conspiring to violate IEEPA.

Vulnerability and Impacts

Health and Safety: Acts of terrorism and sabotage can have severe consequences regarding loss of life and injuries, leading to physical harm, trauma, and long-term health effects for victims and their families. Such acts' psychological and emotional impact can be profound, generating fear, uncertainty, and anxiety within individuals and communities, potentially resulting in increased stress, PTSD, anxiety disorders, and other mental health issues. Additionally, attacks targeting critical infrastructure, including transportation systems, energy, and healthcare facilities, can disrupt essential services and compromise public safety. Disruptions in these areas can impede travel, commerce, and access to medical care during emergencies. Lastly, acts of terrorism and sabotage are designed to instill fear and panic and disrupt societal order, potentially leading to public alarm, social unrest, and a breakdown of trust within communities. These consequences can hinder effective emergency responses and compromise community resilience, further impacting public health and safety.

Property Damage and Critical Infrastructure: Acts of terrorism and sabotage can result in extensive property damage, with explosions, arson, and other destructive methods destroying buildings, infrastructure, and physical assets. Additionally, terrorists and saboteurs often target critical infrastructure, encompassing systems, and facilities vital for societal functioning, such as power plants, transportation networks, communication systems, water treatment plants, and healthcare facilities. Damage to or disruption of critical infrastructure has wide-ranging consequences, affecting public safety, essential services, and economic stability. The social disorder occurs as critical infrastructure becomes a target, resulting in a breakdown of normal functioning. For example, transportation system disruptions hinder the movement of people and goods, affecting daily routines, commerce, and emergency response capabilities. Damage to healthcare facilities hampers access to medical care during emergencies, posing public health and safety risks. Such disruptions can have cascading effects on the overall functioning of society.

Economy: It is difficult to determine the economic impact of terrorist acts. Given that terrorism can take many forms and have widely different consequences, there is the potential for terrorist acts to cause significant economic damage.

4.32 Transportation Accident: Air

Hazard Description

An occurrence associated with the operation of an aircraft occurs between the time any person boards the plane with the intention of flight until all such persons have disembarked and in which any person suffers death or serious injury or in which the aircraft receives substantial damage.

Hazard Location

Because most aircraft accidents occur during landing or takeoff, the area most at risk for impact at an airport (or heliport) includes all runways and immediately adjacent areas. All three public airports (Oakland County International, Oakland Troy, and Oakland Southwest Airport) are owned by Oakland County. The three private airports within the county are Ed Schultes Place Airport, Willie Run Airport in Ortonville, and Handleman Sky Ranch Airport in Oxford. Three of the 20 heliports are owned by hospitals (William Beaumont, Huron Valley Sinai, and Providence Hospitals), and private citizens own nine. The seaplane base is located in Pontiac.

Hazard Extent/Intensity

The extent and intensity of an air transportation accident is measured through various methods. Firstly, immediate notification and reporting of civil aircraft accidents are completed to document information about the incident. Reporting aids in assessing the extent of the accident and allows for compiling comprehensive accident data. Additionally, thorough investigations are conducted to analyze various sources of evidence, such as flight data, cockpit voice recordings, maintenance records, and eyewitness accounts. These investigations aim to determine the causes and contributing factors of the accident, providing insights into its extent and severity. Furthermore, the extent of damage to the aircraft involved, including structural and engine wear, is examined to provide further insights into the accident's intensity and potential impact on aircraft operations.

Probability and Frequency

Since 2010, nine reportable air transportation incidents have occurred in Oakland County. The aircraft involved in these incidents were all small aircraft with a limited number of passengers. There have been no air incidents involving large, commercial passenger aircraft in Oakland County. The probability of air transportation accidents is anticipated to fluctuate with air traffic volume.

Past Events

Notable and recent past events include:

- An airplane accident in Oakland County occurred on March 2, 1973, in Pontiac, when a small, private aircraft stalled in flight and crashed, killing all four people on board. The National Transportation Safety Board determined the crash's probable cause was a pilot error.

- The deadliest single-survivor air transportation accident in U.S. aviation history occurred nearby in Romulus, Michigan (Wayne County). Northwest Airlines Flight 255 crashed after takeoff on August 16, 1987, killing six crew members and 149 passengers, except for a 4-year-old girl who sustained severe injuries. The crash killed two others on the ground.

- In 2006, a flight instructor and his student were killed in a single-engine plane belonging to a flight school. The incident occurred at the Oakland County International Airport.

- In September 2009, a plane was forced to make an emergency landing in a store parking lot resulting in minor injuries to the pilot.

- In June of 2013, four people were killed when a small plane crashed at Oakland County International Airport in Waterford Township. The plane was taking off from runway 9 Left (heading east) and reached an estimated altitude of 100 feet. The plane crashed on the airport grounds beyond the end of the runway and burst into flames.

- In January 2021, three individuals died after small plane crashed into an Oakland County house in New Hudson in a neighborhood just west of Pontiac Trail and Grand River Avenue, in the Orchards of Lyon subdivision. The house is on Dakota Drive. The neighborhood is just a short distance from the Oakland/Southwest Airport along Pontiac Trail. The three who died were the plane's pilot and two passengers.

- In August of 2019, a seaplane crashed into three pontoon boats in Oakland County. This occurred near the Orchard Lake Nature Sanctuary, which is at Pontiac Trial and Old Orchard Trail. The seaplane was trying to land on the lake when it hit three pontoon boats and then struck the sand bar. There were several people in the water and on the pontoon boats who were injured.

- In September of 2019, two people sustained minor injuries after their small plane crashed in an Independence Township yard.

Vulnerability and Impacts

Health and Safety: Air transportation accidents can have significant public health and life safety impacts, including loss of life, injuries and trauma, public safety concerns, and community impact. Fatalities resulting from air transportation accidents can include passengers, crew members, and individuals on the ground near the accident. The loss of life can profoundly

affect the families and loved ones of the victims and the broader community affected by the accident. Survivors of air transportation accidents may suffer various injuries, ranging from minor to severe, which can have long-lasting physical and psychological effects, requiring medical treatment, rehabilitation, and support services. Air transportation accidents pose public safety concerns due to the potential for collateral damage or injuries to people on the ground.

Depending on the circumstances and location of the accident, nearby communities may be exposed to risks such as fires, fuel spills, or debris hazards. Emergency responders and authorities work to mitigate these risks and ensure the public's safety in the aftermath of an accident. In addition, the emotional toll, economic consequences, and recovery efforts following an accident can affect the overall well-being and resilience of the community, leading to a profound impact on the communities in which they occur.

Property Damage and Critical Infrastructure: Air transportation accidents can significantly impact property damage and critical infrastructure, including extensive property damage and destruction of buildings, structures, vehicles, and other physical assets. The force of impact, fires, and other consequential events can substantially damage the accident site and surrounding areas. Air transportation accidents can also disrupt critical infrastructure, including airports, air traffic control systems, communication networks, power generation and distribution facilities, and transportation infrastructure. Damage or destruction of these elements can have far-reaching consequences, affecting public safety, transportation systems, communication networks, power supply, and other vital services. Finally, air transportation accidents can disrupt ground transportation systems. Crashes near airports or significant roadways can lead to road closures, traffic congestion, and delays in ground transportation. Such disruptions can cascade effects on commerce, supply chains, and the movement of people and goods, impacting local and regional economies.

Economy: Economic impact would result from damage to the aircraft and any structures or improvements on the ground at the accident site. Damages to aircraft would typically be the responsibility of the private owner. Because Oakland County owns the airports, any damages to the airport infrastructure may be the county's responsibility. The additional economic impact to the county may result if an accident causes disruption of services at the airport. Reportable airplane crashes result in substantial damage to the aircraft, including prop, nose, wings, fuselage, landing gear, tail, and engine.

4.33 Transportation Accident: Highway

Hazard Description

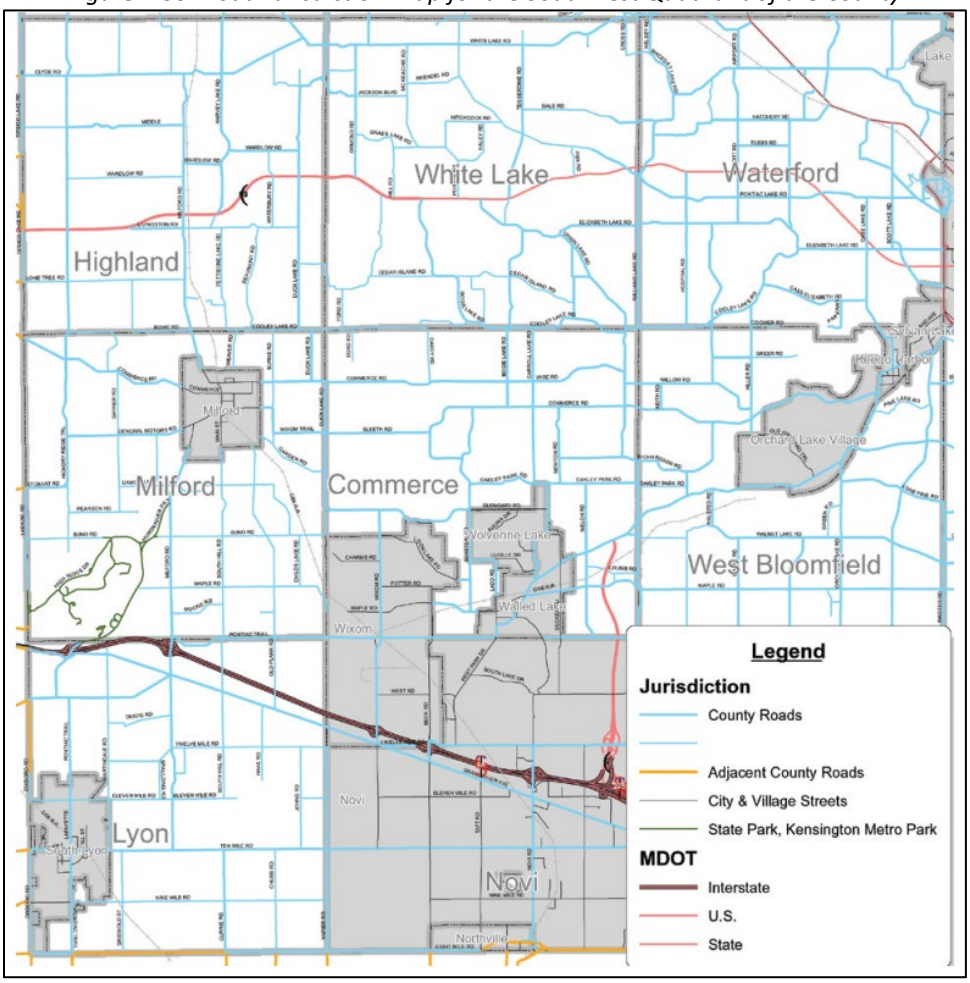
An event involving a motor vehicle operating on a public road or highway that results in property damage, injuries, or fatalities. It encompasses collisions between automobiles, single-vehicle accidents, crashes involving pedestrians or cyclists, and any other mishaps on public roadways.

Hazard Location

As in all counties in Michigan, all roads in Oakland County fall into one of three categories of road jurisdiction: 1. State highways (MDOT) 2. County roads (RCOC) 3. City or village streets.

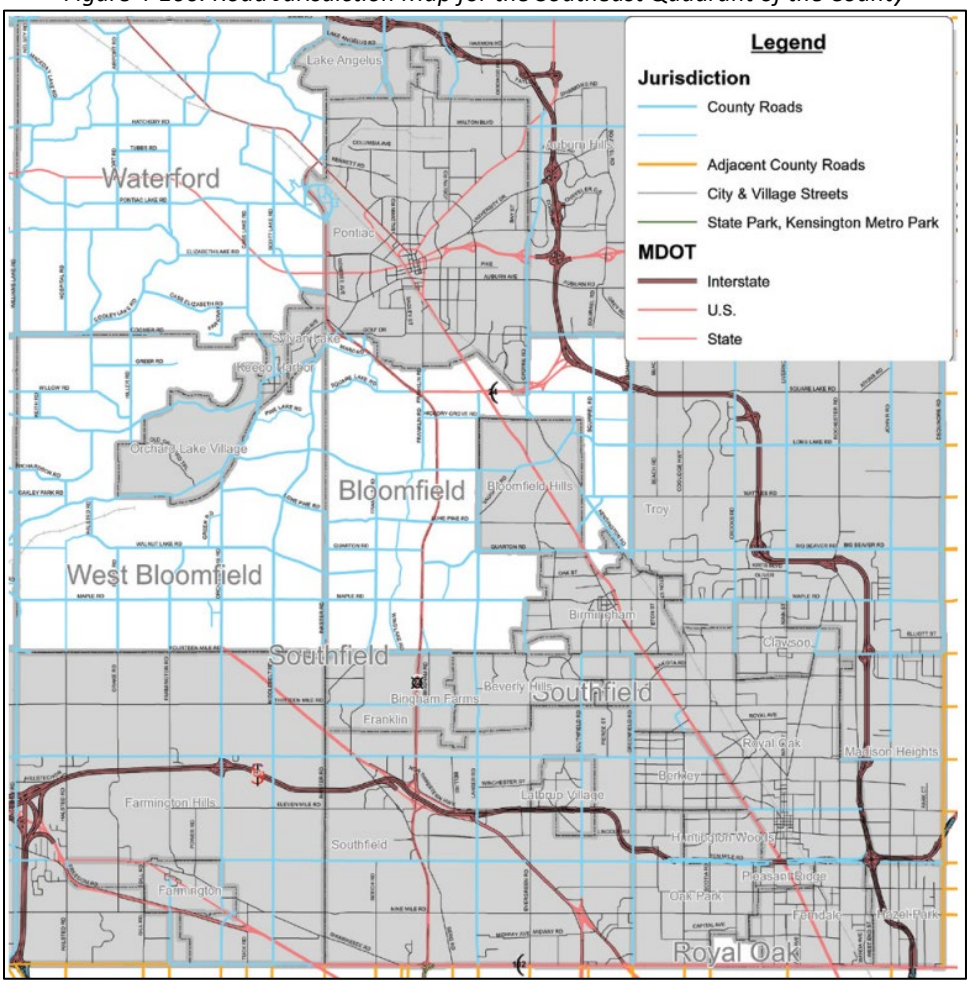
According to 2021/2022 data from SEMCOG, Oakland County has 7,186 miles of public roads.

Figure 4-99. Road Jurisdiction Map for the Southwest Quadrant of the County



Source: Road Commission for Oakland County

Figure 4-100. Road Jurisdiction Map for the Southeast Quadrant of the County

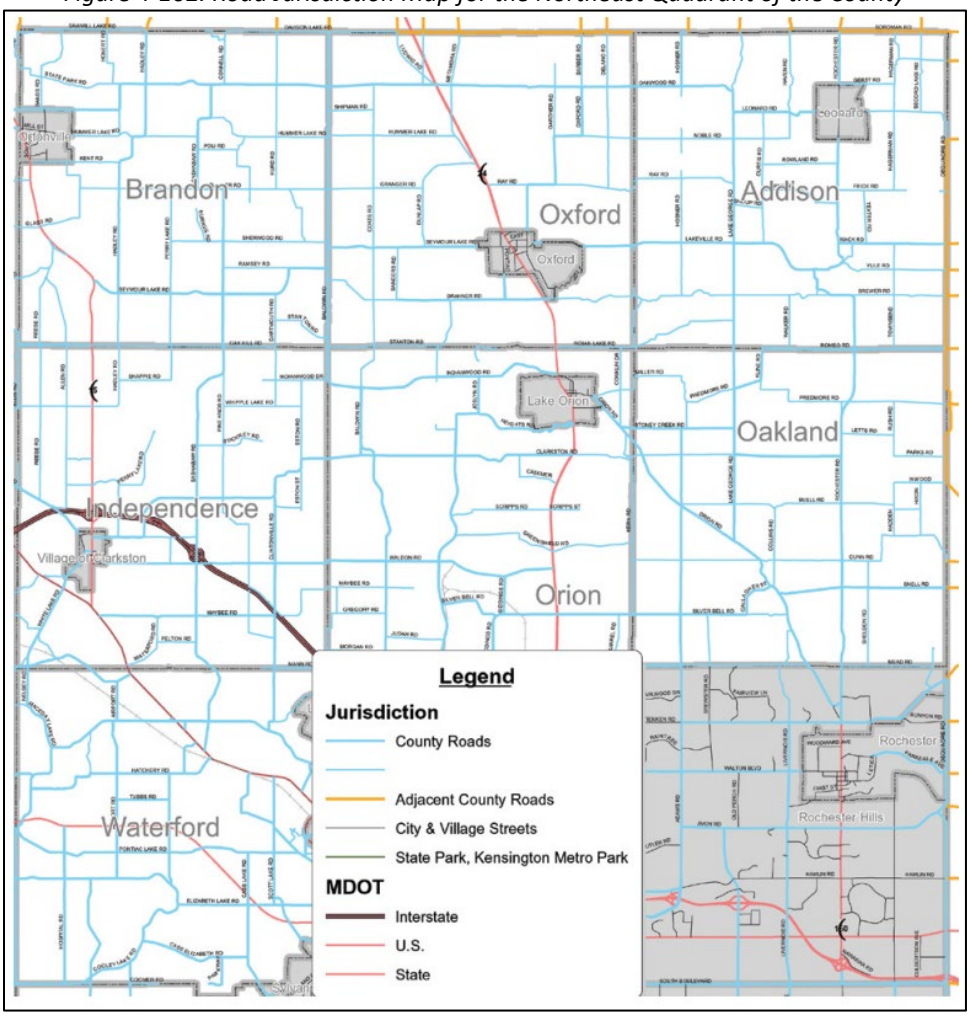


Source: Road Commission for Oakland County

Figure 4-101. Road Jurisdiction Map for the Northwest Quadrant of the County

Source: Road Commission for Oakland County

Figure 4-102. Road Jurisdiction Map for the Northeast Quadrant of the County



Source: Road Commission for Oakland County

Hazard Extent/Intensity

Various methods measure the extent and intensity of a highway transportation accident. These methods include reporting and documentation, accident data analysis, fatality and injury statistics, crash reconstruction, and traffic flow analysis. Reporting and documentation require parties involved in accidents and witnesses to report detailed information about the incident. This data is compiled to gain a comprehensive understanding of the accident. Accident data analysis involves analyzing vehicle types, road conditions, and driver behavior to identify patterns and contributing factors. Fatality and injury statistics provide insights into the human impact of accidents. Crash reconstruction is conducted in more severe cases, utilizing physical evidence and vehicle damage analysis to recreate the sequence of events and understand the accident's intensity. Finally, traffic flow analysis evaluates traffic volume and congestion to prioritize safety improvements in areas with high accident rates.

Probability and Frequency

Automobile accidents occur several times daily in Oakland County.

In **2018**, there were 28,147 vehicular accidents in Oakland County, according to the SEMCOG Traffic Crash Report. 49 of those accidents resulted in a fatality.

In **2019**, there were 28,185 vehicular accidents in Oakland County, according to the SEMCOG Traffic Crash Report. 60 of those accidents resulted in a fatality.

In **2020**, there were 18,251 vehicular accidents in Oakland County, according to the SEMCOG Traffic Crash Report. 48 of those accidents resulted in a fatality.

In **2021**, there were 22,669 vehicular accidents in Oakland County, according to the SEMCOG Traffic Crash Report. 61 of those accidents resulted in a fatality.

From 2012 to 2021, there were 12,516 accidents involving **commercial trucks** in Oakland County, according to the SEMCOG Traffic Crash Report. 41 of those accidents resulted in a fatality.

From 2012 to 2021, there were 748 accidents involving a **school bus** according to the SEMCOG Traffic Crash Report. Two of those accidents resulted in a fatality

Based on the 2017 - 2021 annual average crash statistics from the Southeast Michigan Council of Governments, the following road segments have the highest frequency of crashes in Oakland County:

Table 4-90. Road Segments with the Highest Frequency of Crashes in Oakland County

COUNTY RANK	NAME	FROM ROAD TO ROAD	2017	2018	2019	2020	2021	TOTAL	YEARLY AVG
1	Rochester Rd S	Auburn Rd E - Hamlin Rd E	117	104	123	58	86	488	97.6
2	Dequindre Rd	11 Mile Rd - 12 Mile Rd	91	99	98	52	98	438	87.6
3	Highland Rd	Teggerdine Rd - Pontiac Lake Rd	113	85	99	49	87	433	86.6
4	Huron St W	Telegraph Rd N - Franklin Blvd	74	117	89	70	82	432	86.4
5	Telegraph Rd	12 Mile Rd W - 13 Mile Rd W	89	107	90	58	73	417	83.4
6	Southfield Rd	13 Mile Rd W - 12 Mile Rd W	102	90	89	45	82	408	81.6
7	Highland Rd	Airport Rd - Crescent Lake Rd	108	74	86	59	74	401	80.2
8	Rochester Rd S	Hamlin Rd E - Avon Rd E	90	95	94	52	62	393	78.6
9	Southfield Rd	12 Mile Rd W - 11 Mile Rd W	104	90	68	53	66	381	76.2
10	Orchard Lake Rd	12 Mile Rd W - 13 Mile Rd W	95	71	87	49	73	375	75

11	12 Mile Rd W	N I 75/E 12 Mile Ramp - John R Rd	59	64	66	94	81	364	72.8
12	Rochester Rd	Square Lake Rd E - South Blvd E	91	92	83	31	53	350	70
13	Highland Rd	Pontiac Lake Rd - Cass Lake Rd N	74	80	82	53	58	347	69.4
14	Dequindre Rd	12 Mile Rd - 13 Mile Rd E	67	81	85	48	57	338	67.6
15	Telegraph Rd S	Fairfax - Square Lake Rd W	68	57	75	62	66	328	65.6
16	Union Lake Rd	Richardson Rd - Commerce Rd	87	52	77	45	62	323	64.6
17	Ortonville Rd	Seymour Lake Rd - South St	77	66	67	48	52	310	62
18	Southfield Rd	10 Mile Rd W - Mount Vernon St	70	63	70	38	66	307	61.4
19	Orchard Lake Rd	Northwestern Hwy - Maple Rd W	79	62	74	44	47	306	61.2
20	12 Mile Rd E	John R Rd - Dequindre Rd	52	78	68	38	62	298	59.6

Source: SEMCOG

Based on the 2017 - 2021 annual average crash statistics from the Southeast Michigan Council of Governments, the following intersections have the highest frequency of crashes in Oakland County:

Table 4-91. Intersections with the Highest Frequency of Crashes in Oakland County

COUNTY RANK	NAME	2017	2018	2019	2020	2021	TOTAL	YEARLY AVG
1	Southfield Rd @ 11 Mile Rd W	75	50	51	49	53	278	55.6
2	12 Mile Rd W @ Orchard Lake Rd	79	56	61	26	50	272	54.4
3	Huron St W @ Telegraph Rd N	54	51	46	47	47	245	49
4	Southfield Rd @ 10 Mile Rd W	54	56	62	20	52	244	48.8
5	Martin Pkwy @ N M 5	68	46	53	31	44	242	48.4
6	14 Mile Rd W @ Orchard Lake Rd	52	50	62	31	45	240	48
7	Martin Pkwy @ Pontiac Trl N	39	51	62	44	36	232	46.4
8	Highland Rd @ Crescent Lake Rd	71	43	35	36	40	225	45
9	12 Mile Rd @ Dequindre Rd	48	53	43	37	41	222	44.4
10	Grand River Ave @ Wixom Rd S	60	48	39	31	42	220	44
11	12 Mile Rd E @ John R Rd	27	54	54	43	41	219	43.8
12	14 Mile Rd @ Dequindre Rd	34	52	66	26	37	215	43
13	Highland Rd @ Airport Rd	47	52	42	25	45	211	42.2
13	12 Mile Rd W @ Telegraph Rd	48	59	45	26	33	211	42.2

13	S I 75/Dixie Ramp @ Dixie Hwy	49	39	53	30	40	211	42.2
16	13 Mile Rd E @ John R Rd	37	54	42	33	42	208	41.6
17	Huron St W @ Woodward Ave W	47	30	52	39	37	205	41
18	Elizabeth Lake Rd @ Highland Rd	38	50	46	28	38	200	40
19	Maple Rd W @ Orchard Lake Rd	43	42	49	33	30	197	39.4
20	12 Mile Rd W @ Dartmouth	28	40	33	51	41	193	38.6

Source: SEMCOG

Past Events

Vehicle accidents are common in all communities and can happen along any roadway. Most accidents are due to driver error and/or inclement weather conditions. Accidents involving modes of mass public transportation are of particular concern due to the high number of passengers which could be impacted.

An accident in Wixom on September 14, 2000, involved a collision between a Northville High School bus and an automobile. The school bus was carrying 48 students and several coaches. The accident killed the car's driver and injured one car passenger and ten bus passengers.

Vulnerability and Impacts

Health and Safety: Highway transportation accidents can have significant public health and life safety impacts, including the loss of life among drivers, passengers, pedestrians, or occupants of other vehicles involved in the accident. Such loss affects the individuals and their families, causing immense emotional distress. Survivors of these accidents may suffer various injuries, requiring medical treatment, rehabilitation, and support services. In addition, the resulting trauma can lead to post-traumatic stress disorder (PTSD) and other mental health challenges.

Property Damage and Critical Infrastructure: Highway transportation accidents can result in substantial property damage to vehicles, structures, and personal belongings, causing financial hardships for individuals and businesses. Critical infrastructure, including bridges, tunnels, and roadways, can also be damaged, requiring costly repairs and maintenance and disrupting transportation systems. Highway accidents often necessitate emergency response services, straining local resources and disrupting normal operations. Traffic congestion and disruptions create delays, economic losses, and safety hazards. Accidents involving utility poles or electrical infrastructure can lead to power outages, affecting homes, businesses, and essential services. Environmental impacts such as spills of hazardous materials or damage to natural resources require immediate cleanup and remediation efforts to protect public health and the environment.

Economy: Highway transportation accidents have far-reaching economic consequences. These include significant factors such as medical expenses, property damage, lost productivity, legal and administrative costs, emergency response and healthcare services, traffic congestion and delays, and increased insurance premiums.

4.34 Transportation Accident: Marine

Hazard Description

An occurrence that involves a vessel operating on or near water and results in one or more of the following:

1. Loss of life.
2. Serious injury.
3. Substantial property damage.
4. A significant environmental impact.
5. The vessel is missing or abandoned.

Hazard Location

Oakland County has more inland lakes, more registered boats and handles more watercraft accidents than any other county in the state. Marine-related accidents can occur on any of the County's waterways. The County has nearly 70-square miles of water, covering over 450 navigable lakes, five major rivers, 3,000 miles of shoreline, and 83,000 registered boats.

Hazard Extent/Intensity

Several factors are typically considered when assessing the extent or intensity of a marine transportation accident. These factors include the loss of life, an essential measure of the accident's severity. In addition, the number of fatalities resulting from the incident provides valuable insight. Additionally, the extent and severity of injuries sustained by individuals involved in the accident contribute to understanding its impact. Finally, evaluating the scale of property damage, such as damage to vessels or infrastructure, also helps gauge the accident's severity.

Furthermore, the environmental impact plays a crucial role. For example, the resulting environmental consequences are considered if the accident leads to significant pollution, such as oil spills or releases of hazardous materials. Lastly, the economic implications are examined, encompassing the costs associated with recovery, cleanup efforts, and any related financial losses. Taking all these factors into account allows for a more comprehensive assessment of the severity and impact of a marine transportation accident.

Probability and Frequency

No significant accidents involving public marine transportation have been recorded in Oakland County, Michigan.

Past Events

No significant accidents involving public marine transportation have been recorded in Oakland County, Michigan. Notable recent past events include:

- In August of 2023, a Novi man died after he was struck by a pontoon boat while swimming in the Lower Straits Lake.
- In June of 2023, a 55-year-old Lake Orion man died after falling out of a boat and apparently drowning on Lake Orion.
- A man died after crashing an ice sailboat on Pontiac Lake in February of 2023.
- In August of 2019, a seaplane crashed into three pontoon boats in Oakland County. This occurred near the Orchard Lake Nature Sanctuary, which is at Pontiac Trial and Old Orchard Trail. The seaplane was trying to land on the lake when it hit three pontoon boats and then struck the sand bar. There were several people in the water and on the pontoon boats who were injured.

Vulnerability and Impacts

Health and Safety: Marine transportation accidents can have various public health and safety impacts, including loss of life and injuries with long-term consequences. Search and rescue operations carry risks for the personnel involved. Environmental pollution from accidents, such as oil spills, affects marine ecosystems, wildlife, and communities dependent on marine resources. Disruptions to transportation and commerce impact local economies and supply chains. Infrastructure damage, like collisions with bridges or ports, can compromise public safety and require costly repairs.

Property Damage and Critical Infrastructure: Marine transportation accidents can cause property damage and critical infrastructure impacts, such as vessel loss or destruction, damage to the shoreline and port infrastructure, collisions with bridges or waterway structures, environmental contamination from spills or hazardous material releases, interference with maritime operations, and economic consequences including repair costs, business interruptions, and supply chain disruptions. These impacts can have financial implications for vessel owners, require costly repairs to infrastructure, disrupt transportation and commerce, harm ecosystems, and affect local economies and businesses reliant on maritime transportation.

Economy: Marine transportation accidents can have various economic consequences, including property damage costs that require significant repairs or replacements. Business interruptions can disrupt operations for vessel owners and maritime businesses, leading to revenue losses and productivity declines. Supply chain disruptions can impact multiple industries due to delays in the movement of goods and cargo. Insurance costs may rise for vessel owners following an accident, straining their financial resources. Legal proceedings and liability claims can result in substantial expenses. Environmental cleanup efforts incur significant costs, particularly in oil spills or hazardous material releases. Additionally, accidents in tourist destinations or

recreational areas can negatively affect tourism and related industries, causing reduced visitors and reputational damage to local communities.

Capabilities: The Sheriff's Office Marine Unit – the largest in the state – has more than 45 part-time Marine Deputies who can quickly respond to emergencies on any of the lakes in the county. The unit includes the 17-member Sheriff's Search and Rescue Team, comprised of full-time deputies who are highly trained in search and rescue and public safety diving. They can dive in virtually any weather or water condition.

The unit has 23 patrol boats, two rapid response jump boats, one hovercraft, seven all-terrain vehicles and four specialty boats for search and rescue emergencies.

The Sheriff's Office also contracts with 12 communities to patrol 19 lakes: Cass Lake, Cedar Island Lake, Deer Lake, Lake Orion, Lower Straits Lake, Lake Sherwood, Lakeville Lake, Maceday Lake, North Commerce Lake, Orchard Lake, Pine Lake, South Commerce Lake, Sylvan Lake, Upper Long Lake, Voorheis Lake, Walled Lake, Walnut Lake, White Lake, and Williams Lake.

4.35 Transportation Accident: Rail

Hazard Description

An occurrence associated with the operation of on-track rail equipment which results in either a fatal or a nonfatal injury, significant property damage, or both and involves at least one of the following:

- Derailment of rolling stock
- Collision of rolling stock
- Failure of equipment or track
- An event such as a fire or explosion, regardless of its cause, involving rolling stock or track

Hazard Location

Oakland County has 109 miles of freight rail lines and 62 miles of passenger rail lines. In addition, Amtrak provides passenger rail service with service between Pontiac and Detroit.

Areas adjacent to a railroad are most at risk for impact from this hazard due to the potential for derailment. The majority of accidents occur at public railroad crossings. A secondary effect may result if railroad crossings are blocked, resulting in traffic delays. If the train is transporting hazardous materials, an evacuation zone may need to be implemented. If an accident or derailment leads to the release of dangerous materials, the area may need to be evacuated for an extended period while environmental cleanup is performed.

Hazard Extent/Intensity

The extent/intensity of a rail transportation accident is measured by human casualties, property damage, environmental impact, disruption to operations, and economic consequences. The number of fatalities and injuries provides insights into the severity, while property damage encompasses locomotives, railcars, tracks, bridges, and more. Environmental impact includes pollution from hazardous material spills and disruption to rail operations considering track closures and delays. Lastly, the economic impact accounts for costs associated with damage, cleanup, legal proceedings, insurance claims, and overall financial effects on the rail industry and affected communities.

Probability and Frequency

From 2012 through 2021, there were 14 train-related accidents/incidents in Oakland County. It is anticipated that the likelihood of this hazard will fluctuate with the rate of rail traffic within the County.

Table 4-92. Train-related Accidents/Incidents in Oakland County

Road Name	Jurisdiction	Date	Day of the Week	Severity	Type	Weather Conditions	Lighting Conditions
Griswold Rd	County	May 3, 2017	Wed	B-level	Single veh.	Clear	Daylight
Rattalee Lake Rd E	County	Feb 14, 2020	Fri	A-level	Single veh.	Cloudy	Daylight
9 Mile Rd E	City	Apr 17, 2021	Sat	PDO	Other	Cloudy	Lights
Saginaw St S	State	Jun 11, 2021	Fri	C-level	Rear-end	Clear	Daylight
Hilton	City	Jul 10, 2021	Sat	PDO	Single veh.	Clear	Daylight
University Dr W	City	Nov 1, 2012	Thu	PDO	Other	Cloudy	Daylight
Beck Rd	City	Feb 10, 2013	Sun	PDO	Single veh.	Clear	Daylight
Saginaw St S	State	Apr 29, 2013	Mon	PDO	Other	Rain	Lights
South Blvd E	City	Jan 1, 2014	Wed	C-level	Other	Snow	Dark
Walton Blvd E	City	Jan 27, 2014	Mon	PDO	Rear-end	Snow	Lights
West Rd	City	Apr 26, 2014	Sat	B-level	Other	Clear	Daylight
14 Mile Rd E	County	May 7, 2015	Thu	PDO	Rear-end	Clear	Daylight
Airport Rd	County	Nov 22, 2015	Sun	C-level	Single veh.	Snow	Dark
Wardlow Rd E	County	Dec 22, 2016	Thu	PDO	Other	Cloudy	Dark

Source: University of Michigan Transportation Research Institute - Michigan Traffic Crash Facts (MTCF)

Past Events

Passenger rail accidents are typically associated with derailments or collisions with motor vehicles attempting to cross railroad tracks. On January 13, 2004, in Bloomfield Hills, a school bus driver ignored the warning signals at a railroad crossing and tried to cross the tracks. An approaching passenger train struck the school bus at a speed of 22 miles per hour, causing injury to the bus driver.

Vulnerability and Impacts

Health and Safety: Rail transportation accidents can have health and safety impacts, including injuries and fatalities for passengers, crew members, and people in surrounding communities due to collisions, derailments, crossings, or hazardous materials releases. These accidents can also cause extensive damage to trains, infrastructure, and nearby properties, leading to economic losses. In some cases, accidents involving hazardous materials can have adverse environmental consequences, polluting water bodies, contaminating soil, and causing air pollution. Rail accidents can disrupt transportation services, causing delays, rerouting, and

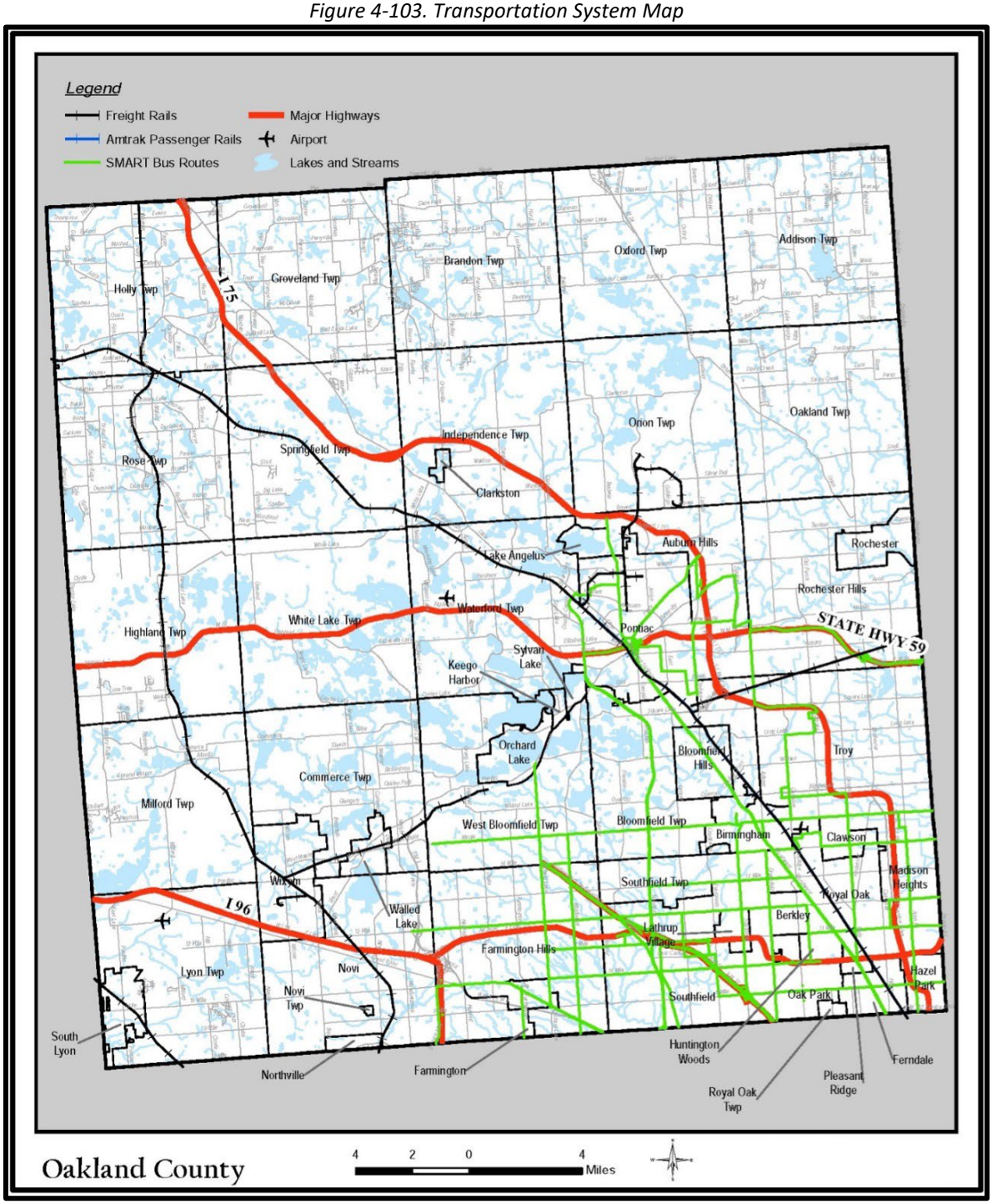
temporary suspensions, which can inconvenience businesses, commuters, and the general public. These accidents present emergency response challenges, particularly in incidents involving hazardous materials or mass casualties, requiring specialized training, resources, and coordination. Additionally, rail accidents can have psychological impacts on those involved, witnesses, and affected communities, necessitating support services and community resilience efforts.

Property Damage and Critical Infrastructure: Rail transportation accidents can have property damage and critical infrastructure impacts, including damage to trains, railcars, infrastructure, and nearby structures. This includes derailments, collisions, fires, or hazardous materials incidents, requiring repairs and replacements and causing economic losses. These accidents disrupt track functioning, damage signals, and hinder the safe movement of trains, requiring infrastructure repairs. Bridges and tunnels can also suffer damage or structural instability, necessitating inspections and repairs—grade crossing accidents damage equipment and signage, affecting traffic and convenience. Utility infrastructure like power lines and pipelines can be impacted, requiring repairs. Accidents involving hazardous materials can lead to environmental contamination, necessitating cleanup. Business interruptions occur due to delays, rerouting, or suspensions of rail operations, affecting businesses reliant on rail freight.

Economy: There is no data documenting the economic impact of rail transportation impacts in Oakland County. However, historical rail transportation accidents have resulted in economic impacts, including extensive property damage costs for trains, railcars, infrastructure, and nearby structures. Business interruption occurs due to disruptions in the flow of goods and services, leading to logistical challenges and economic losses for businesses relying on rail freight. Rail companies may experience a loss of revenue from temporary or prolonged service disruptions. Legal and insurance costs arise from legal proceedings, claims, and liability settlements. Emergency response expenditures, such as personnel salaries and equipment, contribute to the overall economic impact. Rail accidents also affect the local economy through disruptions in transportation services, property damage, and business interruptions, impacting employment and tourism.

Figure 4-94 illustrates a transportation system map of Oakland County.

Figure 4-103. Transportation System Map



Source: Oakland County, MI, USDA, SEMCOG

4.36 Weapons of Mass Destruction (WMD)

Hazard Description

Any explosive, incendiary, chemical, biological, or radiological/nuclear device intended to cause widespread harm, destruction, and casualties among the civilian population and disrupt societal functions.

Hazard Location

A WMD incident could occur anywhere in Oakland County. Any information on this matter is sensitive to law enforcement and homeland security and, therefore, unavailable to the general public.

Hazard Extent/Intensity

The extent and intensity of WMD incidents can be assessed by multiple factors, including the type of WMD involved (chemical, biological, radiological/nuclear, or explosive), the potential scale of the impact, the capability and intent of the threat actors, and the likelihood of successful deployment. Intelligence gathering, risk assessments, and collaboration with various agencies/partners are methods used to measure WMD threats.

Probability and Frequency

Weapons of mass destruction have never been used to attack Oakland County. Although Oakland County does not have a history of attacks from weapons of mass destruction, the possibility of such an event does exist in the county.

Past Events

At the start of 2023, nine states—the United States, Russia, the United Kingdom, France, China, India, Pakistan, the Democratic People's Republic of Korea (DPRK, or North Korea) and Israel—together possessed approximately 12 512 nuclear weapons, of which 9576 were considered to be potentially operationally available (Stockholm International Peace Research Institute, 2023).

Vulnerability and Impacts

Health and Safety: WMD can have severe public health and safety impacts, causing widespread casualties, injuries, and fatalities among the civilian population. WMD incidents can cause significant harm to public health, including exposure to hazardous substances, contamination of the environment, and the spread of diseases or illnesses. Such incidents also threaten critical infrastructure, disrupt essential services, and create psychological distress among affected individuals and communities.

Property Damage and Critical Infrastructure: The destructive potential of WMD, such as explosive devices or chemical, biological, and radiological/nuclear agents, can result in extensive damage to buildings, structures, and surrounding areas. Critical infrastructure, including transportation systems, utilities, communication networks, and essential facilities, can suffer severe disruptions or destruction. WMD incidents can lead to long-lasting structural damage, rendering infrastructure inoperable and requiring extensive repairs or reconstruction. The impacts on property and critical infrastructure can have far-reaching consequences on communities, economies, and public safety.

Economy: WMD can result in extensive property damage, leading to costly repairs, replacements, and reconstruction efforts. WMD incidents can disrupt business operations, interrupt supply chains, and cause economic losses for affected industries. The aftermath of WMD events may require significant investments in infrastructure restoration, environmental remediation, and healthcare services. Additionally, the psychological impact and public fear following WMD incidents can negatively affect consumer confidence, tourism, and overall economic stability. The economic consequences of WMD underscore the importance of prevention, preparedness, and response measures to mitigate their devastating effects.

Other Hazards of Concern

Although FEMA does not require non-natural hazards for inclusion in a hazard mitigation plan, Oakland County wishes to rank and mitigate public health emergencies that could impact the county. Therefore, due to the nature of non-natural hazards and the discretionary status regarding their inclusion, public health emergencies have been briefly and qualitatively assessed for general education and informing their inclusion within the hazard ranking and mitigation process.

4.37 Public Health Emergencies

Hazard Description

A situation that poses a significant threat to the health and well-being of a population. It is characterized by the occurrence or imminent risk of widespread illness, injury, or death, resulting from infectious diseases, natural disasters, chemical or radiological incidents, or other events with public health implications. Public health emergencies require immediate and coordinated response efforts to mitigate the impact on individuals, communities, and healthcare systems, including disease surveillance, risk communication, resource allocation, and implementation of public health measures to prevent further spread and protect the public's health.

Hazard Location

A public health emergency could impact anywhere in Oakland County.

Hazard Extent/Intensity

Measuring the extent and intensity of a public health emergency involves several key factors. The assessment typically considers the scale and severity of the health threat, including the number of affected individuals, the potential for transmission, and the impact on morbidity and mortality rates. Additionally, the CDC measures the geographic spread of the emergency, tracking its reach and evaluating the risk of further dissemination. Other critical aspects include the availability and utilization of healthcare resources, the capacity to diagnose and treat affected individuals, and the effectiveness of public health interventions. By analyzing these factors, public health agencies can gauge the extent and intensity of a public health emergency and tailor their response accordingly.

Probability and Frequency

Public health emergencies vary in their probability and frequency over time. Factors such as emerging infectious diseases, natural disasters, or other health-related events can influence the occurrence of public health emergencies. While the exact probability and frequency of such

emergencies over the last ten years can vary, it is essential to note that the World Health Organization (WHO) and other public health agencies continuously monitor and prepare for potential threats.

WHO collects and analyzes data from affected countries and regions to assess health emergencies' magnitude, severity, and impact. They monitor disease outbreaks, conduct epidemiological investigations, and provide technical expertise to understand the dynamics of the crisis. The WHO also collaborates with partners to develop standardized tools and methodologies for data collection and analysis. In addition, they facilitate information sharing, research collaboration, and the dissemination of best practices among countries and stakeholders.

Past Events

Over the last five years, the most notable public health emergency is the COVID-19 pandemic, which began in late 2019 and continues to have a global impact at the time of this plan. Another significant international event was the Ebola outbreak in the Democratic Republic of Congo, which persisted from 2018 to 2020. The ongoing crisis of opioid overdoses and addiction in various countries, including the United States, has also been considered a public health emergency. Additionally, the Zika virus outbreak occurred in 2015-2016, primarily affecting the Americas, and raised significant concerns.

Vulnerability and Impacts

Health and Safety: Public health emergencies significantly impact health and safety. These emergencies often result in increased morbidity and mortality rates, posing a threat to the well-being of individuals and communities. They can lead to the rapid spread of infectious diseases, causing widespread illness and potentially overwhelming healthcare systems. Public health emergencies may also disrupt routine healthcare services, delay access to necessary treatments, and hinder the management of chronic conditions. Additionally, these emergencies can result in psychological distress, fear, and social disruption within affected populations.

Property Damage and Critical Infrastructure: Public health emergencies can disrupt essential services and infrastructure systems critical for public health and safety. For instance, healthcare facilities may experience increased demands and strains on resources, potentially affecting their capacity to provide adequate care. In addition, transportation networks, including airports and roadways, may face disruptions, impacting the movement of supplies, personnel, and patients. Public health emergencies can also affect the functioning of utilities such as water and wastewater systems, power grids, and communication networks.

Economy: Public health emergencies can often lead to disruptions in various sectors of the economy. For instance, lockdowns, travel restrictions, and social distancing guidelines can result in business closures, reduced consumer spending, and job losses. Industries directly impacted by public health emergencies, such as hospitality, tourism, and retail, may experience

a decline in revenue and profitability. Additionally, healthcare systems and public health agencies may face increased financial burdens due to the surge in service demand and the need to invest in emergency response capabilities.

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Chapter 5: Capabilities and Integration of Mitigation Measures

5.1 Overview

Preventative activities keep problems related to natural hazards from escalating and ensure new developments have reduced vulnerability to hazards. The information within this Chapter primarily focuses on building codes, planning and zoning, comprehensive plans, capital improvement plans, in addition to related studies and publications.

This capability assessment examines the existing studies, plans, programs, and policies that have incorporated hazard mitigation and other proactive measures into processes at the local and county levels. The purpose of the capability assessment is to highlight successes, identify shortcomings, and lay the groundwork for possible improvement.

5.2 Building Codes

Updating and adopting new building codes and addressing the effectiveness of these codes can be one of the best ways to conduct mitigation. When properly designed and constructed, many buildings can withstand the impacts of high winds, floods, or tornadoes.

5.2.1 Building Codes in Michigan

Prior to 1973, the use and standardization of building codes across Michigan varied. The state legislators felt a need to control construction practices throughout the state. They also felt that construction should meet a code of minimum structural and safety standards. Thus, in 1972, the Michigan Legislature proposed Public Act 230, also known as the Stille-Derossett-Hale Single State Construction Code Act. It passed into law and became effective January 1, 1973.

While PA 230 has undergone a number of amendments and revisions over the years, its basic idea remains the same; to have a building code applicable throughout Michigan to standardize construction methods and requirements. All communities in Michigan are subject to the State Construction Code, which establishes general minimum construction standards for buildings and structures in all Michigan municipalities. The State Construction Code is a compilation of the International Residential Code, the International Building Code, the International Mechanical Code, the International Plumbing Code published by the International Code Council, the National Electrical Code published by the National Fire Prevention Association, and the Michigan Uniform Energy Code with amendments, additions, or deletions as the Michigan Department of Energy, Labor and Economic Growth determines appropriate.

One important change made to PA 230 is that any local governmental unit enforcing building codes within Michigan must use the "Michigan Building Codes" and only the version approved by the state legislature under the guidance of the Bureau of Construction Codes.

PA 230 does not allow local modification of the codes. In other words, a local government authority cannot choose to delete, amend, revise, ignore, add to, change, exempt certain persons from, or modify the codes. This language assures continuity across all of the codes and their enforcement. Local units of government must enforce the State of Michigan Codes or relinquish local code enforcement to the State.

Minimum building code standards for all participating jurisdictions in Oakland County

- 2015 Michigan Building Code (Current Code - Effective April 20, 2017)
  - 2015 Part 4. Building Code (Storm Shelters)
  - *Note: Residential requirements are contained in the Michigan Residential Code.*
- 2015 Michigan Residential Code (Current Code – Effective February 8, 2016)
- 2015 Michigan Rehabilitation Code (Current Code – Effective December 13, 2016)
- 2015 Michigan Mechanical Code (Current Code – Effective April 12, 2017)
  - *Note: Residential requirements are contained in the Michigan Residential Code.*
- 2018 Michigan Plumbing Code (Current Code – Effective September 15, 2021)
  - *Note: Residential requirements are contained in the Michigan Residential Code.*
- 2015 Michigan Energy Code (Current Code – Effective September 20, 2017)
  - *Note: Residential requirements are contained in the Michigan Residential Code.*
- 2017 National Electrical Code (NEC) ** Current Code - Effective January 4, 2019
  - *Note: Residential requirements are contained in the Michigan Residential Code.*

Source: https://www.michigan.gov/lara/bureau-list/bcc/rules-acts/codes/code-books

5.3 Planning & Regulatory Capabilities

5.3.1 Master Plans

The Michigan Planning Enabling Act outlines the boundary coordination process communities must follow in the course of the review and adoption of any new master plan or an amendment to an existing master plan. All communities are required to review their master plan every five years to determine whether the plan should be amended or revised. The County's role in this

process is to review plans for coordination between communities, particularly with regard to designated future land uses along community boundaries.

Oakland County does not have a Planning Commission. Instead, the Board of Commissioners appoints three Commissioners of the Economic Development and Infrastructure Committee to sit on the Coordinating Zoning Committee (CZC) and uphold the County's legal planning and zoning review function. Planning staff reviews all plans and zoning proposals and presents those findings to the Coordinating Zoning Committee for their approval and endorsement.

The Michigan Zoning Enabling Act authorizes Oakland County to review and comment on township rezoning requests for those rezoning cases that are at the border of an adjacent community or involve or are adjacent to County property. The County's review focuses on master plan conformance and boundary coordination of existing and proposed land uses.

5.3.2 Zoning Ordinances

A zoning ordinance typically addresses three primary areas: 1) the use of land and structures and the height and bulk of structures; 2) the density of population and intensity of land and structural use; and 3) the provision for space around structures (i.e., requirements for side yards, rear yards, open space, building setback lines, etc.).

Some zoning ordinances may specifically address potential hazards to life and property, although there is no requirement to do this in the State of Michigan. Although there are a variety of standard zoning districts, there are no formal legal requirements regarding the type of districts that must be included in an ordinance. The Michigan Zoning Enabling Act is suggestive but not prescriptive in its provisions for zoning districts. Section 201 (1) of the Act suggests a variety of land uses that may be addressed by formal zoning districts but it does not mandate a standardized list of zoning districts that must be applied in each Michigan community that has a zoning ordinance. The Michigan Zoning Enabling Act provides sufficient flexibility and regulatory framework to allow communities to use comprehensive planning and zoning to effectively reduce their natural hazard risk and vulnerability.

5.3.3 Subdivision Regulations

Subdivision regulations are the legally established standards of design and construction for dividing a land parcel into smaller ones for the purpose of selling or leasing the property. The Land Division Act (1967 PA 288, as amended by 1996 PA 591, 1997 PA 87, and 2004 PA 524) governs the subdivision of land in Michigan. The Act requires that the land being subdivided be suitable for building sites and public improvements, that there be adequate drainage and proper ingress and egress to lots, and that reviews be conducted at the local, county and state levels to ensure that the land being subdivided is suitable for development. The Act also requires conformance with all local planning codes.

5.3.4 Capital Improvement Plans

Communities use Capital Improvement Plans or Community Investment Programs to guide major public expenditures for the next five to 20 years. Capital expenditures can include

roadways, water and sewer lines, floodplain open space acquisition, and retrofitting existing public structures to withstand hazards.

5.3.5 Plan Integration & Opportunities to Expand and Improve

Table 5-1 illustrates Oakland County communities' efforts to integrate hazard mitigation, hazards, and other mitigation considerations into their comprehensive or related community-wide plans. Oakland County does not control local planning and zoning for Cities, Villages, or Townships.

The information in the table is based on the best available data. Opportunities to expand or improve do not indicate a community is out of compliance, but suggests that future updates to a specific plan or ordinance may consider further integration of hazard-related risks and mitigation efforts.

Table 5-93. Oakland County Planning and Land Use Ordinances

Community	Master Plan	Mitigation and/or Hazards Included in Master Plan (or related plan)	Capital Improvement Plan(s) Published on Public-Facing Web site	Mitigation and/or Hazards Included in Capital Improvement Plan(s)	Flood hazards or drainage provisions in Zoning Ordinance **Note:** Subdivision Regulations are state mandated per PA 288.
Addison Township	July 2002	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Auburn Hills	2018	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Berkley	November 2021	Opportunity to expand/improve	-	Opportunity to expand/improve	Yes
Village of Beverly Hills	March 2016	Yes	-	Opportunity to expand/improve	Yes
Village of Bingham Farms	August 2021	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Birmingham	November 2021	Yes	-	Opportunity to expand/improve	Yes
City of Bloomfield Hills	May 2009	Yes	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Bloomfield Township	2007	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Bloomfield	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Brandon Township	August 2022	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City/Village of Clarkston	2019	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Clawson	2017	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
Commerce Township	2015	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve

Community	Master Plan	Mitigation and/or Hazards Included in Master Plan (or related plan)	Capital Improvement Plan(s) Published on Public-Facing Web site	Mitigation and/or Hazards Included in Capital Improvement Plan(s)	Flood hazards or drainage provisions in Zoning Ordinance **Note:** Subdivision Regulations are state mandated per PA 288.
City of Farmington	2016	Opportunity to expand/improve	Yes	Yes	Yes
City of Farmington Hills	2019	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
City of Ferndale	September 2022	Yes	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Village of Franklin	2007	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Groveland Township	2021	Opportunity to expand/improve	-	Opportunity to expand/improve	Yes
City of Hazel Park	October 2020	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Highland Township	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Holly Township	2016	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Holly	2021	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Huntington Woods	February 2022	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Independence Township	February 2016	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Keego Harbor	August 2018	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Lake Angelus	October 2017	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Lake Orion	2021	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Lathrup Village	July 2021	Yes	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Village Of Leonard	2018	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Lyon Township	April 2012	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
City of Madison Heights	February 2021	Yes	Yes	Yes	Opportunity to expand/improve
Milford Township	February 2009	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Milford	2020	Opportunity to expand/improve	-	Opportunity to expand/improve	Yes
City of Northville	July 2018	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve

Community	Master Plan	Mitigation and/or Hazards Included in Master Plan (or related plan)	Capital Improvement Plan(s) Published on Public-Facing Web site	Mitigation and/or Hazards Included in Capital Improvement Plan(s)	Flood hazards or drainage provisions in Zoning Ordinance **Note:** Subdivision Regulations are state mandated per PA 288.
City of Novi	2016	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
Novi Township	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Oak Park	2020	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Oakland Township	January 2020	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Orchard Lake Village	2018	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Orion Township	2022	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Ortonville	March 2022	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
Oxford Township	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Oxford	May 2011	Opportunity to expand/improve	-	Opportunity to expand/improve	Yes
City of Pleasant Ridge	2015	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
City of Pontiac	October 2014	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Rochester	April 2022	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Rochester Hills	2018	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
Rose Township	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Royal Oak	April 2012	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Royal Oak Township	September 2019	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of South Lyon	November 2016	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Southfield	December 2022	Opportunity to expand/improve	Yes	Yes	Opportunity to expand/improve
Southfield Township	-	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Springfield Township	April 2016	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
City of Sylvan Lake	October 2022	Yes	-	Opportunity to expand/improve	Opportunity to expand/improve

Community	Master Plan	Mitigation and/or Hazards Included in Master Plan (or related plan)	Capital Improvement Plan(s) Published on Public-Facing Web site	Mitigation and/or Hazards Included in Capital Improvement Plan(s)	Flood hazards or drainage provisions in Zoning Ordinance **Note:** Subdivision Regulations are state mandated per PA 288.
City of Troy	February 2017	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
City of Walled Lake	February 2014	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
Waterford Township	January 2003	Opportunity to expand/improve	-	Opportunity to expand/improve	Yes
West Bloomfield Township	September 2010	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
White Lake Township	2012	Opportunity to expand/improve	Yes	Opportunity to expand/improve	Opportunity to expand/improve
City of Wixom	August 2020	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve
Village of Wolverine Lake	April 2022	Opportunity to expand/improve	-	Opportunity to expand/improve	Opportunity to expand/improve

5.3.6 Underground Utilities

Since 1970, DTE, which is the largest electricity supplier in Oakland County, has installed its lines underground during the construction phase of all new subdivisions and other construction projects where possible. Currently, one-third of DTE's infrastructure is underground. Relocating existing infrastructure from above ground to below ground is more complex and can be expensive. Pilots are currently underway to identify opportunities to make this relocation more affordable in places where it would make sense to do so, including areas where DTE is rebuilding its infrastructure.

5.3.7 Development in the Floodplain and NFIP

Michigan Building Codes: For residential structures within the floodplain, the Michigan Building Code requires that the structure have the lowest floor one foot above the base flood elevation (the depth of peak elevation of flooding, including wave height, which has a 1% or greater chance of being equaled or exceeded in any given year). Basements (defined as being below-grade on all sides) must be at or above the base flood elevation (BFE). The one foot of freeboard is more restrictive than the NFIP minimum criteria involving elevation above the BFE.

In addition to FEMA-mapped floodplains, the floodplain criteria of the Building Codes apply to state-regulated floodplains. This includes all unmapped streams with a drainage area greater than two square miles. This means that floodplain management requirements are much more broadly applied in Michigan. The Code also requires that utilities and mechanical equipment be elevated above the base flood elevation or protected so as to prevent water from entering or accumulating within the components during the occurrence of a 1%-annual-chance flood.

For non-residential structures, the level of flood protection required by the State Building Code is dependent on the classification of the building use. Category III and IV buildings (critical facilities) such as hospitals, emergency response facilities, power generation stations, and other public utilities must have the lowest flood elevated or dry floodproofed one foot above the "500-year" flood elevation. The critical facilities requirement is more restrictive than NFIP requirements, which only require elevation above the BFE. Buildings that do not fall within Categories III or IV must have the lowest floor elevated or floodproofed one foot above the base flood elevation (State of Michigan Hazard Mitigation Plan, 2019).

By enforcing the flood resistant construction provisions of the State Building Code, inspectors can help ensure that new construction within flood-prone areas will be built in such a manner as to minimize future flood losses.

Subdivision Regulations: Proposed subdivisions are reviewed by the County Drain Commissioner for proper drainage, and for floodplain impacts by the Michigan Department of Environmental Quality, Water Resources Division. The subdivision rules require a minimum buildable area above the BFE and outside of any wetlands, for each platted lot.

NFIP Community Participation. Because of the existing state laws and the building codes, every community in Michigan meets the minimum standards to participate in the NFIP. The only actions necessary to join the NFIP would be the passing of a resolution indicating an interest in joining the NFIP, adopting an ordinance indicating the State Building Code is enforced in the community, and completing an application. The Michigan Department of Environment, Great Lakes, and Energy (EGLE), in cooperation with the Michigan Attorney General's Office has developed a sample ordinance that may be used by communities when joining the NFIP.

A continued effort is needed to make the communities in Oakland County aware of the NFIP and floodplain management.

Table 5-2. NFIP Participation

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	CRS Entry Date	Current Effective Date	Current Class	Opportunity to and Reasons for not Participating
Oakland County	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Addison Township	-	09/29/06	09/29/06	-	-	-	-	Sanction Date: 09/29/07 Lack of capacity. Will explore participation in future updates, if appropriate, based on further analysis.
City of Auburn Hills	06/28/74	07/16/79	09/29/06	07/16/79	-	-	-	N/A

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	CRS Entry Date	Current Effective Date	Current Class	Opportunity to and Reasons for not Participating
City of Berkley	05/13/77	09/29/06	(NSFHA)	02/29/80	-	-	-	N/A
Village of Beverly Hills	02/22/74	06/15/79	09/29/06	06/15/79	-	-	-	N/A
Village of Bingham Farms	04/25/75	01/03/85	09/29/06	05/15/85	-	-	-	N/A
City of Birmingham	04/06/73	05/15/80	09/29/06	05/15/80	-	-	-	N/A
City of Bloomfield Hills	-	07/05/84	09/29/06	07/05/84	-	-	-	N/A
Bloomfield Township	05/17/74	01/06/83	09/29/06	01/06/83	-	-	-	N/A
Brandon Township	-	09/29/06	09/29/06	09/29/06	-	-	-	N/A
City/Village of Clarkston	04/25/75	03/02/83	09/29/06	03/02/83	-	-	-	N/A
City of Clawson	06/28/74	09/29/06	(NSFHA)	06/19/76	-	-	-	N/A
Commerce Township	03/25/77	03/16/81	09/29/06	03/16/81	10/01/03	10/01/14	9	N/A
City of Farmington	10/12/73	07/16/80	09/29/06	07/16/80	-	-	-	N/A
City of Farmington Hills	03/15/74	02/01/80	09/29/06	02/01/80	10/01/94	10/01/95	10	N/A
City of Ferndale	10/03/75	09/29/06	(NSFHA)	01/31/83	-	-	-	N/A
Village of Franklin	04/11/75	12/01/81	09/29/06	12/01/81	-	-	-	N/A
Groveland Township	-	09/29/06	09/29/06 (M)	09/29/06	-	-	-	N/A
City of Hazel Park	-	09/29/06	(NSFHA)	11/30/78	-	-	-	N/A
Highland Township	-	01/18/84	09/29/06	01/18/84	-	-	-	N/A
Holly Township	06/24/77	02/01/88	09/29/06	02/01/88	-	-	-	N/A
Village of Holly	10/03/75	12/04/84	09/29/06	12/04/84	-	-	-	N/A
City of Huntington Woods	-	09/29/06	(NSFHA)	03/16/84	-	-	-	N/A
Independence Township	05/13/77	05/16/83	09/29/06	06/10/83	-	-	-	N/A
City of Keego Harbor	05/24/74	12/01/82	09/29/06	12/01/82	-	-	-	N/A
City of Lake Angelus	-	11/16/83	09/29/06	08/18/03	-	-	-	N/A

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	CRS Entry Date	Current Effective Date	Current Class	Opportunity to and Reasons for not Participating
Village of Lake Orion	10/10/75	09/16/81	09/29/06	09/16/81	-	-	-	N/A
City of Lathrup Village	11/22/74	09/29/06	(NSFHA)	06/19/76	-	-	-	N/A
Village Of Leonard	-	-	-	-	-	-	-	Flood risk is low. Not within the 100-year floodplain. Will explore participation in future updates, if appropriate, based on further analysis.
Lyon Township	-	09/29/06	09/29/06 (M)	09/29/06	-	-	-	N/A
City of Madison Heights	05/24/74	09/29/06	(NSFHA)	05/25/78	-	-	-	N/A
Milford Township	-	09/29/06	09/29/06 (M)	12/20/06	-	-	-	N/A
Village of Milford	05/10/74	12/21/84	09/29/06	12/21/84	-	-	-	N/A
City of Northville	09/03/76	09/16/81	02/02/12	09/16/81	-	-	-	N/A
City of Novi	06/28/74	04/03/78	09/29/06	04/03/78	10/01/99	05/01/19	8	N/A
Novi Township	-	09/29/06	09/29/06	-	-	-	-	Sanction Date: 09/29/07 Flood risk is low. Not within the 100-year floodplain. Will explore participation in future updates, if appropriate, based on further analysis.
City of Oak Park	-	09/29/06	(NSFHA)	09/28/78	-	-	-	N/A
Oakland Township	04/01/77	12/01/82	09/29/06	12/23/82	-	-	-	N/A
City of Orchard Lake Village	07/18/75	01/07/83	09/29/06	01/07/83	-	-	-	N/A
Orion Township	-	09/29/06	09/29/06	08/29/07	-	-	-	N/A
Village of Ortonville	-	09/29/06	09/29/06	08/07/07	-	-	-	N/A

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	CRS Entry Date	Current Effective Date	Current Class	Opportunity to and Reasons for not Participating
Oxford Township	-	-	-	-	-	-	-	Flood risk is low. Not within the 100-year floodplain. Will explore participation in future updates, if appropriate, based on further analysis.
Village of Oxford	-	-	-	-	-	-	-	Flood risk is low. Not within the 100-year floodplain. Will explore participation in future updates, if appropriate, based on further analysis.
City of Pleasant Ridge	-	09/29/06	(NSFHA)	11/30/78	-	-	-	N/A
City of Pontiac	02/01/74	08/15/79	09/29/06	08/15/79	-	-	-	N/A
City of Rochester	04/11/75	05/05/81	09/29/06	05/05/81	-	-	-	N/A
City of Rochester Hills	04/25/75	09/16/81	09/29/06	09/16/81	-	-	-	N/A
Rose Township	-	09/29/06	(NSFHA)	05/25/84	-	-	-	N/A
City of Royal Oak	06/04/76	09/29/06	(NSFHA)	05/25/78	-	-	-	N/A
Royal Oak Township	-	-	-	-	-	-	-	Flood risk is low. Not within the 100-year floodplain. Will explore participation in future updates, if appropriate, based on further analysis.
City of South Lyon	-	09/29/06	09/29/06 (M)	09/29/06	-	-	-	N/A
City of Southfield	05/17/74	09/28/79	09/29/06	09/28/79	-	-	-	N/A
Southfield Township	-	09/29/06	09/29/06	09/27/07	-	-	-	N/A
Springfield Township	06/10/77	09/29/06	(NSFHA)	04/15/09	-	-	-	N/A
City of Sylvan Lake	07/14/78	11/16/83	09/29/06	11/16/83	-	-	-	N/A

Community	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date	Reg-Emer Date	CRS Entry Date	Current Effective Date	Current Class	Opportunity to and Reasons for not Participating
City of Troy	06/28/74	05/02/83	01/16/09	05/02/83	-	-	-	N/A
City of Walled Lake	05/31/74	09/29/06	09/29/06	11/08/07	-	-	-	N/A
Waterford Township	08/16/74	02/02/83	09/29/06	02/02/83	-	-	-	N/A
West Bloomfield Township	06/28/74	03/02/83	09/29/06	03/02/83	-	-	-	N/A
White Lake Township	05/27/77	02/01/85	09/29/06	02/11/85	-	-	-	N/A
City of Wixom	-	09/29/06	09/29/06	11/08/07	-	-	-	N/A
Village of Wolverine Lake	04/11/75	05/01/87	09/29/06 (M)	05/01/87	-	-	-	N/A

5.4 Financial Capabilities

Financial capabilities are the resources that a jurisdiction has access to or is eligible to use to fund mitigation actions. This section provides a summary of what funding sources a community may have access to. It is understood that some governments have access to recurring sources of revenue beyond property, sales, and incomes taxes, such as stormwater utility or development impact fees.

The primary funding mechanisms used to implement hazard mitigation projects are FEMA's three Hazard Mitigation Assistance (HMA) programs. The grant program includes Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and Flood Mitigation Assistance (FMA). These competitive grant programs are intended to provide funding for eligible mitigation measures that reduce loss. Adoption of this plan will increase participants' eligibility for federal grants to develop hazard mitigation plans.

In addition to the federal opportunities, Michigan does have a Disaster and Emergency Contingency Fund (DECF) as a result of amendments to Public Act 390, which requires the legislature to annually appropriate sufficient funds to maintain the fund at a level between $2.5 million and $10 million. These funds are authorized by the governor to provide state assistance to counties and municipalities when federal assistance is not available.

Table 5-3. Oakland County Financial Capabilities

Community	Capital Improvements Project Funding	Authority to Levy Taxes/Bonds for Specific Purposes	FEMA BRIC	FEMA HMGP	FEMA FMA	Safeguarding Tomorrow Revolving Loan Fund	MI State Disaster and Emergency Contingency Fund
Oakland County	Yes	Yes	Yes	Yes	Yes	Via the State	Yes

Community	Capital Improvements Project Funding	Authority to Levy Taxes/Bonds for Specific Purposes	FEMA BRIC	FEMA HMGP	FEMA FMA	Safeguarding Tomorrow Revolving Loan Fund	MI State Disaster and Emergency Contingency Fund
Addison Township	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of Auburn Hills	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Berkley	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Beverly Hills	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Bingham Farms	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Birmingham	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Bloomfield Hills	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Bloomfield Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Bloomfield	Yes	Yes	Yes	Yes	No	Via the State	Yes
Brandon Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City/Village of Clarkston	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Clawson	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Commerce Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Farmington	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Farmington Hills	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Ferndale	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Franklin	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Groveland Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Hazel Park	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Highland Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Holly Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Holly	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Huntington Woods	Yes	Yes	Yes	Yes	Yes	Via the State	Yes

Community	Capital Improvements Project Funding	Authority to Levy Taxes/Bonds for Specific Purposes	FEMA BRIC	FEMA HMGP	FEMA FMA	Safeguarding Tomorrow Revolving Loan Fund	MI State Disaster and Emergency Contingency Fund
Independence Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Keego Harbor	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Lake Angelus	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Lake Orion	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Lathrup Village	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village Of Leonard	Yes	Yes	Yes	Yes	No	Via the State	Yes
Lyon Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Madison Heights	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Milford Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Milford	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Northville	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Novi	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Novi Township	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of Oak Park	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Oakland Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Orchard Lake Village	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Orion Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Ortonville	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Oxford Township	Yes	Yes	Yes	Yes	No	Via the State	Yes
Village of Oxford	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of Pleasant Ridge	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of Pontiac	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Rochester	Yes	Yes	Yes	Yes	Yes	Via the State	Yes

Community	Capital Improvements Project Funding	Authority to Levy Taxes/Bonds for Specific Purposes	FEMA BRIC	FEMA HMGP	FEMA FMA	Safeguarding Tomorrow Revolving Loan Fund	MI State Disaster and Emergency Contingency Fund
City of Rochester Hills	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Rose Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Royal Oak	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Royal Oak Township	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of South Lyon	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Southfield	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Southfield Township	Yes	Yes	Yes	Yes	No	Via the State	Yes
Springfield Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Sylvan Lake	Yes	Yes	Yes	Yes	No	Via the State	Yes
City of Troy	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Walled Lake	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Waterford Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
West Bloomfield Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
White Lake Township	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
City of Wixom	Yes	Yes	Yes	Yes	Yes	Via the State	Yes
Village of Wolverine Lake	Yes	Yes	Yes	Yes	Yes	Via the State	Yes

5.5 Warning, Education, and Outreach Capabilities

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards and all phases of a disaster.

When a threat is identified, Oakland County Emergency Management and Homeland Security, municipalities, and/or entities such as the NWS notify the public.

The National Weather Service issues notice to the public using two levels of notification:

- *Watch:* conditions are right for flooding, thunderstorms, tornadoes, or winter storms

- *Warning:* a flood, tornado, etc., has started or has been observed

The communities in Oakland County have the capability to disseminate a more specific warning in a variety of ways. The following are the more common notification methods:

- Outdoor warning sirens
- Commercial or public radio or TV stations
- IPAWS mass cell phone notification
- Community notification systems
- NOAA Weather Radio
- Tone-activated receivers in critical facilities
- Door-to-door contact
- Mobile public address systems
- E-mail notifications

5.5.1 OakAlert

The county's emergency notification system, OakAlert, sends texts, calls and emails when emergency situations occur. The notification tool is powered by CodeRed, an emergency, mass-notification system. It allows citizens to self-register with their name and personal contact information and their own username and password. Oakland County recommends that everyone should have a plan during emergencies and a method to accept notifications in different modes, i.e., NOAA Weather radios, television, phone app, etc.

5.5.2 Outdoor Warning Siren System

When the National Weather Service issues a Tornado Warning or a Severe Thunderstorm with damaging winds at or greater than 70 mph for Oakland County, the sirens are activated.

Oakland County has 275 outdoor warning sirens located throughout Oakland County. All sirens are activated by the transmission of an RF signal with a tone alert. The signal is transmitted by the Oakland County Emergency Management.

When sirens are activated, a steady three minute tone indicates a tornado has been sighted or strongly indicated on radar and/or a severe thunderstorm with 70 mph winds or greater is in the area.

Each siren is capable of covering about a one mile radius from its location. The sirens are designed to alert citizens who are outside but citizens inside buildings may hear the siren if they are close to the siren location.

5.5.3 Early Weather Warning/Tone Alert Receiver System

When the National Weather Service issues a severe weather condition, Oakland County Homeland Security will activate the tone alert receivers (different from NOAA weather radios) and broadcast detailed severe weather information impacting Oakland County.

For Tornado Warnings and/or Severe Thunderstorms with damaging winds at or greater than 70 mph, activation will occur seconds after the Oakland County Outdoor Warning Sirens are activated.

The following severe weather conditions may result in an activation:

- Tornado Warning
- Tornado Watch
- Thunderstorm Warning
- Thunderstorm Watch
- Severe Blizzard Warning
- Blizzard Warning
- Heavy Snow Warning
- Ice Storm Warning
- Winter Storm Warning
- Winter Storm Watch
- Flood Warning
- High Wind Warning
- Dense Fog Advisory

To participate in the Tone Alert Receiver System, persons or agencies obtain and maintain a tone alert receiver with proper frequency and tones. Tone alert receivers are small radio-type appliances available for purchase from $200-500.00 each. NOAA weather radios can be purchased for under $50.00. Persons/Agencies who may participate are:

- Citizens
- Businesses
- Schools
- Hospitals
- Media
- Industry
- Police
- Public Safety
- Government
- Fire
- Emergency Medical Service

5.5.4 Amateur Radio Public Service Corps (ARPSC)

The Oakland County Amateur Radio Public Service Corps (ARPSC) is a volunteer organization of public service minded amateur radio operators dedicated to providing organized emergency communications in a time of need. The ARPSC mission includes a number ham radio based communication services:

- Amateur Radio Emergency Service (ARES) – This group is organized and recognized through the Amateur Radio Relay League (ARRL) to provide communications assistance during disasters
- Radio Amateur Civil Emergency Service (RACES) – RACES volunteers are recognized through their local Emergency Management program, and they assist with many tasks for the governmental agencies they serve. The Federal Emergency Management Agency (FEMA) provides planning guidance and technical assistance for RACES teams.
- National Traffic System (NTS) – The National Traffic System utilizes "Radiograms" to relay information critical to saving lives or property, or to inquire about the health or welfare of disaster victims
- SKYWARN – Ham radio operators working with the National Weather Service and the Oakland County Emergency Management and Homeland Security Department perform as severe weather spotters, reporting their observations of severe weather and the resulting damages via radio
- Amateur Radio Hospital Emergency Communications (ARHEC) – Amateur radio volunteers participating in this program provide emergency communications for the hospitals in Oakland County

In addition to the emergency communication roles listed above, ARPSC members also provide many additional communications related services, including:

- Assisting the Oakland County Emergency Management and Homeland Security Department with monthly Outdoor Warning Siren tests, observing and reporting back on the activation and operation of the sirens within the County
- Assisting with two-way radio communications for non-profit, civic, or special events such as the Woodward Avenue Dream Cruise and the Brooksie Way Half Marathon

5.5.5 Citizen Corps/CERT Program

Oakland County partners and liaisons with local community programs and is a major contributor to Citizen Corps framework with CERT being one of the foundational programs. As indicated by the Federal Emergency Management Agency, the Citizen Corps Program is a collaborative framework that brings together local communities, citizen volunteers, and a network of first-responder organizations. The organizations involved in Citizen Corps Programs are local fire and police departments, county health departments, and community neighborhood associations. The Citizen Corps Partner Programs consist of Community Emergency Response Team (CERT); Fire Corps; Medical Reserve Corps; Neighborhood Watch; and Volunteers in Police Service.

One of the goals of the Citizen Corps framework is to pair interested volunteers with organizations in need of support.

Oakland County Communities with Community Emergency Response Teams:

- Brandon Township
- Holly Township
- Waterford CERT
- City of Hazel Park
- City of Novi
- City of Rochester
- City of Rochester Hills
- City of Southfield
- White Lake Twp

Oakland County Communities with Volunteers in Police Services

- Oakland County Sheriff's Office
- City of Royal Oak
- Sylvan Lake
- Waterford Township

Neighborhood Watch Programs

- City of Hazel Park
- City of Pontiac
- City of Royal Oak
- City of Southfield
- Waterford Township

5.5.6 Skywarn Spotter Training Program

Skywarn is an effort to save lives during severe weather emergencies by expanding networks of spotters and by encouraging the widest possible participation in tornado warning programs. Skywarn Weather Spotters provide a valuable service to the National Weather Service by reporting storm damage, precipitation and other observed weather phenomena.
This program is coordinated by the Oakland County Emergency Management and Homeland Security Department.

5.5.7 StormReady Community

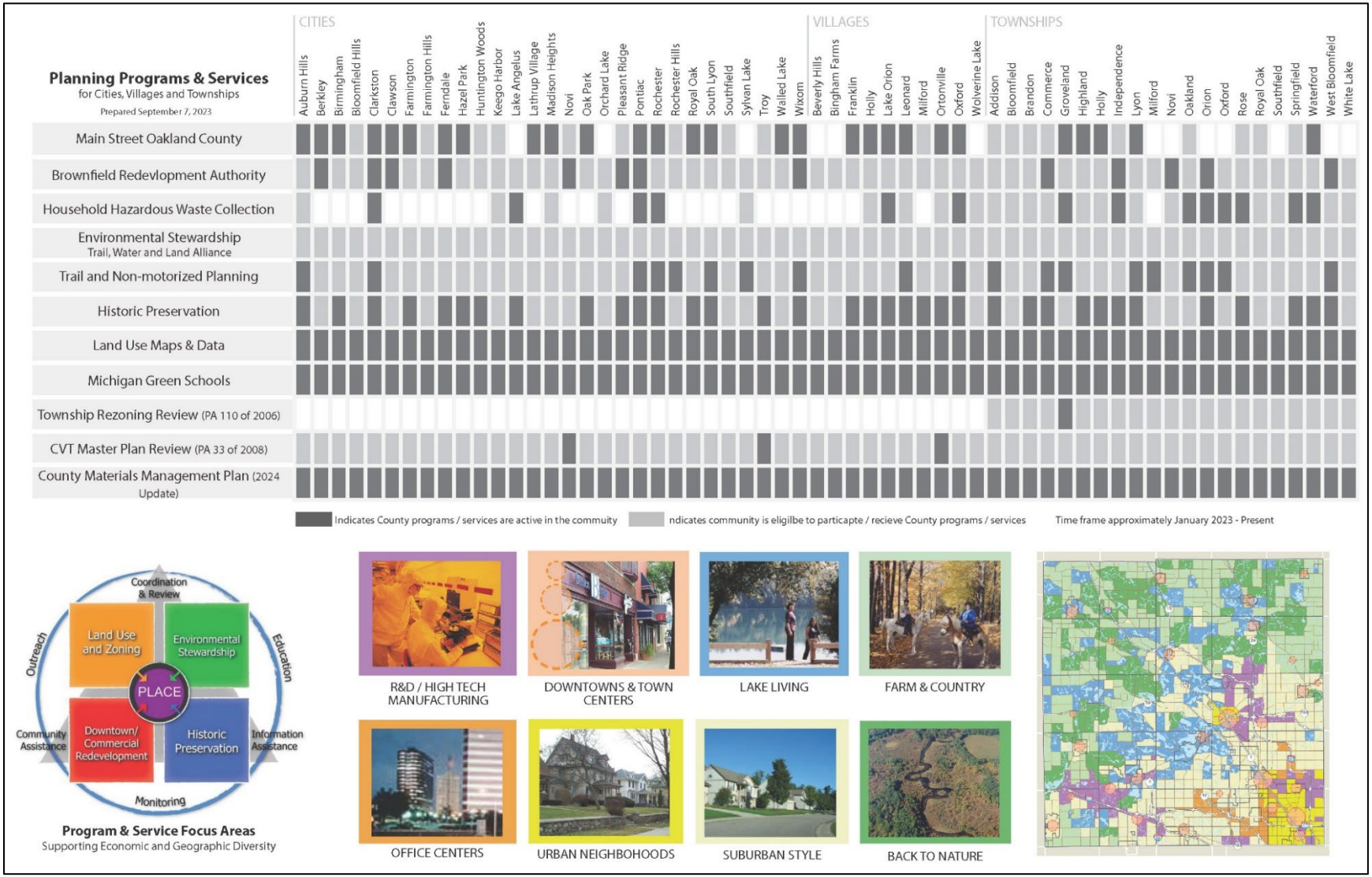
Oakland County was designated by the National Weather Service (NWS) as a StormReady community in 2004. StormReady is a nationwide volunteer community preparedness program that started in 1999 in Tulsa, Oklahoma. Oakland County has always taken a pro-active approach to hazardous weather operations, however, this designation lets residents, business owners and visitors know that the County is committed to safety and preparedness.

5.6 Administrative and Technical Capabilities & Support

Administrative and technical capabilities refer to the jurisdiction's staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. It also

refers to the ability to access and coordinate these resources effectively. The following programs and plans have been identified as having mitigation implications for all participating jurisdictions of this plan. The dark box indicates the program/capability is active in the community. The lighter box indicates the community is eligible to participate, and represents an area of potential expansion, implementation and/or improvement, especially with respect to hazard mitigation integration.

Figure 5-104. Oakland County Planning Programs and Services



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Chapter 6: Mitigation Goals & Changes in Priority

Mitigation goals describe the broad direction that Oakland County and participating jurisdictions will take to select mitigating projects, which are designed specifically to address risks posed by natural and manmade hazards. The goals are stepping-stones between the mission statement and the individual mitigation projects.

As stated in this Plan, the purpose of the hazard mitigation planning process is to identify hazard areas, to assess the risks, to analyze the potential for mitigation and to recommend mitigation strategies, where appropriate. Potential mitigation projects will be reviewed using criteria that stress the intrinsic value of the increased safety for people and property in relation to the monetary costs to achieve this (i.e., a cost-benefit analysis). With that in mind, the planning goals for this entire Plan were reassessed and updated.

The analysis of the Risk Assessment identified areas where mitigation improvements could be made, providing the framework for the committee to readdress and formulate planning goals.

6.1 Goals

6.1.1 Hazard Mitigation Goals

The following goals (shown in order of importance) were developed by the planning team for the purpose of guiding and directing the plan in accordance with governmental requirements, community priorities, and changing circumstances.

Goal 1. Protection of public health and safety and prevention and reduction of loss of life and injury due to all hazards.

Goal 2. Protect critical infrastructure and community lifelines within Oakland County by identifying and reducing vulnerabilities to the impacts of natural and manmade hazards.

Goal 3. Protect the assets (people, properties, key resources, etc.) within Oakland County from the impacts of natural and manmade hazards through the implementation of structural mitigation projects, such as flood mitigation projects, green infrastructure, retrofitting, reducing the number of repetitively damaged structures in the County, etc.; and nonstructural mitigation activities, such as public outreach and education and improving/promoting advanced warning systems.

Goal 4. Strengthen relationships between the public sector, private sector entities, leaders from underserved communities, and residents to enhance community resilience through a whole-

community approach, with specific emphasis on achieving equitable outcomes for all communities, including underserved communities and socially vulnerable populations.

Goal 5. Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards.

Goal 6. Promote coordination between public service sectors, and encourage participation in sustainable and cost-effective mitigation projects, and by improving and supporting public and private organizational response capabilities.

Goal 7. Encourage systematic updates and adoptions of regulations and policies to ensure new and existing developments address changing environmental, climate change, and natural hazard concerns. Integrate hazard mitigation strategies and priorities into existing community plans.

6.1.2 Oakland County Strategic Framework Goals & Plan Integration

Oakland County has developed a plan to define its priorities, guide the County's work and help the County measure its impact on the community. These eight (8) strategic goals were considered when updating the hazard mitigation goals and is a reflection of the County's effort to integrate hazard mitigation efforts, where applicable.

- Thriving & Inclusive Economy
- Healthy Residents
- Skilled and Educated Workforce
- Diversity, Equity, and Inclusion
- Livable Neighborhoods
- Environmental sustainability
- Public Safety, & Fairness in the Criminal Justice System
- Organizational Excellence

6.2 Changes in Priority

Mitigation priorities have not significantly changed for either Oakland County or the participating jurisdictions since the update of the last plan. However, for the 2023 plan update, mitigation goals for Oakland County and the entire planning area were significantly updated to better align with the County's current strategic framework, current federal priorities, ongoing sustainability and climate change efforts in jurisdictions, and a more concerted focus on achieving equitable outcomes for all communities, including underserved communities and socially vulnerable populations. The plan also underwent a rewrite to better align with new mitigation plan requirements.

Also, for past mitigation projects identified in previous iterations of the plan, a **2023 Status Update and Changes in Priority** section was included for each past action. A description of the

update and changes in priority were included, if appropriate and applicable. The table below provides an example of how mitigation projects were captured for each jurisdiction.

Mitigation Project	
Year Initiated	Year
Applicable Jurisdiction	Community Name
Lead Agency / Organization / Position	Lead Agency / Organization / Position
Supporting Agencies/ Organizations	Supporting Agencies/ Organizations
Applicable Goal(s)	1, 2, 3, 4, 5, 6, or 7
Estimated Cost & Analysis (Low, Medium, High)	Low, Medium, or High
Potential Funding Source	Funding Source
Benefits (Loss Avoided)	Benefit or Loss Avoided
Benefits Analysis (Low, Medium, High)	Low, Medium, or High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term, Long-term, or Ongoing
Actual Completion Date	Date
Priority and Level of Importance (Low, Medium, High) *(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)*	Low, Medium, or High
Hazard(s) Mitigated	Hazard
Action/Implementation Plan and Project Description, if applicable	Project Description
2023 Plan Update Status and Changes in Priority	A description of the update and changes in priority, if appropriate and applicable

Chapter 7: Mitigation Strategies and Actions

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In this section, mitigation actions/projects were updated/amended, identified, evaluated, and prioritized.

Plan participants assessed over 300 hazard mitigation strategies, including strategies from FEMA documents, strategies from the 2018 Oakland County Plan and suggestions from the communities, Steering Committee members and stakeholders.

7.1 Mitigation Action Plan

The Action Plan for each mitigation project is presented in a table format. The table is designed to capture important details intended to support the implementation of the project. It is also designed to facilitate and encourage the annual review and maintenance of each mitigation action by allowing the Lead Agency/Organization to document the status of the project prior to and/or during the Annual Steering Committee meeting.

Mitigation Project	
Year Initiated	Year
Applicable Jurisdiction	Community Name
Lead Agency / Organization / Position	Lead Agency / Organization / Position
Supporting Agencies/ Organizations	Supporting Agencies/ Organizations
Applicable Goal(s)	1, 2, 3, 4, 5, 6, or 7
Estimated Cost & Analysis (Low, Medium, High)	Low, Medium, or High
Potential Funding Source	Funding Source
Benefits (Loss Avoided)	Benefit or Loss Avoided
Benefits Analysis (Low, Medium, High)	Low, Medium, or High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term, Long-term, or Ongoing
Actual Completion Date	Date
Priority and Level of Importance (Low, Medium, High) *(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)*	Low, Medium, or High
Hazard(s) Mitigated	Hazard

Action/Implementation Plan and Project Description, if applicable	Project Description
2023 Plan Update Status and Changes in Priority	A description of the update and changes in priority, if appropriate and applicable

7.1.1 Mitigation Strategy/Action Timeline Parameters

While the preference is to provide definitive project completion dates, this is not possible for every mitigation strategy/action. Therefore, the parameters for the timeline (**Projected Completion Date**) are as follows:

- **Short-term**—To be completed in 1 to 5 years
- **Long-term**—To be completed in greater than 5 years
- **Ongoing**—Currently being implemented under existing programs but without a definite completion date

7.1.2 Mitigation Strategy/Action Benefit Analysis Parameters

Benefit ratings are defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

7.1.3 Mitigation Strategy/Action Estimated Cost Parameters

While the preference is to provide definitive costs (dollar figures) for each mitigation strategy/action, this is not possible for every mitigation strategy/action. Therefore, the estimated costs for the mitigation initiatives identified in this plan are identified as high, medium, or low, using the following ranges:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (e.g., bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget or with staff time. The project is part of or can be part of an ongoing existing program.

7.1.4 Mitigation Strategy/Action Prioritization Process and Priority & Level of Importance

The action plan must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed

projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was conducted. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

The priorities are defined as follows:

- **High**—A project that addressed numerous goals or hazards, has benefits that exceed cost, has funding secured or is an ongoing project, and/or meets eligibility requirements for the HMGP or BRIC grant program. High priority projects can typically be completed in the short term (1 to 5 years).
- **Medium**—A project that addressed multiple goals and hazards, that has benefits that exceed costs, and for which funding has not been secured but that is grant eligible under HMGP, BRIC, or other grant programs. The project can be completed in the short term once funding is secured. Medium priority projects will become high priority projects once funding is secured.
- **Low**—A project that will address few or no goals, mitigate the risk of one or few hazards, has benefits that do not exceed the costs or are difficult to quantify, for which funding has not been secured, that is not eligible for HMGP or BRIC grant funding, and for which the timeline for completion is long term (1 to 10 years). Low priority projects may be eligible for other sources of grant funding from other programs.

For many of the strategies identified in this action plan, the partners may seek financial assistance under the BRIC, HMGP or other HMA programs, all of which may require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define “benefits” according to parameters that meet the goals of this plan.

To further support the prioritization process, all new mitigation actions were required to undergo the STAPLEE assessment, which includes seven criteria for evaluating a mitigation action: **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental. The STAPLEE method provides a systematic approach that considers the opportunities and constraints of implementing a particular mitigation action. Each criterion is ranked from 1 (strongly disagree) to 5 (strongly agree) and calculated by adding together all seven criteria. The STAPLEE scoring worksheet is provided below.

The STAPLEE score and past feasibility analyses for past mitigation projects informed the **Priority and Level of Importance** score for each mitigation project.

Handout: New Mitigation Actions (Oakland County)

Name:

Organization/Department:

E-mail:

Phone:

New Mitigation Action (Please Describe):

Year Initiated	**2023 (New Mitigation Action)**
Applicable Jurisdiction	
Lead Agency/Organization	
Supporting Agencies/Organizations	
Potential Funding Source	
Estimated Cost	
Benefits (loss avoided)	
Projected Completion Date	
PRIORITY (High, Medium, Low)	

Please indicate if the mitigation goals and objectives below are applicable to the new mitigation action/project). Check All That Apply.

X	Place an "X" by the applicable goals, if applicable
	1. Protection of public health and safety and prevention and reduction of loss of life and injury due to all hazards.
	2. Protect critical infrastructure and community lifelines within Oakland County by identifying and reducing vulnerabilities to the impacts of natural and manmade hazards.
	3. Protect the assets (people, properties, key resources, etc.) within Oakland County from the impacts of natural and manmade hazards through the implementation of structural mitigation projects, such as flood mitigation projects, green infrastructure, retrofitting, reducing the number of repetitively damaged structures in the County, etc.; and nonstructural mitigation activities, such as public outreach and education and improving/promoting advanced warning systems.
	4. Strengthen relationships between the public sector, private sector entities, leaders from underserved communities, and residents to enhance community resilience through a whole-community approach, with specific emphasis on achieving equitable outcomes for all communities, including underserved communities and socially vulnerable populations.
	5. Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards.
	6. Promote coordination between public service sectors, and encourage participation in sustainable and cost-effective mitigation projects, and by improving and supporting public and private organizational response capabilities.
	7. Encourage systematic updates and adoptions of regulations and policies to ensure new and existing developments address changing environmental, climate change, and natural hazard concerns. Integrate hazard mitigation strategies and priorities into existing community plans.

Page **1** of **2**

Handout: New Mitigation Actions (Oakland County)

This mitigation action:

Instructions: Circle the best option

	Strongly Disagree (1)	Disagree (2)	Neither Agree or Disagree (3)	Agree (4)	Strongly Agree (5)
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community; does not adversely affect a particular segment of the population; does not cause relocation of lower income people and is compatible with the community's social and cultural values.	1	2	3	4	5
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts.	1	2	3	4	5
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action.	1	2	3	4	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process.	1	2	3	4	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action.	1	2	3	4	5
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost benefit review, and is possible to fund?	1	2	3	4	5
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals.	1	2	3	4	5

Place an "X" by the hazard(s) this action/project will mitigate:

Mitigated Hazards			
X	Place an "X" by the applicable hazard		Winter Storm and Blizzards
	All Hazards		Wildfire
	Dam Failure		Active Shooter/Active Assailant
	Drought		Cybersecurity
	Earthquake		Hazardous Materials Incidents: Fixed Site
	Extreme Cold		Hazardous Materials Incidents: Transportation Incident
	Extreme Heat		Infrastructure Failure
	Fog		Nuclear Power Plant Accidents
	Hail		Oil and Gas Well Accidents
	High Winds/Severe Winds		Public Health Emergencies: Pandemic/Epidemic
	Ice and/or Sleet Storms		Socio-Political Hazards (Civil Disturbance, Social Unrest)
	Invasive Species		Structural Fire
	Flood (Riverine/Creek)		Terrorism/ Weapons of Mass Destruction
	Flood (Flash Flooding)		Transportation Accidents: Air
	Subsidence (Sinkhole)		Transportation Accidents: Highway
	Thunderstorm (Lightning)		Transportation Accidents: Marine
	Tornadoes		Transportation Accidents: Rail

Page 2 of 2

7.2 Mitigation Projects

Participating jurisdictions agreed upon a number of mitigation actions that apply to the county and all or some participating jurisdictions. These shared actions, some of which address all hazards, help to meet the following FEMA requirement:

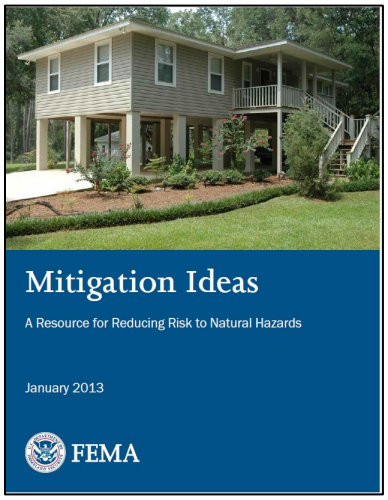
- Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?
- Does the plan include one or more action(s) per jurisdiction for each hazard identified within the risk assessment?

In addition to the mitigation measures that apply to the county and all participating jurisdictions, all communities identified additional mitigation actions unique to their jurisdiction.

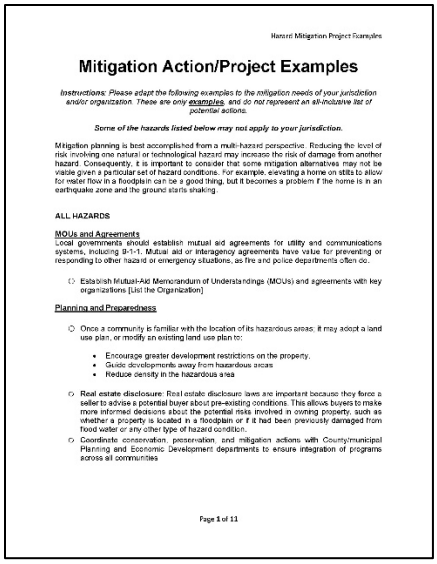
7.2.1 Potential Hazard Mitigation Activities

Plan participants used the following resources to identify mitigation activities. These resources were sent to plan participants prior to the Mitigation Workshop. Hard copies of these resources were available to each participant during the workshop, and they were again sent as a follow-up to the meeting.

FEMA Mitigation Ideas: https://www.fema.gov/sites/default/files/2020-06/fema-mitigation-ideas_02-13-2013.pdf



Mitigation Action/Project Examples Handout: See Appendix G for the full document.



Hazard Mitigation Project Examples

Mitigation Action/Project Examples

Instructions: Please adapt the following examples to the mitigation needs of your jurisdiction and/or organization. These are only examples, and do not represent an all-inclusive list of potential actions.

Some of the hazards listed below may not apply to your jurisdiction.

Mitigation planning is best accomplished from a multi-hazard perspective. Reducing the level of risk involving one natural or technological hazard may increase the risk of damage from another hazard. Consequently, it is important to consider that some mitigation alternatives may not be viable given a particular set of hazard conditions. For example, elevating a home on stilts to allow for water flow in a floodplain can be a good thing, but it becomes a problem if the home is in an earthquake zone and the ground starts shaking.

ALL HAZARDS

MOUs and Agreements
Local governments should establish mutual aid agreements for utility and communications systems, including 9-1-1. Mutual aid or interagency agreements have value for preventing or responding to other hazard or emergency situations, as fire and police departments often do.

- Establish Mutual-Aid Memorandum of Understandings (MOUs) and agreements with key organizations [List the Organization]

Planning and Preparedness

- Once a community is familiar with the location of its hazardous areas, it may adopt a land use plan, or modify an existing land use plan to:
  - Encourage greater development restrictions on the property.
  - Guide developments away from hazardous areas
  - Reduce density in the hazardous area
- Real estate disclosure: Real estate disclosure laws are important because they force a seller to advise a potential buyer about pre-existing conditions. This allows buyers to make more informed decisions about the potential risks involved in owning property, such as whether a property is located in a floodplain or if it had been previously damaged from flood water or any other type of hazard condition.
- Coordinate conservation, preservation, and mitigation actions with County/municipal Planning and Economic Development departments to ensure integration of programs across all communities

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7.2.2 Mitigation Actions and Projects from the County and Municipalities

The Mitigation Actions and Projects from the County and Municipalities are included in Volume II:

Volume II:

- County Mitigation Actions (County Departments and Mitigation Actions that Apply to the County and All Participating Municipalities)
- Municipal Mitigation Actions (Cities, Townships, and Villages)

Each entities' Mitigation Actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed Mitigation Actions** - Completed actions since 2005.

Chapter 8: Plan Maintenance

The Oakland County Hazard Mitigation Plan (Plan) maintenance process includes a schedule for annual monitoring and evaluation of the programmatic outcomes established in the Plan and for producing a formal Plan revision every five years.

The Steering Committee will continue to monitor, evaluate, and update the plan, specifically focusing on progress toward each action item within the Hazard Mitigation Plan (Plan). The Steering Committee will dedicate one meeting annually to discuss the report's findings, progress each community has made, issues each community has experienced, and proposed projects. The annual meeting will also give the Steering Committee the opportunity to discuss needed revisions/amendments to this Plan.

Developing an annual report and meeting annually to discuss progress keeps the Steering Committee involved in the plan maintenance process, formalizes the maintenance process, and provides a level of accountability to work toward accomplishing the action items within the Plan. Oakland County Emergency Management and Homeland Security and staff assigned shall be responsible for coordinating and overseeing the development of the annual report and its associated meeting. In addition, to continue to encourage community participation, annual meetings will be open to the public and a public comment period will be incorporated into each meeting.

Per the Federal Emergency Management Agency (FEMA), this Plan will be updated every five years. Again, Oakland County departments and staff assigned will be responsible for coordinating and overseeing the next plan update. Oakland County coordination will be overseen by Oakland County Emergency Management and Homeland Security. In addition, it is recommended that the next 5-year update be conducted over the process of one to two years. This will provide the Steering Committee ample time to meet, develop drafts, involve the public, coordinate with stakeholders, and finalize the plan.

This chapter describes the plan maintenance process for Oakland County.

8.1 Formal Review Process

The Plan will be reviewed on an annual basis by the Steering Committee to determine the effectiveness of programs and to reflect changes that may affect mitigation priorities. The Director of Oakland County Emergency Management and Homeland Security or designee will be responsible for contacting the Steering Committee and organizing the review. The Steering Committee will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan. The Steering Committee will review the goals and action items to determine their relevance to changing situations in the county as well as changes in Federal

policy and to ensure they are addressing current and expected conditions. The Steering Committee will also review the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The organizations responsible for the various action items will report on the status of the projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised or removed.

The Director of Oakland County Emergency Management and Homeland Security or designee will be responsible for ensuring the updating of the Plan. The Director or designee will also notify all holders of the Plan and affected stakeholders when changes have been made. Every five years, the updated plan will be submitted to the Michigan State Police, Emergency Management and Homeland Security Division's (MSP/EMHSD) Mitigation Program and to the Federal Emergency Management Agency for review.

8.2 Continued Public Involvement

Oakland County and the Steering Committee are dedicated to involving the public directly in the review and updates of the Plan. The public will have the opportunity to provide input into Plan revisions and updates. Copies of the Plan will be kept by appropriate county departments and outside agencies.

Public meetings will be held when deemed necessary by the Steering Committee. The meetings will provide a forum where the public can express concerns, opinions, or new alternatives that can then be included in the Plan. The Steering Committee, and specifically Oakland County Emergency Management and Homeland Security, will be responsible for using county resources to publicize the public meetings and maintain public involvement.

To further facilitate continued public involvement in the planning process, Oakland County will ensure that:

- Oakland County Emergency Management and Homeland Security will keep a copy of the plan on hand at their office for review and comment by the public. The Plan will also be maintained on their website.
- A public meeting will be held annually to provide the public with a forum for discussing concerns, opinions, and ideas with the Steering Committee.
- Oakland County Emergency Management and Homeland Security will conduct outreach after a disaster event to remind members of the importance of mitigation and to solicit mitigation ideas to be included in the plan.

8.3 Monitoring, Evaluation, and Updating the Plan

To ensure the Hazard Mitigation Plan continues to provide an appropriate path for risk reduction throughout the county, it is necessary to regularly evaluate and update it. The

Steering Committee will be responsible for monitoring the status of the plan and gathering appropriate parties to report the status of mitigation actions. The Steering Committee will convene on an annual basis to determine the progress of the identified mitigation actions. The Steering Committee will also be an active participant in the next plan update. As the Hazard Mitigation Plan matures, new stakeholders, specifically those stakeholders and organizations that represent underserved populations and groups in the county, will be identified and encouraged to join the existing Steering Committee.

Oakland County Emergency Management and Homeland Security is responsible for contacting Steering Committee members and organizing the annual meeting. The Steering Committee's responsibilities include:

- Annually reviewing each goal to determine its relevance and appropriateness.
- Monitor and evaluate the mitigation strategies in this Plan to ensure the document reflects current hazard analyses, development trends, code changes and risk analyses and perceptions.
- Ensure the appropriate implementation of annual status reports and regular maintenance of the plan.
- Create future action plans and mitigation strategies. These should be carefully assessed and prioritized using benefit-cost analysis (BCA) methodology that FEMA has developed.
- Ensure the public is invited to comment and be involved in mitigation plan updates.
- Ensure that the county complies with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR.
- Reassess the plan in light of any major hazard event. The Steering Committee will convene within 45 days of any major event to review all applicable data and to consider the risk assessment, plan goals, and action items given the impact of the hazard event.
- Review the plan in connection to other plans, projects, developments, and other significant initiatives.
- Coordinate with appropriate municipalities and authorities to incorporate regional initiatives that transcend the boundaries of the county.
- Update the plan every five years and submit for FEMA approval.
- Amend the plan whenever necessary to reflect changes in State or Federal laws and statutes required in 44 CFR.

8.3.1 The Five-Year Action Plan

This section outlines the implementation agenda that the Steering Committee should follow five years following adoption of this Plan, and then every five years thereafter. The Steering Committee is responsible to ensure the Hazard Mitigation Plan is updated every five years.

The Steering Committee will consider the following an action plan for the five-year planning cycle. It should be noted that the schedule below can be modified as necessary and does not include any meetings and/or activities that would be necessary following a disaster event (which would include reconvening the Steering Committee within 45 days of a disaster or

emergency to determine what mitigation projects should be prioritized during the community recovery). If an emergency meeting of the Steering Committee occurs, this proposed schedule may be altered to fit any new needs.

Year 0:

- **2023:** Update Hazard Mitigation Plan, including a series of meetings & public meetings. Submit 2023 Hazard Mitigation Plan for FEMA approval.
- **2023:** Work on mitigation actions. Oakland County Emergency Management and Homeland Security to stay in contact with lead departments and municipalities to keep tabs on project status.

Year 1:

- **January 2024 – December 2024:** Work on mitigation actions. Oakland County Emergency Management and Homeland Security to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage plan integration efforts.
- **Fall/Winter 2024:** Reconvene Steering Committee for an annual meeting. Discuss opportunities for mitigation plan integration with other planning documents. Discuss recent hazards. Update the status of projects. Host a public meeting.

Year 2:

- **January 2025 – December 2025:** Work on mitigation actions. Oakland County Emergency Management and Homeland Security to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage plan integration efforts.
- **Fall/Winter 2025:** Reconvene Steering Committee for an annual meeting. Discuss opportunities for mitigation plan integration with other planning documents. Discuss recent hazards. Update the status of projects. Host a public meeting.

Year 3:

- **January 2026 – December 2026:** Work on mitigation actions. Oakland County Emergency Management and Homeland Security to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage plan integration efforts.
- **Summer/Fall 2026:** Apply for Building Resilient Infrastructure and Communities or Hazard Mitigation Grant Program funds to update the next iteration of the mitigation plan.
- **Fall/Winter 2026:** Reconvene Steering Committee for an annual meeting. Discuss opportunities for mitigation plan integration with other planning documents. Discuss recent hazards. Update the status of projects. Host a public meeting.

Year 4:

- **January 2027 – December 2027:** Work on mitigation actions. Oakland County Emergency Management and Homeland Security to stay in contact with lead departments and municipalities to keep tabs on project status. Encourage plan integration efforts.
- Update 2023 Hazard Mitigation Plan, including a series of meetings & public meetings.

Year 5:

- **2028:** Submit 2028 Hazard Mitigation Plan for FEMA approval. Repeat.

8.4 Annual Hazard Mitigation Steering Committee Planning Meetings

During each annual Steering Committee meeting, the Steering Committee will be responsible for a brief evaluation of the 2023 Hazard Mitigation Plan and to review the progress on mitigation actions.

8.4.1 Plan Evaluation

To evaluate the plan, the Steering Committee should answer the following questions:

- Are the goals still relevant?
- Is the risk assessment still appropriate, or has the nature of the hazard and/or vulnerability changed over time?
- Are current resources appropriate for implementing this Plan?
- Have lead agencies participated as originally proposed?
- Has the public been adequately involved in the process? Are their comments being heard?
- Have county departments and participating jurisdictions been integrating mitigation into their planning documents?

If the answer to each of the above questions is “yes,” the plan evaluation is complete. If any questions are answered with a “no,” the identified gap must be addressed.

8.4.2 Review of Mitigation Actions

Once the plan evaluation is complete, the Steering Committee will review the status of the mitigation actions. To do so, the Steering Committee should answer the following questions:

- Have the mitigation actions been implemented as planned?
- Have outcomes been adequate?
- What problems have occurred in the implementation process?

8.4.3 Meeting Documentation

Each annual Steering Committee meeting must be documented, including the plan evaluation and review of mitigation actions. This may be done by survey or other means, as appropriate.

8.5 Implementation through Existing Programs

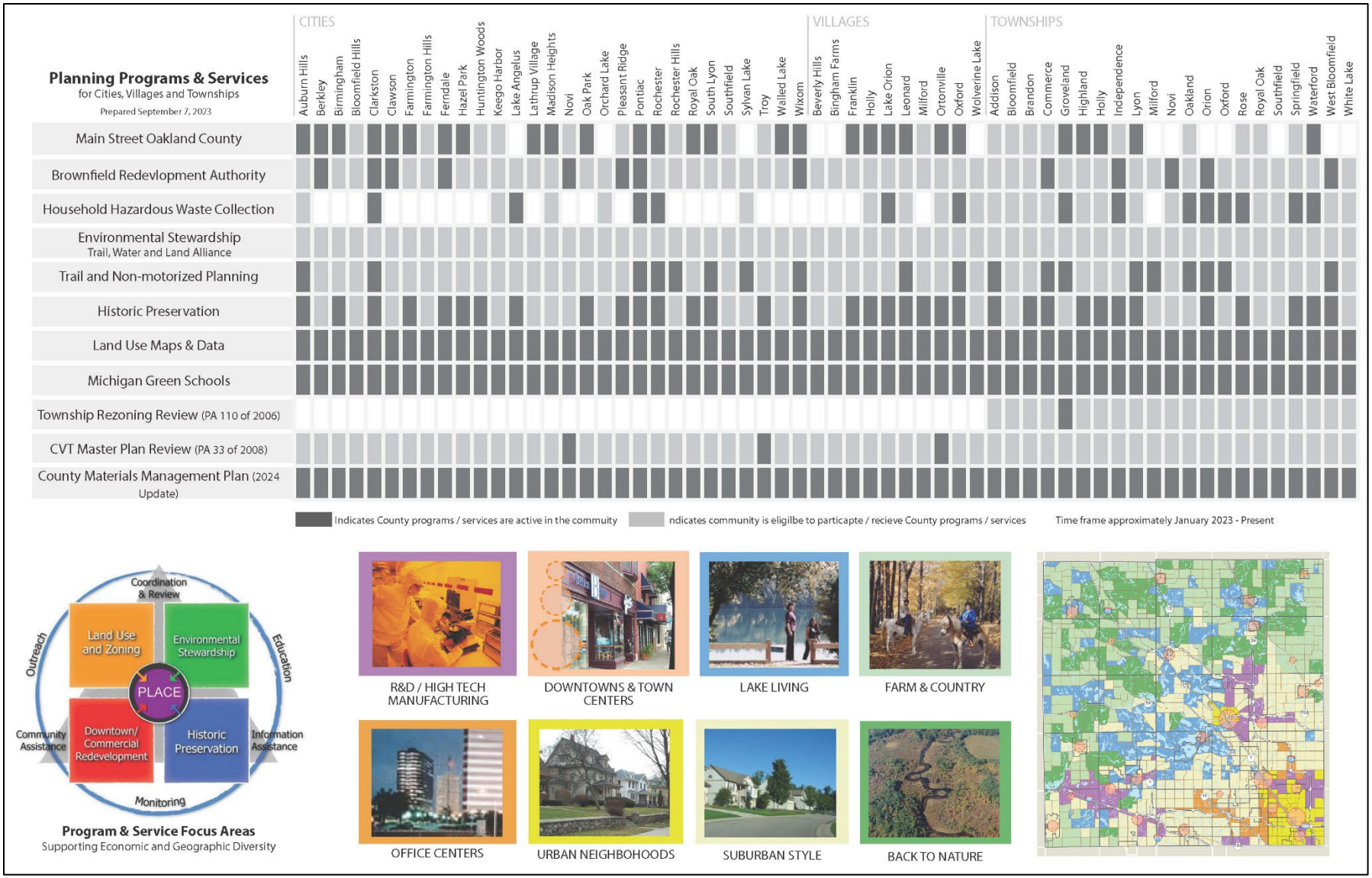
Hazard mitigation practices must be incorporated within existing plans, projects, and programs. Therefore, the involvement of all departments, private non-profits, private industry, and appropriate jurisdictions is necessary in order to find mitigation opportunities within existing or planned projects and programs. To execute this, the Steering Committee will assist and coordinate resources for the mitigation actions and provide strategic outreach to implement mitigation actions that meet the goals identified in this Plan.

Oakland County Planning and Economic Development Services will incorporate the hazard mitigation plan and its concepts when formally reviewing municipal-level comprehensive plans to ensure goals and strategies are aligned and integrated. Specifically, the Planning & Local Business Development Division (PLBD) of the Department of Economic Development in Oakland County will apply the following text to their future recommendations regarding hazard mitigation for Master Plans during their review:

> Incorporate a hazard mitigation plan or elements that could be used in a hazard mitigation plan. Oakland County's PLBD staff is making a deliberate effort to encourage communities to consider the natural and manmade hazards and associated risks to communities and integrate their hazard mitigation priorities and strategies into their comprehensive Master Plans, when applicable. This is particularly relevant for hazard mitigation related to infrastructure, utilities, natural features, major assets, and historic districts/structures that may be added to the Village's Capital Improvement Program if applicable or may represent FEMA (Federal Emergency Management Agency) eligible projects. Through FEMA, communities may be eligible for nationally competitive, annually awarded Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) grants for planning and project work. Communities responding to and recovering from major disasters or emergencies declared by the President are also eligible for Public Assistance (PA) Funds for emergency work and permanent infrastructure projects. Mitigation opportunities resulting from declared disasters, specifically through the Hazard Mitigation Grant Program (HMGP), are a source of potential funding following major disaster declarations. The 2023 Oakland County Hazard Mitigation Plan is available online through the Oakland County Emergency Management and Homeland Security Department webpage at: https://www.oakgov.com/community/emergency-management/need-to-know/disaster-planning/hazard-mitigation-plan

Additionally, mitigation actions were identified to promote plan integration in future revisions of this plan (See Volume II).

The following programs and plans have been identified as having mitigation implications for all participating jurisdictions of this plan. The dark box indicates the program is active in the community. The lighter box indicates the community is eligible to participate, and represents an area of potential expansion, implementation and/or improvement, especially with respect to hazard mitigation integration.


Planning Programs & Services
for Cities, Villages and Townships
Prepared September 7, 2023
CITIES
VILLAGES
TOWNSHIPS
Auburn Hills
Berkley
Birmingham
Bloomfield Hills
Clarkston
Clawson
Farmington
Farmington Hills
Ferndale
Hazel Park
Huntington Woods
Keego Harbor
Lake Angelus
Lathrup Village
Madison Heights
Novi
Oak Park
Orchard Lake
Pleasant Ridge
Pontiac
Rochester
Rochester Hills
Royal Oak
South Lyon
Southfield
Sylvan Lake
Troy
Walled Lake
Wixom
Beverly Hills
Bingham Farms
Franklin
Holly
Lake Orion
Leonard
Milford
Ortonville
Oxford
Wolverine Lake
Addison
Bloomfield
Brandon
Commerce
Groveland
Highland
Holly
Independence
Lyon
Milford
Novi
Oakland
Orion
Oxford
Rose
Royal Oak
Southfield
Springfield
Waterford
West Bloomfield
White Lake
Main Street Oakland County
Brownfield Redevlopment Authority
Household Hazardous Waste Collection
Environmental Stewardship
Trail, Water and Land Alliance
Trail and Non-motorized Planning
Historic Preservation
Land Use Maps & Data
Michigan Green Schools
Township Rezoning Review (PA 110 of 2006)
CVT Master Plan Review (PA 33 of 2008)
County Materials Management Plan (2024 Update)
Indicates County programs / services are active in the commuity
ndicates community is eligilbe to particapte / recieve County programs / services
Time frame approximately January 2023 - Present
Coordination & Review
Land Use and Zoning
Environmental Stewardship
Outreach
Education
PLACE
Community Assistance
Downtown/ Commercial Redevelopment
Historic Preservation
Information Assistance
Monitoring
Program & Service Focus Areas
Supporting Economic and Geographic Diversity
R&D / HIGH TECH MANUFACTURING
DOWNTOWNS & TOWN CENTERS
LAKE LIVING
FARM & COUNTRY
OFFICE CENTERS
URBAN NEIGHBOHOODS
SUBURBAN STYLE
BACK TO NATURE

Appendix A: Plan Participation and Documentation

This appendix describes the methods the County used to involve stakeholders in the mitigation planning process.

A.1 Mitigation Webinar Participation

Name	Organization	Title
Alan Maciag	City of Northville Police Department	Chief of Police
Amy Neary	West Bloomfield Township	Planning and Development Services Director
Andrew Pazuchowski	City of Huntington Woods	Director of Public Safety
Ann Echols	Rochester Hills Fire Department	Captain / Assistant Fire Marshal
Bob Houhanisin	Farmington Public Safety	Director
Ed Haapala	West Bloomfield Township	Utilities Director
Eileen Harryvan*	Southfield Township	Clerk
Gregory Flynn	West Bloomfield Township	Fire Chief
Jerry Morawski	Addison Township Fire	Fire Chief
Jim O'Reilly	Southfield Township	Supervisor
Justin Taylor	West Bloomfield Township	Utilities Superintendent
Kim Chalifoux	Southfield Township	Treasurer
Kris D'Arcy	West Bloomfield Township	Executive Assistant to Steve Kaplan
Madeleine Daniels	Associate Planner-GIS	Oakland County
Matt Church	City of Berkley Public Library	Library Director
Mike Kamenec	Oakland County EMA	Emergency Management Coordinator
Mike McDonald	Village of Leonard	Village President
Paul Wells	City of Birmingham	Fire Chief
Richard Story	City of Hazel Park	Fire Chief
Robert Scripture	West Bloomfield Township	Assessing Director
Ryan Dividock	Oakland County	Supervisor - Planning, Zoning, and Land Use
Scott Berkseth	City of Novi Police Department	Emergency Management Coordinator
Teri Weingarden	West Bloomfield	Treasurer
Theresa McArleton	City of Berkley	Director of Parks and Recreation
Thomas Hardesty	Oakland County EMA	Director
Tony Averbuch	Villages of Franklin, Bingham Farms, and Southfield Township	Fire Chief
Kristin Kapelanski	City of Berkley	Development Director
James Breuckman	City of Pleasant Ridge	City Manager
Jennifer Curran	West Bloomfield Police Dept.	Dispatch Manager
Jill Martin	City of Royal Oak	
John Blanchard	City of Berkley	Emergency Manager
John Ellsworth	Wolverine Lake	Chief of Police

John Holland	White Lake Township Fire Dept.	Fire Chief
Phil Langmeyer	Wixom Police Department	Chief of Police
Matt Majestic*	Oxford Fire Department	Fire Chief
Michael Patton	West Bloomfield Police Department	Chief of Police
Scott McKee	City of Lathrup Village	Chief of Police / Emergency Manager
Sean O'Neil	White Lake Township	Community Development Director
Seth Greely	West Bloomfield Fire Department	Firefighter / Paramedic
Dale Young	West Bloomfield Police Department	Lieutenant
Curt Lawson	West Bloomfield PD	Deputy Chief
Tim Sikma	City of Wixom Department of Public Works	DPW Director
Brandy Siedlaczek	Southfield Township	Storm Water Manager
Brendan Brosnan	Waterford Township	Waterford EM
Byron Turnquist	West Bloomfield Fire Department	Fire Marshal
Christopher Sederlund	South Lyon Police Department	Lieutenant
David Cummins	Royal Oak Fire Department	Fire Chief
David Kwapis	Brandon Fire Department/Brandon Township	Fire Chief
Derek VanDam	Waterford Township DPW	DPW Superintendent
Douglas Baaki	South Lyon Police Department	Police Chief
Donald Green	Milford Township	Township Supervisor
Gary Wall	Waterford Township	Township Supervisor
James Neufeld	City of Farmington Hills Fire Department	EMC
Jeffrey Polkowski	Waterford Township	Superintendent of Planning and Zoning
Jim Schafer	Oakland County Economic Development	Senior Planner
John Cieslik	Rochester Fire Department	Fire Chief
Kevin Knauss	Milford Police Department	Lieutenant
Michael Moore	Royal Oak Police Department	Chief of Police
Patrick Stanton	Royal Oak Police Department	Deputy Chief of Police
Steve Brown	City of Wixom	City Manager
Brian Pankow	Farmington Hills Fire Department	Emergency Manager
Gerard Proctor	West Bloomfield Fire Department	EMS Captain
Mike Kamenec	Oakland County	Emergency Management Specialist
Christian Wuerth	Village of Milford	Village Manager
Sara Stoddard	Oakland County	Chief of Administrative Services, Oakland County Health Division
Sam Montney	OCHD	EP Supervisor
Rachel Witherspoon	Village of Milford	Asst. to the Village Manager
Justin Beck	City of Southfield	Director of Homeland Security and Emergency Preparedness
James Neufeld	Farmington Hills Fire Department	Fire Chief

A.2 Mitigation Workshops

Oakland County, Michigan
Hazard Mitigation Plan Update 2023
Oakland County, Michigan

Hazard Mitigation Planning Workshop | Monday, July 17, 2023 (1:00 p.m. to 4:00 p.m.) | Detroit Zoo, 8450 W. 10 Mile Rd, Royal Oak, MI 48067

Hazard Mitigation Planning Workshop | Wednesday, July 19, 2023 (1:00 p.m. to 4:00 p.m.) | Waterford Oaks Activity Center, 2800 Watkins Lake Rd, Waterford Twp, MI 48328

Hazard Mitigation Planning Workshop | Thursday, July 20, 2023 (9:00 a.m. to 12:00 p.m.) | Farmington Hills Fire Station #5, 31455 W. Eleven Mile Rd, Farmington Hills, Mi 48336

Workshop Agenda

Introductions

Overview of mitigation: Why mitigate?

How the mitigation plan can benefit my community

Overview of key mitigation plan elements & plan process

New FEMA guidance that will affect the 2023 update

Risk Summary/Risk Assessment Discussion

Jurisdiction/Agency Hazard Summary

Mitigation Goals Discussion

New and Ongoing Mitigation Actions/Projects

Project schedule and key dates

1

A.2.1 Mitigation Workshop Documentation

Hazards

Oakland County, MI Jurisdiction-Specific Hazard Assessment Form

Name:

Municipality (if applicable)**:**

Organization/Department:

E-mail:

Phone:

Instructions: *Please use this form to identify and describe how the hazards below have impacted (or could impact) your municipality or organization. Please be as specific as possible.*

Exposure and vulnerability to certain hazards **affect the entire county**. In other words, these hazards can affect the entire county (i.e., severe winter storm) or happen anywhere in the county (i.e., lightning). The following hazards, for example, fall into this category: Thunderstorms, lightning, hail, high winds, severe winter storms, extreme cold, drought, extreme heat, and earthquakes. Although the entire county may be vulnerable to these hazards, their impacts may vary based on existing community conditions (i.e., underserved or functional access needs populations may be more susceptible based on certain conditions, vulnerabilities, or needs). **Please indicate the hazards in which your community is uniquely vulnerable and provide a brief explanation.**

Our community and/or organization is NOT uniquely vulnerable to any hazards that affect the entire county. Check the box if this applies to your community and/or organization. ☐

Please describe how your municipality/organization is uniquely vulnerable to Blizzards, Heavy Snow, or Ice Storms/Sleet (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard or if certain long-term care facilities lack back-up generators).

Please describe how your municipality/organization is uniquely vulnerable to Drought. Describe the location of concern and its potential impacts.

Please describe how your municipality/organization is uniquely vulnerable to Earthquake (example: identify specific buildings or structures in your community that are seismically unreinforced or prone to collapse).

Please describe how your municipality/organization is uniquely vulnerable to Extreme Cold (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard or if certain long-term care facilities lack back-up generators).

Page **1** of **4**

Please describe how your municipality/organization is uniquely vulnerable to Extreme Heat (example: indicate if there is a specific population subgroup that is uniquely vulnerable to extreme heat or if certain long-term care facilities lack sufficient air conditioning or back-up generators).

Please describe how your municipality/organization is uniquely vulnerable to High Winds (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard, such as manufactured homes).

Please describe how your municipality/organization is uniquely vulnerable to Public Health Emergencies. Describe the location of concern and its potential impacts.

Please describe how your municipality/organization is uniquely vulnerable to Thunderstorms, Lightning, and Hail (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard).

Please describe how your municipality/organization is uniquely vulnerable to Tornadoes (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard, such as manufactured homes; lack warning).

Exposure and vulnerability to certain hazards are **geographically defined**. In other words, these hazards tend to affect certain areas in your community (i.e., riverine-based flooding). The following hazards, for example, fall into this category: flooding, wildfire, dam failure, hazardous materials, and major transportation incidents. Please indicate the hazards in which your community is uniquely vulnerable and provide a brief explanation.

Our community and/or organization is NOT uniquely vulnerable to any hazards that are geographically defined. Check the box if this applies to your community and/or organization. ☐

Please describe how your municipality/organization is uniquely vulnerable to Dam Failure. For example, indicate the dam of concern, and describe how a failure of the dam could impact your community. What structures/homes and roadways reside in the inundation area?

Please describe how your municipality/organization is uniquely vulnerable to Flood-related hazards (flash flood; riverine/creek flood). For example, describe how a specific intersection, and/or subdivision repeatedly floods.

Please describe how your municipality/organization is uniquely vulnerable to Fog Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Subsidence (Sinkhole) Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Wildfire. For example, indicate the area of concern, and describe how wildfire could impact your community or key infrastructure vulnerable to wildfire.

Please describe how your municipality/organization is uniquely vulnerable to Active Shooter Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Cybersecurity Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Hazardous Materials Accidents. Describe the location of concern and its potential impacts/issues.

Please describe how your municipality/organization is uniquely vulnerable to Infrastructure Failure Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Invasive Species. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Nuclear Power Plant Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Oil and Gas Well Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Socio-Political Incidents (Civil Disturbance, Social Unrest). Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Structural Fire Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Terrorism/Weapon of Mass Destruction Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Major Transportation Incident(s). Describe the location(s) of concern and its potential impacts. Indicate specific roadways, conditions, and/or circumstances that make this hazard a higher risk.

Mitigation Actions

Handout: New Mitigation Actions (Oakland County)

Name:

Organization/Department:

E-mail:

Phone:

New Mitigation Action (Please Describe):

Year Initiated	**2023 (New Mitigation Action)**
Applicable Jurisdiction	
Lead Agency/Organization	
Supporting Agencies/Organizations	
Potential Funding Source	
Estimated Cost	
Benefits (loss avoided)	
Projected Completion Date	
PRIORITY (High, Medium, Low)	

Please indicate if the mitigation goals and objectives below are applicable to the new mitigation action/project). Check All That Apply.

X	Place an "X" by the applicable goals, if applicable
	1. Protection of public health and safety and prevention and reduction of loss of life and injury due to all hazards.
	2. Protect critical infrastructure and community lifelines within Oakland County by identifying and reducing vulnerabilities to the impacts of natural and manmade hazards.
	3. Protect the assets (people, properties, key resources, etc.) within Oakland County from the impacts of natural and manmade hazards through the implementation of structural mitigation projects, such as flood mitigation projects, green infrastructure, retrofitting, reducing the number of repetitively damaged structures in the County, etc.; and nonstructural mitigation activities, such as public outreach and education and improving/promoting advanced warning systems.
	4. Strengthen relationships between the public sector, private sector entities, leaders from underserved communities, and residents to enhance community resilience through a whole-community approach, with specific emphasis on achieving equitable outcomes for all communities, including underserved communities and socially vulnerable populations.
	5. Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards.
	6. Promote coordination between public service sectors, and encourage participation in sustainable and cost-effective mitigation projects, and by improving and supporting public and private organizational response capabilities.
	7. Encourage systematic updates and adoptions of regulations and policies to ensure new and existing developments address changing environmental, climate change, and natural hazard concerns. Integrate hazard mitigation strategies and priorities into existing community plans.

Page **1** of **2**

Handout: New Mitigation Actions (Oakland County)

This mitigation action:

Instructions: Circle the best option

	Strongly Disagree (1)	Disagree (2)	Neither Agree or Disagree (3)	Agree (4)	Strongly Agree (5)
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community; does not adversely affect a particular segment of the population; does not cause relocation of lower income people and is compatible with the community's social and cultural values.	1	2	3	4	5
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts.	1	2	3	4	5
Administrative: Do you agree or disagree that your jurisdiction/organization has the necessary staffing and funding to carry-out this mitigation action.	1	2	3	4	5
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process.	1	2	3	4	5
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action.	1	2	3	4	5
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost benefit review, and is possible to fund?	1	2	3	4	5
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals.	1	2	3	4	5

Place an "X" by the hazard(s) this action/project will mitigate:

Mitigated Hazards			
X	Place an "X" by the applicable hazard		Winter Storm and Blizzards
	All Hazards		Wildfire
	Dam Failure		Active Shooter/Active Assailant
	Drought		Cybersecurity
	Earthquake		Hazardous Materials Incidents: Fixed Site
	Extreme Cold		Hazardous Materials Incidents: Transportation Incident
	Extreme Heat		Infrastructure Failure
	Fog		Nuclear Power Plant Accidents
	Hail		Oil and Gas Well Accidents
	High Winds/Severe Winds		Public Health Emergencies: Pandemic/Epidemic
	Ice and/or Sleet Storms		Socio-Political Hazards (Civil Disturbance, Social Unrest)
	Invasive Species		Structural Fire
	Flood (Riverine/Creek)		Terrorism/ Weapons of Mass Destruction
	Flood (Flash Flooding)		Transportation Accidents: Air
	Subsidence (Sinkhole)		Transportation Accidents: Highway
	Thunderstorm (Lightning)		Transportation Accidents: Marine
	Tornadoes		Transportation Accidents: Rail

Page 2 of 2

A.2.2 Workshop Attendee List

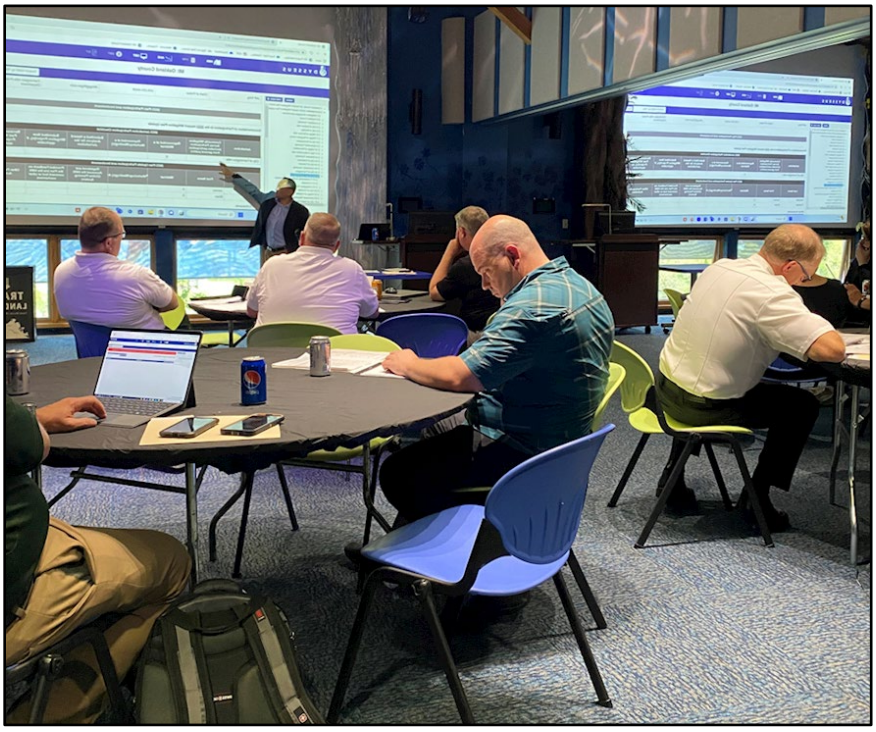
The sign-in sheets for the workshops are available in **Appendix D: Jurisdiction Participation & Sign-in Sheets**.

Name	Organization	Title
John Blanchard	City of Berkley, MI	Emergency Manager
Bridget Dean	Berkley	Mayor
Scott Berkseth	City of Novi	Emergency Management Coordinator
John Martin	Novi Fire Department	Assistant Fire Chief
Greg Lelito	Madison Heights / City of Madison Heights	Fire Chief
Aaron Filipski	City of Royal Oak / Public Services and Recreation	Director of Public Services and Recreation
Jeffrey Herczeg	City of Novi	Director of Public Works
Greg Flynn	West Bloomfield Twp. Fire Department	Fire Chief
Brent LeMerise	Madison Heights Police Department	Police Chief
Matthew Majestic	Oxford Fire Department	Fire Chief
Jeff Derringer	City of Royal Oak	Supervisor
Randy Vesper	Oxford Township/Village Fire Department	Assistant Fire Chief
Jeffery Schiffman	Clinton River Watershed Council	Watershed Planner
Kim Chalifoux	Southfield Township	Treasurer
Eileen Harryvan	Southfield Township	Clerk
Tim Sikma	City of Wixom	DPW Director
Darin Page	Oakland County EM	Specialist
Mike Kamenec	Oakland County EMA	EM Specialist
Thomas Hardesty	Oakland County EMHSD	Director
David Feichtner	Springfield Township	Fire Chief
Rachel Witherspoon	Village of Milford	Assistant to the Village Manager
Christian Wuerth	Village of Milford	Village Manager
John Holland	White Lake Township Fire Department	Fire Chief
Jason Hanifen	White Lake Township Fire Department	Fire Marshall
Jerry Morawski	Addison Twp and Village Leonard - Addison Twp. Fire Department	Fire Chief
John Cieslik	City of Rochester / Rochester Fire Department	Fire Chief / Emergency Manager
David Kwapis	Brandon Township and Village of Ortonville / Brandon Fire Department	Fire Chief
Jason Wilton	Brandon Fire Department / Building Department	Fire Marshal
John Fedele	City of Royal Oak	Director of Recreation
Brendan Brosnan	Waterford Township	Emergency Management Coordinator
Cynthie Conrad	South Lyon Fire Department	Lieutenant
Chris Barnett	Orion Township	Township Supervisor
Lee Davis	Beverly Hills Public Safety Department	Deputy Chief
Aaron Whatley	Charter Township of Orion	Director of Parks, Recreation & Facilities
Jeremy Stubbs	Auburn Hills Police Department	Lieutenant
Matt Exley	City of Royal Oak	Superintendent of Facilities
Deb Walton	Orion Township	Planning and Zoning Clerk

Adam Massingill	City of Auburn Hills Fire Department	Fire Chief
Karen Mondora	City of Farmington Hills	Director of Public Services
Vikie Winn	City of Farmington Hills	Communications Director
Joe Valentine	City of Farmington Hills	Assistant City Manager
Matt Koehn	City of Berkley	Public Safety Director
Theresa McArleton	City of Berkley	Director of Parks and Recreation
Bryan Farmer	City of Farmington Hills Special Services	Deputy Director
Don Green	Milford Township	Township Supervisor
Corrigan O'Donohue	Sylvan Lake	Chief of Police
Teresa Jablonski	City of Farmington Hills	Assistant Finance Director
Charmaine Kettler-Schmult	City of Farmington Hills PCD/Planning and Community	Director of Planning and Community Development
Tony Averbuch	Franklin, Bingham Farms, and Southfield Township	Fire Chief
Thomas Moore	Milford Fire Department / Township	Fire Chief
Erik Perdonik	City of Farmington Hills	City Planner
Ann Echols	Rochester Hills Fire Department	Captain / Assistant Fire Marshal
Joe Meier	Oak Park Department of Public Safety	Lieutenant / Fire Marshall
Richard Story	Hazel Park Fire Department / City of Hazel Park	Fire Chief
Christopher Sederlund	South Lyon Police Department	Lieutenant
Sgt. Chris Faught	South Lyon Police Department	Sergeant
Patrick Stanton	City of Royal Oak Police Department	Deputy Chief of Police
Reggie Madeline	Charter Township of Lyon, Lyon Township Fire Department	Assistant Chief
Bruce Harbin	Charter Township of Lyon	Fire Marshal
David Cummins	Royal Oak Fire Dept.	Fire Chief
Vince Sinacola	Orion Township	Water and Sewer Superintendent
Michael Moore	Royal Oak Police Department	Chief of Police
Ed Haapala	West Bloomfield Township	Utilities Director
Gary Mekjian	City of Farmington Hills	City Manager
Jill Martin	City of Royal Oak	Grants Coordinator - Management Analyst
Dave Korponic	Oakland County / Highland Twp Fire	Training Captain
Andrew Pazuchowski	Huntington Woods Department of Public Safety	Director of Public Safety
Hank Berry	Huntington Woods	Planning Director
Derrick Schueller	City of Farmington Hills / Public Works	Superintendent
Julie Lyons Bricker	Oakland County	Sustainability Project Manager
James Neufeld	City of Farmington Hills	Assistant Emergency Manager -Retired
Sean O'Neil	White Lake TWP	Community Development Director
Brian Pankow	City of Farmington Hills	Emergency Manager
Michelle Aranowski	City of Farmington Hills	Central Services Director

A.2.3 Workshop Photos

Workshop on 7/17/2023



Workshop on 7/19/2023


Why Mitigate?
Definition of Mitigation


Sign-In Sheet
Name and Title
Name
Title
Organization
Phone
Email

Workshop on 7/20/2023


Mitigation Planning Process

A.3 Other Meeting Documentation

Oakland County, Michigan
Hazard Mitigation Plan Update 2023
Oakland County, Michigan

LEPC Meeting Agenda

June 1, 2023 | 9:00 a.m. to 10:00 a.m.
Zoom | Virtual Meeting
https://us02web.zoom.us/j/82619545925?pwd=U1ZRbmhGVmRaaDJPeDVPeVdneUJEQT09

Introductions

Overview of mitigation: Why mitigate?

Mitigation planning process

Overview of key mitigation plan elements that are being updated and new FEMA guidance that will affect the 2023 update

Hazards and Risk Assessment Discussion

Mitigation Goals Discussion

Project schedule and key dates

Virtual Meeting Details: Zoom Meeting

https://us02web.zoom.us/j/82619545925?pwd=U1ZRbmhGVmRaaDJPeDVPeVdneUJEQT09

Meeting ID: 826 1954 5925
Passcode: 900910

Dial-in Option: (312) 626-6799

1

Appendix B: Public Involvement Activities and Documentation

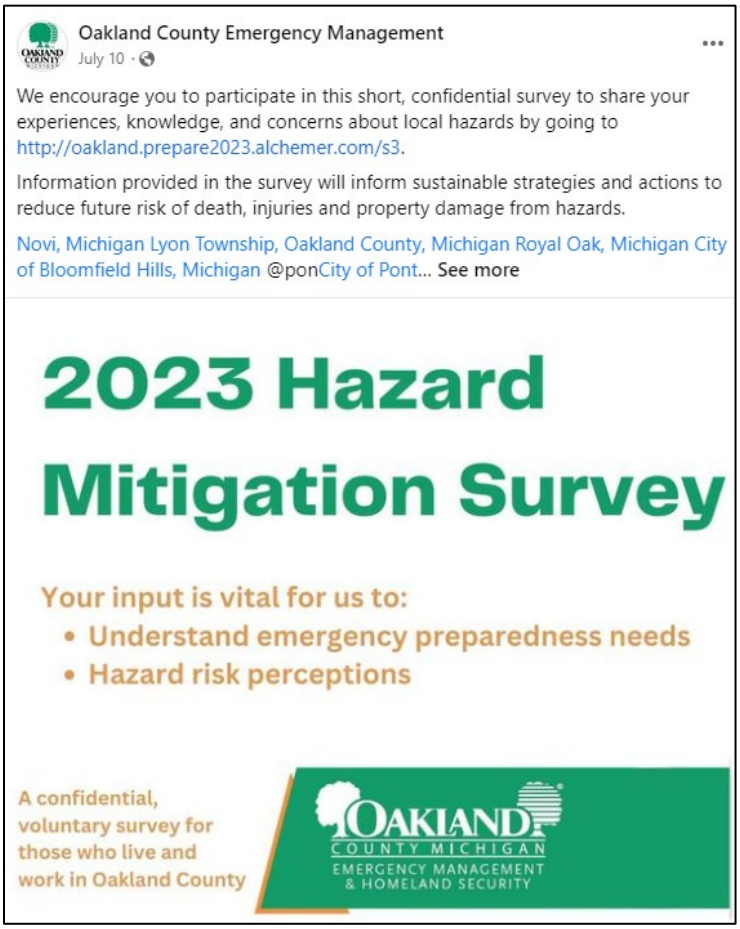
Below are samples of public information and public involvement activities that were used during the development of the Oakland County Hazard Mitigation Plan, including:

- Survey Results
- Public Meeting Announcements / News Releases
- Outreach Activities

B.1 Community Hazard Mitigation Survey

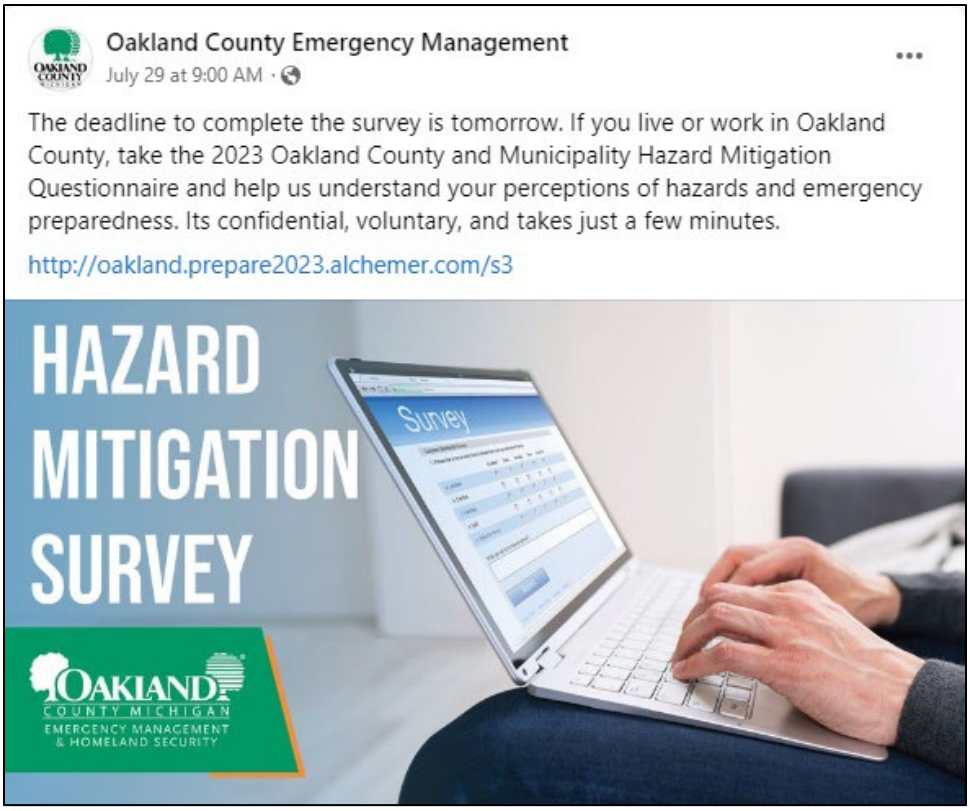
Please see **Appendix C: Report for 2023 Oakland County and Municipality Hazard Mitigation Questionnaire** for the Community Hazard Mitigation Survey results.

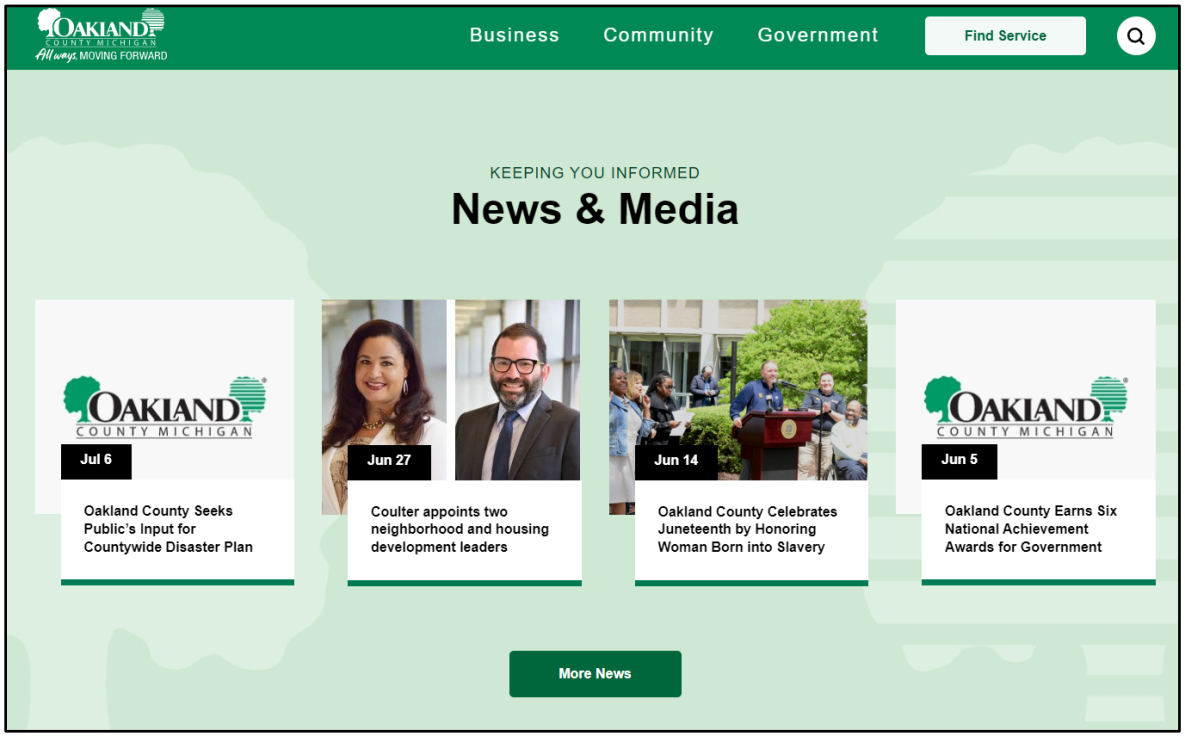
B.1.1 Social Media Posts for Hazard Mitigation Community Survey



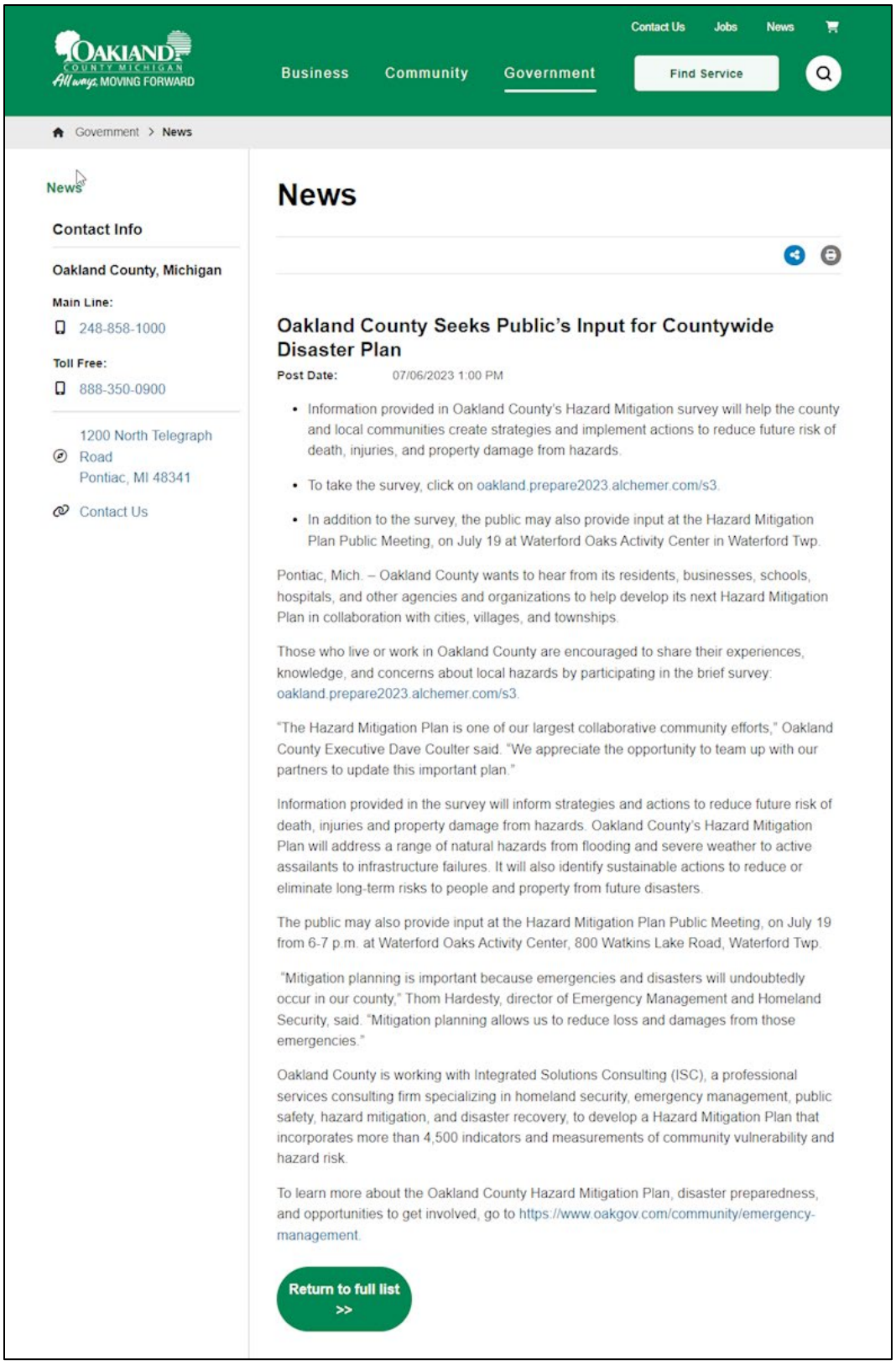

Oakland County Emergency Management
July 20 at 5:00 PM ·
If you live or work in Oakland County, take the 2023 Oakland County and Municipality Hazard Mitigation Questionnaire and help us understand your perceptions of hazards and emergency preparedness. Its confidential, voluntary, and takes just a few minutes.
http://oakland.prepare2023.alchemer.com/s3
Charter Township of Commerce Charter Township of Milford City of South Lyon Charter Township of Highland, Michigan White Lake Township, Michigan
HAZARD MITIGATION SURVEY
Survey
OAKLAND COUNTY MICHIGAN
EMERGENCY MANAGEMENT & HOMELAND SECURITY


Oakland County Emergency Management
July 25 at 5:00 PM ·
The deadline to complete the survey is approaching. If you live or work in Oakland County, take the 2023 Oakland County and Municipality Hazard Mitigation Questionnaire and help us understand your perceptions of hazards and emergency preparedness. Its confidential, voluntary, and takes just a few minutes.
http://oakland.prepare2023.alchemer.com/s3
Pontiac Michigan Franklin Village, Michigan Southfield, Michigan Royal Oak, Michigan City Government of Ferndale, Michigan
HAZARD MITIGATION SURVEY
Survey
OAKLAND COUNTY MICHIGAN
EMERGENCY MANAGEMENT & HOMELAND SECURITY


Oakland County Emergency Management
July 29 at 9:00 AM
The deadline to complete the survey is tomorrow. If you live or work in Oakland County, take the 2023 Oakland County and Municipality Hazard Mitigation Questionnaire and help us understand your perceptions of hazards and emergency preparedness. Its confidential, voluntary, and takes just a few minutes.
http://oakland.prepare2023.alchemer.com/s3
HAZARD MITIGATION SURVEY
Survey
OAKLAND COUNTY MICHIGAN
EMERGENCY MANAGEMENT & HOMELAND SECURITY


OAKLAND COUNTY MICHIGAN
All ways MOVING FORWARD
Business
Community
Government
Find Service
KEEPING YOU INFORMED
News & Media
Jul 6
Oakland County Seeks Public's Input for Countywide Disaster Plan
Jun 27
Coulter appoints two neighborhood and housing development leaders
Jun 14
Oakland County Celebrates Juneteenth by Honoring Woman Born into Slavery
Jun 5
Oakland County Earns Six National Achievement Awards for Government
More News

B.2 Public Meeting Announcements/News Releases



OAKLAND COUNTY MICHIGAN
All ways, MOVING FORWARD

Contact Us Jobs News

Business Community Government Find Service

Government > News

News

Contact Info

Oakland County, Michigan

Main Line:
248-858-1000

Toll Free:
888-350-0900

1200 North Telegraph Road
Pontiac, MI 48341

Contact Us

News

Oakland County Seeks Public's Input for Countywide Disaster Plan

Post Date: 07/06/2023 1:00 PM

- Information provided in Oakland County's Hazard Mitigation survey will help the county and local communities create strategies and implement actions to reduce future risk of death, injuries, and property damage from hazards.
- To take the survey, click on oakland.prepare2023.alchemer.com/s3.
- In addition to the survey, the public may also provide input at the Hazard Mitigation Plan Public Meeting, on July 19 at Waterford Oaks Activity Center in Waterford Twp.

Pontiac, Mich. – Oakland County wants to hear from its residents, businesses, schools, hospitals, and other agencies and organizations to help develop its next Hazard Mitigation Plan in collaboration with cities, villages, and townships.

Those who live or work in Oakland County are encouraged to share their experiences, knowledge, and concerns about local hazards by participating in the brief survey: oakland.prepare2023.alchemer.com/s3.

"The Hazard Mitigation Plan is one of our largest collaborative community efforts," Oakland County Executive Dave Coulter said. "We appreciate the opportunity to team up with our partners to update this important plan."

Information provided in the survey will inform strategies and actions to reduce future risk of death, injuries and property damage from hazards. Oakland County's Hazard Mitigation Plan will address a range of natural hazards from flooding and severe weather to active assailants to infrastructure failures. It will also identify sustainable actions to reduce or eliminate long-term risks to people and property from future disasters.

The public may also provide input at the Hazard Mitigation Plan Public Meeting, on July 19 from 6-7 p.m. at Waterford Oaks Activity Center, 800 Watkins Lake Road, Waterford Twp.

"Mitigation planning is important because emergencies and disasters will undoubtedly occur in our county," Thom Hardesty, director of Emergency Management and Homeland Security, said. "Mitigation planning allows us to reduce loss and damages from those emergencies."

Oakland County is working with Integrated Solutions Consulting (ISC), a professional services consulting firm specializing in homeland security, emergency management, public safety, hazard mitigation, and disaster recovery, to develop a Hazard Mitigation Plan that incorporates more than 4,500 indicators and measurements of community vulnerability and hazard risk.

To learn more about the Oakland County Hazard Mitigation Plan, disaster preparedness, and opportunities to get involved, go to https://www.oakgov.com/community/emergency-management.

Return to full list >>

Oakland County Emergency Management
July 7 ·

Oakland County is seeking the public's input for its countywide disaster plan. Oakland County Homeland Security will be hosting a Hazard Mitigation Plan Public Meeting, on July 19 from 6-7 p.m. at Waterford Oaks Activity Center, 2800 Watkins Lake Road, Waterford Twp. The meeting is to get the public's input into the hazards that effect the county. To learn more about the Oakland County Hazard Mitigation Plan, disaster preparedness, and opportunities to get involved, go to https://www.oakgov.com/community/emergency-management. #OaklandCounty Oakland County, Michigan Government Executive Office, Oakland County, Michigan

Oakland County Emergency Management
July 17 at 7:00 AM ·

Oakland County is seeking the public's input for its countywide disaster plan. Oakland County Homeland Security will be hosting a Hazard Mitigation Plan Public Meeting, on July 19 from 6-7 p.m. at Waterford Oaks Activity Center, 2800 Watkins Lake Road, Waterford Twp. The meeting is to get the public's input into the hazards that effect the county. . #OaklandCounty Executive Office, Oakland County, Michigan Oakland County, Michigan Government

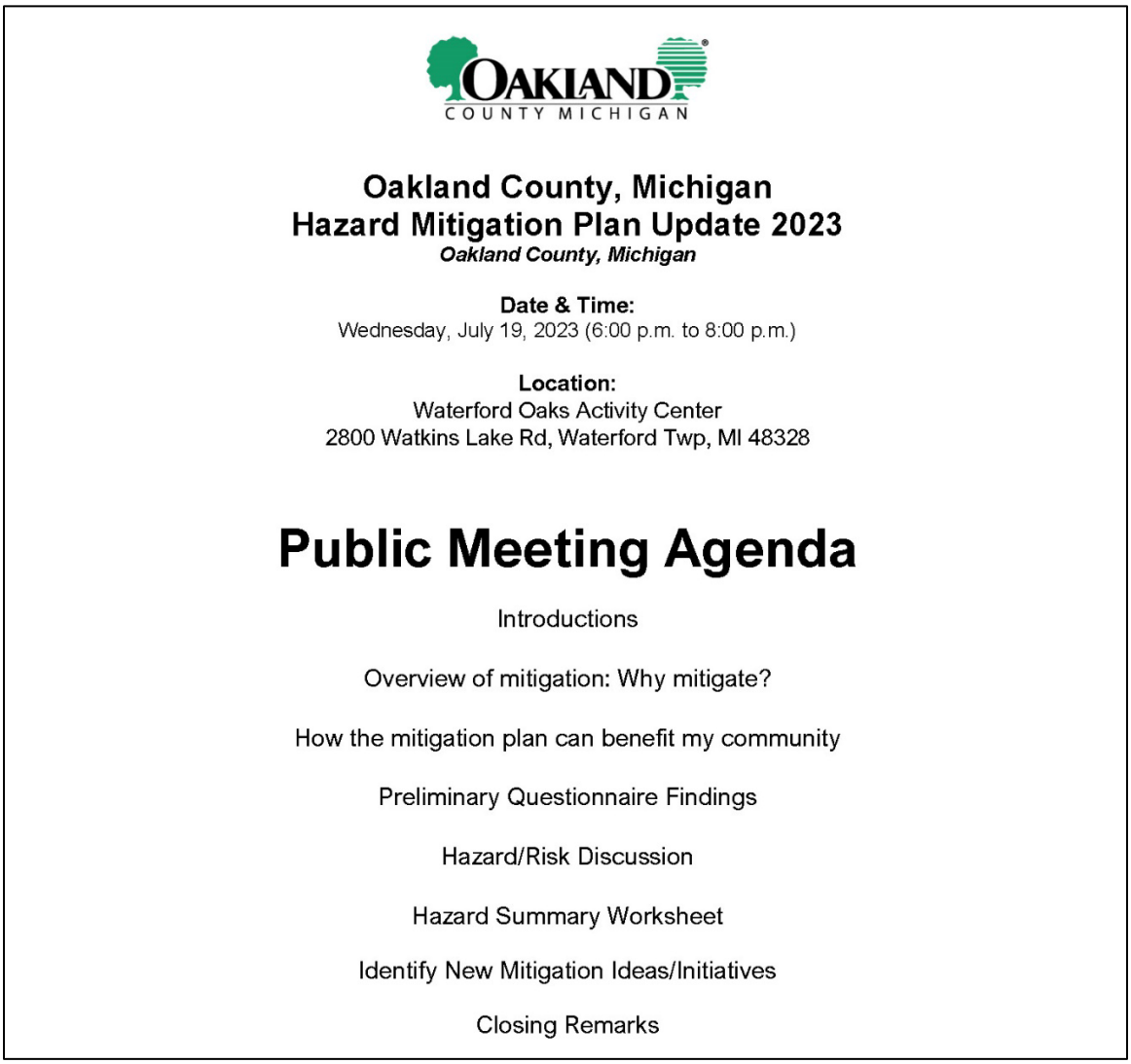
Oakland County Emergency Management
July 19 at 7:00 AM ·

Tonight, Oakland County Homeland Security will be hosting a Hazard Mitigation Plan Public Meeting from 6-7 p.m. at Waterford Oaks Activity Center, 2800 Watkins Lake Road, Waterford Twp. This meeting is to get the public's input into the hazards that effect the county.
#OaklandCounty Executive Office, Oakland County, Michigan , Oakland County, Michigan Government

B.3 Public Meeting Documentation

B.3.1 Public Meeting

The sign-in sheet for the public meeting is available in **Appendix D: Jurisdiction Participation & Sign-in Sheets**.



OAKLAND COUNTY MICHIGAN

Oakland County, Michigan
Hazard Mitigation Plan Update 2023
Oakland County, Michigan

Date & Time:
Wednesday, July 19, 2023 (6:00 p.m. to 8:00 p.m.)

Location:
Waterford Oaks Activity Center
2800 Watkins Lake Rd, Waterford Twp, MI 48328

Public Meeting Agenda

Introductions

Overview of mitigation: Why mitigate?

How the mitigation plan can benefit my community

Preliminary Questionnaire Findings

Hazard/Risk Discussion

Hazard Summary Worksheet

Identify New Mitigation Ideas/Initiatives

Closing Remarks

Oakland County, MI | Hazard Assessment Form | Public Meeting

Name:

Municipality (if applicable)**:**

Organization/Department (if applicable)**:**

E-mail:

Phone:

Instructions: *Please use this form to identify and describe how the hazards below have impacted (or could impact) your municipality or organization. Please be as specific as possible.*

Exposure and vulnerability to certain hazards **affect the entire county**. In other words, these hazards can affect the entire county (i.e., severe winter storm) or happen anywhere in the county (i.e., lightning). The following hazards, for example, fall into this category: Thunderstorms, lightning, hail, high winds, severe winter storms, extreme cold, drought, extreme heat, and earthquakes. Although the entire county may be vulnerable to these hazards, their impacts may vary based on existing community conditions (i.e., underserved or functional access needs populations may be more susceptible based on certain conditions, vulnerabilities, or needs). **Please indicate the hazards in which your community is uniquely vulnerable and provide a brief explanation.**

Our community and/or organization is NOT uniquely vulnerable to any hazards that affect the entire county. Check the box if this applies to your community and/or organization. ☐

Please describe how your municipality/organization is uniquely vulnerable to Blizzards, Heavy Snow, or Ice Storms/Sleet (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard or if certain long-term care facilities lack back-up generators).

Please describe how your municipality/organization is uniquely vulnerable to Drought. Describe the location of concern and its potential impacts.

Please describe how your municipality/organization is uniquely vulnerable to Earthquake (example: identify specific buildings or structures in your community that are seismically unreinforced or prone to collapse).

Please describe how your municipality/organization is uniquely vulnerable to Extreme Cold (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard or if certain long-term care facilities lack back-up generators).

Please describe how your municipality/organization is uniquely vulnerable to Extreme Heat (example: indicate if there is a specific population subgroup that is uniquely vulnerable to extreme heat or if certain long-term care facilities lack sufficient air conditioning or back-up generators).

Please describe how your municipality/organization is uniquely vulnerable to High Winds (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard, such as manufactured homes).

Please describe how your municipality/organization is uniquely vulnerable to Public Health Emergencies. Describe the location of concern and its potential impacts.

Please describe how your municipality/organization is uniquely vulnerable to Thunderstorms, Lightning, and Hail (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard).

Please describe how your municipality/organization is uniquely vulnerable to Tornadoes (example: indicate if there is a specific population subgroup that is uniquely vulnerable to this hazard, such as manufactured homes; lack warning).

Exposure and vulnerability to certain hazards are **geographically defined**. In other words, these hazards tend to affect certain areas in your community (i.e., riverine-based flooding). The following hazards, for example, fall into this category: flooding, wildfire, dam failure, hazardous materials, and major transportation incidents. Please indicate the hazards in which your community is uniquely vulnerable and provide a brief explanation.

Our community and/or organization is NOT uniquely vulnerable to any hazards that are geographically defined. Check the box if this applies to your community and/or organization. ☐

Please describe how your municipality/organization is uniquely vulnerable to Dam Failure. For example, indicate the dam of concern, and describe how a failure of the dam could impact your community. What structures/homes and roadways reside in the inundation area?

Please describe how your municipality/organization is uniquely vulnerable to Flood-related hazards (flash flood; riverine/creek flood). For example, describe how a specific intersection, and/or subdivision repeatedly floods.

Please describe how your municipality/organization is uniquely vulnerable to Fog Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Subsidence (Sinkhole) Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Wildfire. For example, indicate the area of concern, and describe how wildfire could impact your community or key infrastructure vulnerable to wildfire.

Please describe how your municipality/organization is uniquely vulnerable to Active Shooter Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Cybersecurity Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Hazardous Materials Accidents. Describe the location of concern and its potential impacts/issues.

Please describe how your municipality/organization is uniquely vulnerable to Infrastructure Failure Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Invasive Species. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Nuclear Power Plant Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Oil and Gas Well Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Socio-Political Incidents (Civil Disturbance, Social Unrest). Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Structural Fire Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Terrorism/Weapon of Mass Destruction Incidents. Describe the location(s) of concern and unique vulnerabilities/issues.

Please describe how your municipality/organization is uniquely vulnerable to Major Transportation Incident(s). Describe the location(s) of concern and its potential impacts. Indicate specific roadways, conditions, and/or circumstances that make this hazard a higher risk.

Handout: New Mitigation Actions (Oakland County, MI) – Public Meeting

Neighborhood:

Jurisdiction:

Name *(optional):*

E-mail *(optional):*

Phone *(optional)*:

New Mitigation Idea/Initiative (Please Describe):

Benefit (problem this mitigation idea will address): *Please describe the benefits this mitigation idea/initiative will offer to your community and/or organization.*

Place an "X" by the hazard(s) this action/project will mitigate:

Mitigated Hazards			
X	Place an "X" by the applicable hazard		Winter Storm and Blizzards
	All Hazards		Wildfire
	Dam Failure		Active Shooter/Active Assailant
	Drought		Cybersecurity
	Earthquake		Hazardous Materials Incidents: Fixed Site
	Extreme Cold		Hazardous Materials Incidents: Transportation Incident
	Extreme Heat		Infrastructure Failure
	Fog		Nuclear Power Plant Accidents
	Hail		Oil and Gas Well Accidents
	High Winds/Severe Winds		Public Health Emergencies: Pandemic/Epidemic
	Ice and/or Sleet Storms		Socio-Political Hazards (Civil Disturbance, Social Unrest)
	Invasive Species		Structural Fire
	Flood (Riverine/Creek)		Terrorism/ Weapons of Mass Destruction
	Flood (Flash Flooding)		Transportation Accidents: Air
	Subsidence (Sinkhole)		Transportation Accidents: Highway
	Thunderstorm (Lightning)		Transportation Accidents: Marine
	Tornadoes		Transportation Accidents: Rail

Page **1** of **1**

B.3.2 Oakland County Hazard Mitigation Plan – A Draft Review

The *Oakland County Hazard Mitigation Plan – A Draft Review* meeting was held on September 27, 2023. For those that were not able to attend, a link to the video was made available.

- **LINK TO VIDEO OF PUBLIC MEETING/PLANNERS GATHERING MEETING:** https://www.youtube.com/watch?v=5uDj68aYD7M

The attendee list is available in **Appendix D: Jurisdiction Participation & Sign-in Sheets**.

B.4 Public Outreach Activities & Draft Review

LINK TO PLAN ON ONLINE PLANNING SYSTEM FOR THE PUBLIC: https://mi-oakland-hs.isc-cemp.com

For members of the public or stakeholders who do not have a unique username and password, please use the following to access the plan:

- **Username**: public access
- **Password**: OaklandHMP#

DYSSEUS KMS CPM AAS CBT GMT SIT

MI: Oakland County

Search KMS by Title

Volume I: Oakland County, MI Hazard Mitigation Plan 2023

Published 11/11/2023 12:27 by Daiko Abe

Link Info | Export to Word | Print | Comment | ★

Edit | History

» *Volume I: Oakland County, MI Hazard Mitigation ...*

To further facilitate continued public involvement in the planning process, the public has the opportunity to provide continual feedback and input. As future needs and concerns arise, or if you would like to provide feedback regarding the latest version of the Oakland County Hazard Mitigation Plan, please use the form below to provide your comments.

- **LINK TO FORM:** https://integratedsolutions.wufoo.com/forms/comment-form-oakland-county-mitigation-plan/

DRAFT PLAN (VOLUME I): Please click on the corresponding chapters below to access the PDF version of the draft chapter. The PDF will open in a new tab on your browser.

Chapter 1: Introduction

Chapter 2: Plan Process

Chapter 3: Community Profile

Chapter 4: Risk Assessment

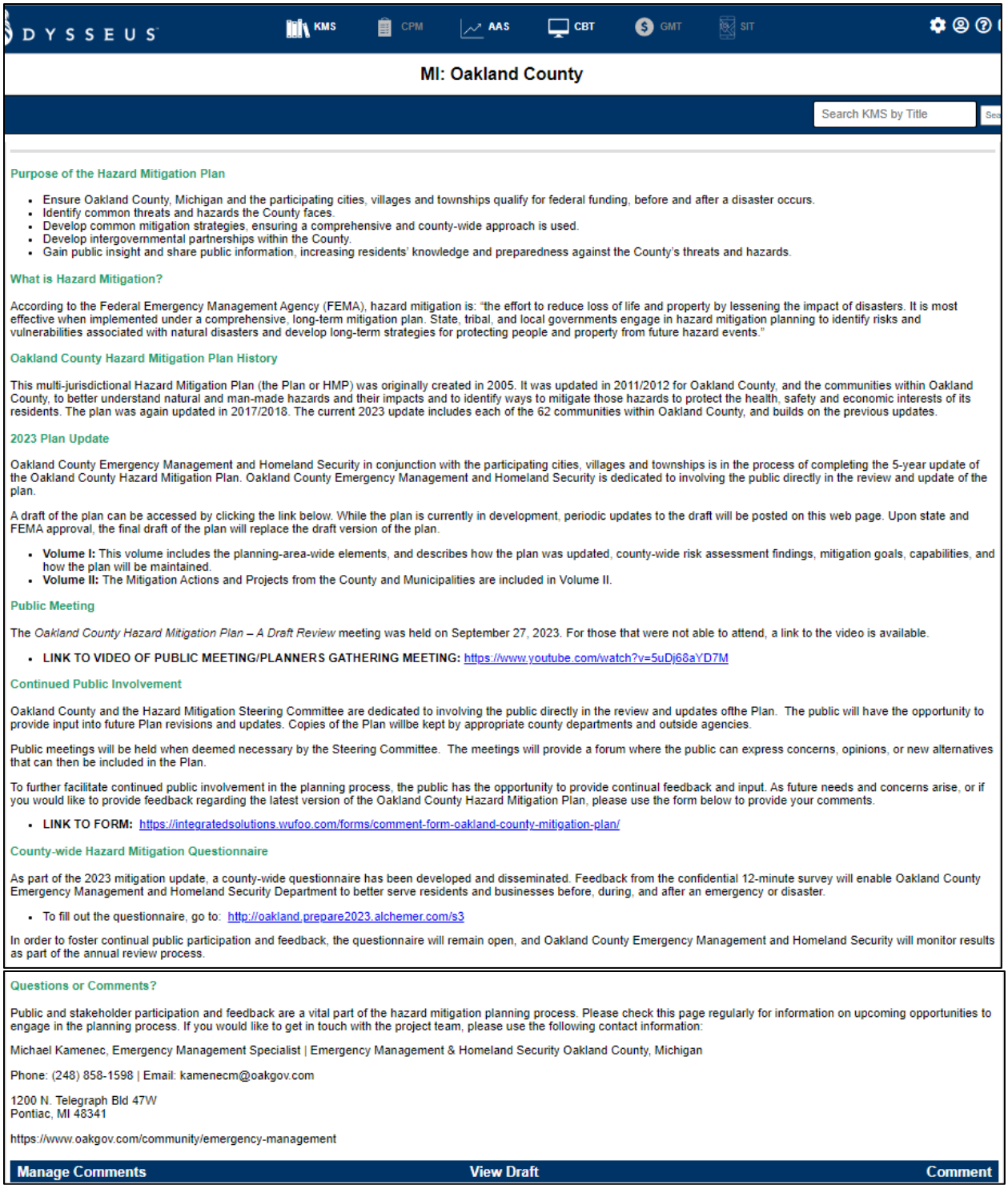
Chapter 5: Capabilities and Integration of Mitigation Measures

Chapter 6: Mitigation Goals

Chapter 7: Mitigation Strategies

Chapter 8: Plan Maintenance

DRAFT PLAN: VOLUME II


DYSSEUS
KMS
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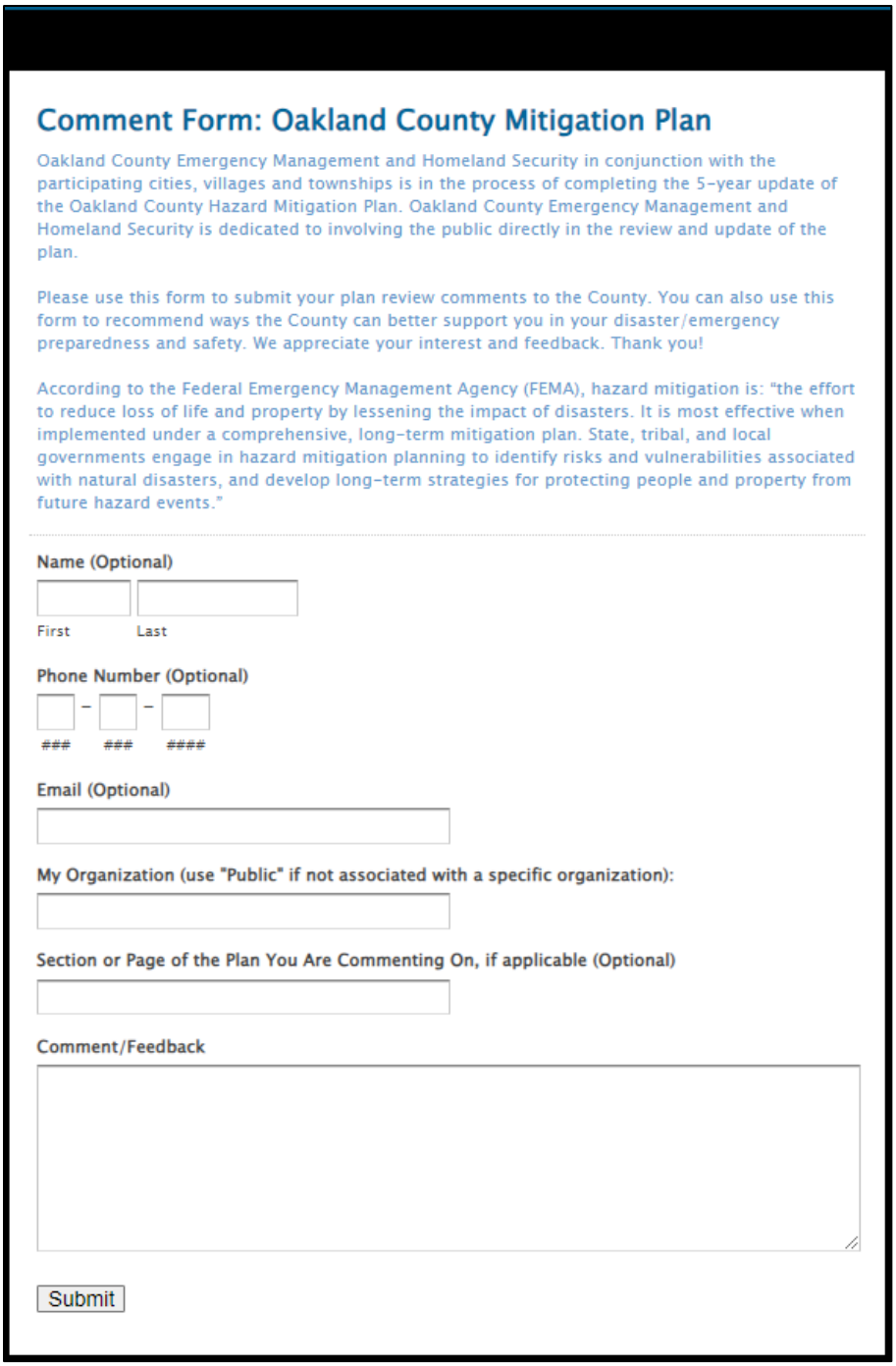
SIT
MI: Oakland County
Search KMS by Title
Purpose of the Hazard Mitigation Plan
Ensure Oakland County, Michigan and the participating cities, villages and townships qualify for federal funding, before and after a disaster occurs.
Identify common threats and hazards the County faces.
Develop common mitigation strategies, ensuring a comprehensive and county-wide approach is used.
Develop intergovernmental partnerships within the County.
Gain public insight and share public information, increasing residents' knowledge and preparedness against the County's threats and hazards.
What is Hazard Mitigation?
According to the Federal Emergency Management Agency (FEMA), hazard mitigation is: "the effort to reduce loss of life and property by lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal, and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters and develop long-term strategies for protecting people and property from future hazard events."
Oakland County Hazard Mitigation Plan History
This multi-jurisdictional Hazard Mitigation Plan (the Plan or HMP) was originally created in 2005. It was updated in 2011/2012 for Oakland County, and the communities within Oakland County, to better understand natural and man-made hazards and their impacts and to identify ways to mitigate those hazards to protect the health, safety and economic interests of its residents. The plan was again updated in 2017/2018. The current 2023 update includes each of the 62 communities within Oakland County, and builds on the previous updates.
2023 Plan Update
Oakland County Emergency Management and Homeland Security in conjunction with the participating cities, villages and townships is in the process of completing the 5-year update of the Oakland County Hazard Mitigation Plan. Oakland County Emergency Management and Homeland Security is dedicated to involving the public directly in the review and update of the plan.
A draft of the plan can be accessed by clicking the link below. While the plan is currently in development, periodic updates to the draft will be posted on this web page. Upon state and FEMA approval, the final draft of the plan will replace the draft version of the plan.
Volume I: This volume includes the planning-area-wide elements, and describes how the plan was updated, county-wide risk assessment findings, mitigation goals, capabilities, and how the plan will be maintained.
Volume II: The Mitigation Actions and Projects from the County and Municipalities are included in Volume II.
Public Meeting
The Oakland County Hazard Mitigation Plan – A Draft Review meeting was held on September 27, 2023. For those that were not able to attend, a link to the video is available.
LINK TO VIDEO OF PUBLIC MEETING/PLANNERS GATHERING MEETING: https://www.youtube.com/watch?v=5uDj68aYD7M
Continued Public Involvement
Oakland County and the Hazard Mitigation Steering Committee are dedicated to involving the public directly in the review and updates ofthe Plan. The public will have the opportunity to provide input into future Plan revisions and updates. Copies of the Plan willbe kept by appropriate county departments and outside agencies.
Public meetings will be held when deemed necessary by the Steering Committee. The meetings will provide a forum where the public can express concerns, opinions, or new alternatives that can then be included in the Plan.
To further facilitate continued public involvement in the planning process, the public has the opportunity to provide continual feedback and input. As future needs and concerns arise, or if you would like to provide feedback regarding the latest version of the Oakland County Hazard Mitigation Plan, please use the form below to provide your comments.
LINK TO FORM: https://integratedsolutions.wufoo.com/forms/comment-form-oakland-county-mitigation-plan/
County-wide Hazard Mitigation Questionnaire
As part of the 2023 mitigation update, a county-wide questionnaire has been developed and disseminated. Feedback from the confidential 12-minute survey will enable Oakland County Emergency Management and Homeland Security Department to better serve residents and businesses before, during, and after an emergency or disaster.
To fill out the questionnaire, go to: http://oakland.prepare2023.alchemer.com/s3
In order to foster continual public participation and feedback, the questionnaire will remain open, and Oakland County Emergency Management and Homeland Security will monitor results as part of the annual review process.
Questions or Comments?
Public and stakeholder participation and feedback are a vital part of the hazard mitigation planning process. Please check this page regularly for information on upcoming opportunities to engage in the planning process. If you would like to get in touch with the project team, please use the following contact information:
Michael Kamenec, Emergency Management Specialist | Emergency Management & Homeland Security Oakland County, Michigan
Phone: (248) 858-1598 | Email: kamenecm@oakgov.com
1200 N. Telegraph Bld 47W
Pontiac, MI 48341
https://www.oakgov.com/community/emergency-management
Manage Comments
View Draft
Comment

To facilitate an opportunity to comment on the draft and continued public involvement in the planning process, the public has the opportunity to provide feedback and input. As future needs and concerns arise, or if you would like to provide feedback regarding the latest version of the Oakland County Hazard Mitigation Plan, please use the form below to provide your comments.

LINK TO FORM: https://integratedsolutions.wufoo.com/forms/comment-form-oakland-county-mitigation-plan/



Comment Form: Oakland County Mitigation Plan

Oakland County Emergency Management and Homeland Security in conjunction with the participating cities, villages and townships is in the process of completing the 5-year update of the Oakland County Hazard Mitigation Plan. Oakland County Emergency Management and Homeland Security is dedicated to involving the public directly in the review and update of the plan.

Please use this form to submit your plan review comments to the County. You can also use this form to recommend ways the County can better support you in your disaster/emergency preparedness and safety. We appreciate your interest and feedback. Thank you!

According to the Federal Emergency Management Agency (FEMA), hazard mitigation is: "the effort to reduce loss of life and property by lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal, and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters, and develop long-term strategies for protecting people and property from future hazard events."

Name (Optional)

First Last

Phone Number (Optional)

– ### –

Email (Optional)

My Organization (use "Public" if not associated with a specific organization):

Section or Page of the Plan You Are Commenting On, if applicable (Optional)

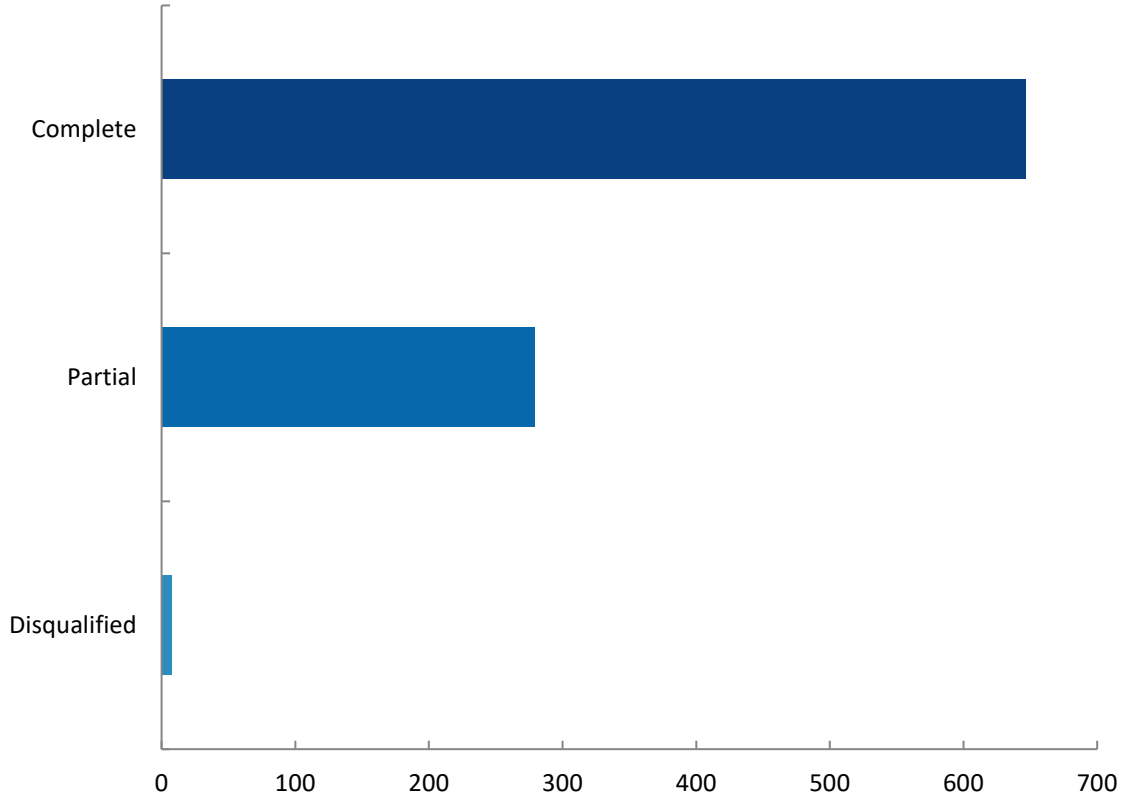
Comment/Feedback

Submit

Appendix C: Report for 2023 Oakland County and Municipality Hazard Mitigation Questionnaire

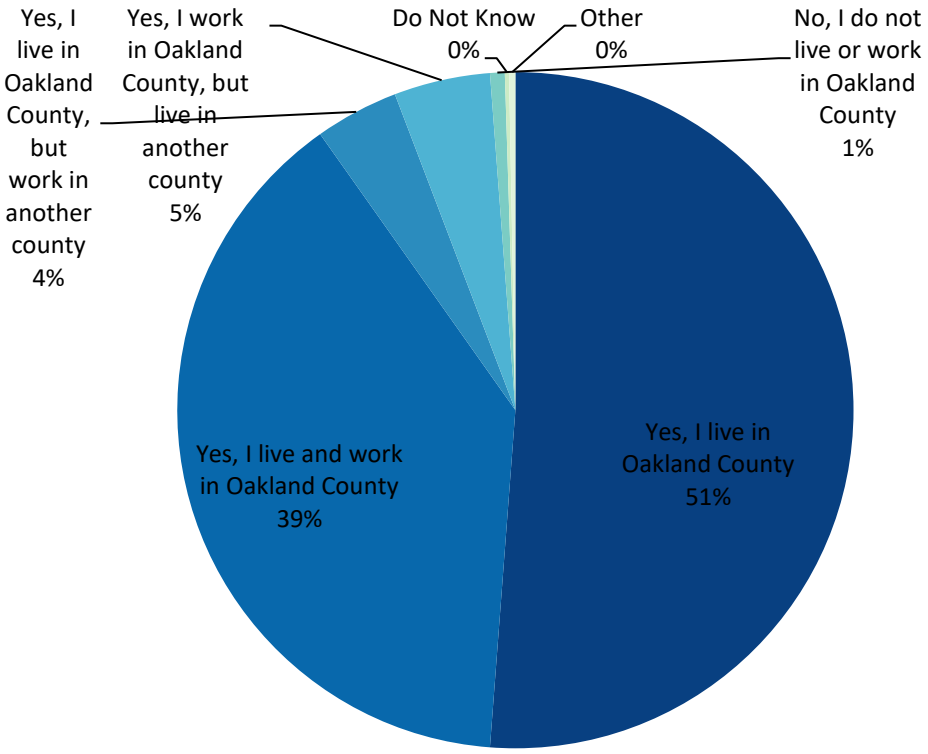
***NOTE**: This is the redacted version of the questionnaire. Open-ended responses from the public were NOT included in this version to ensure confidentiality and privacy.*

Response Statistics



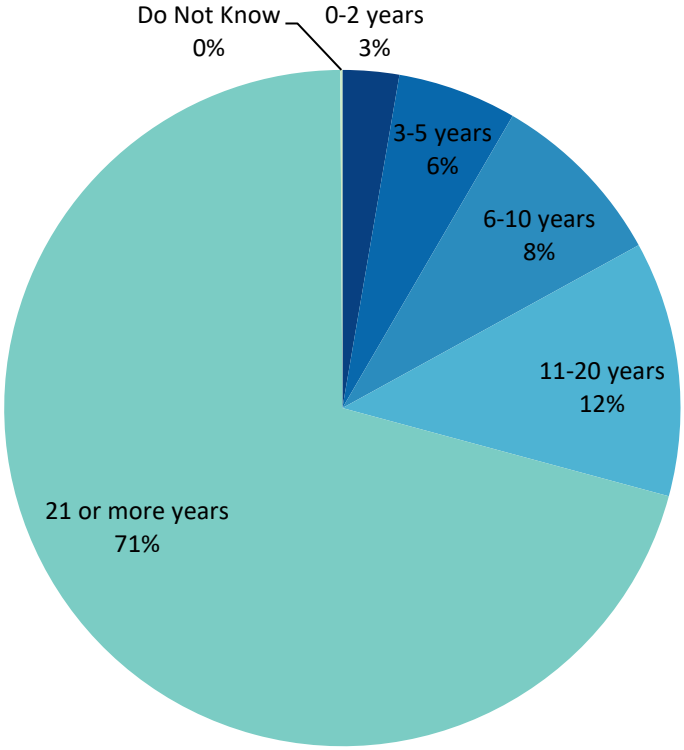
	Count	Percent
Complete	647	69.3
Partial	279	29.9
Disqualified	8	0.9
Total	934	

Do you live and/or work in Oakland County? Please select the best answer that applies to your current situation.



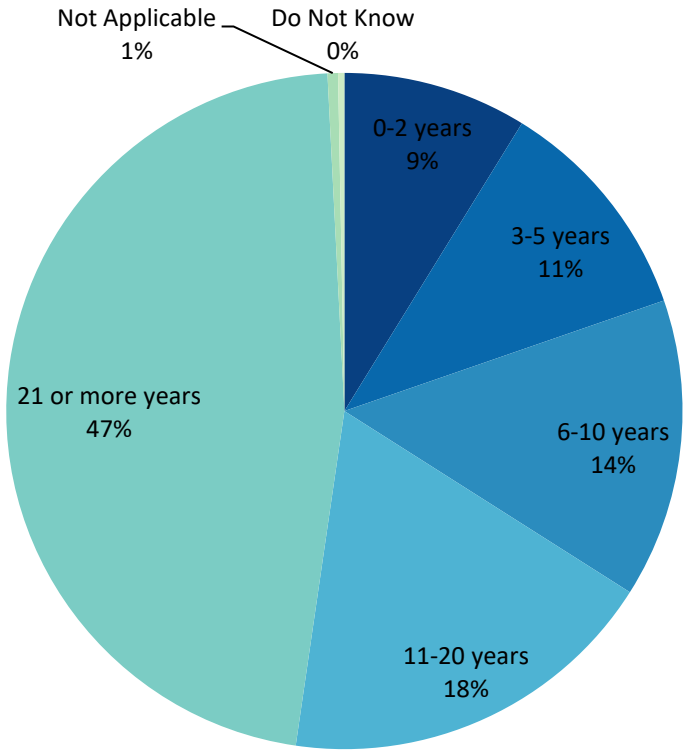
Value	Percent	Count
Yes, I live in Oakland County	51.2%	450
Yes, I live and work in Oakland County	39.0%	343
Yes, I live in Oakland County, but work in another county	4.0%	35
Yes, I work in Oakland County, but live in another county	4.6%	40
No, I do not live or work in Oakland County	0.7%	6
Do Not Know	0.2%	2
Other	0.3%	3
	Total	879

Approximately how many years have you lived in Oakland County, Michigan?



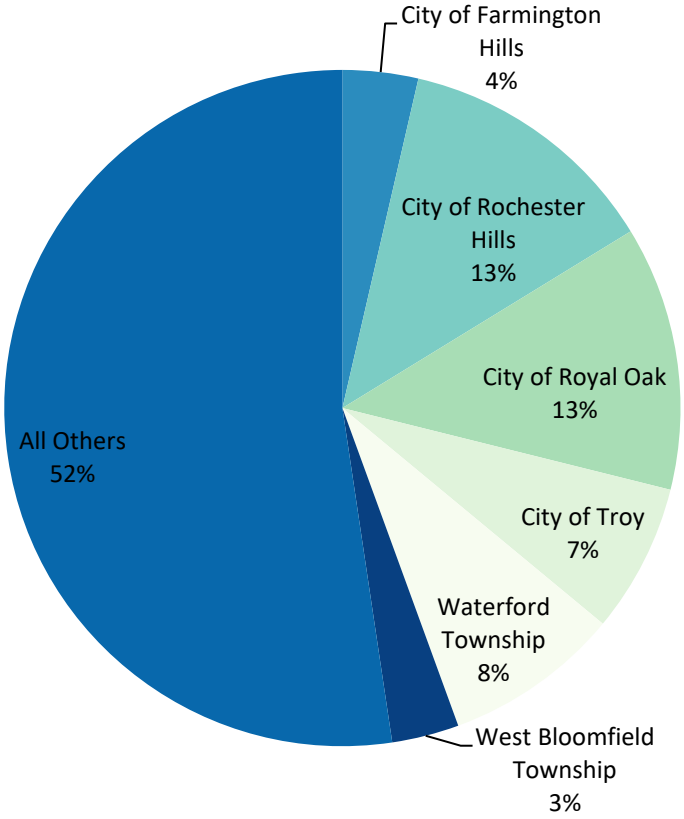
Value	Percent	Count
0-2 years	2.7%	22
3-5 years	5.7%	46
6-10 years	8.6%	70
11-20 years	12.2%	99
21 or more years	70.7%	575
Do Not Know	0.1%	1
	Total	813

Approximately how many years have you worked in Oakland County, Michigan?



Value	Percent	Count
0-2 years	8.8%	33
3-5 years	10.9%	41
6-10 years	14.3%	54
11-20 years	18.3%	69
21 or more years	46.9%	177
Not Applicable	0.5%	2
Do Not Know	0.3%	1
	Total	377

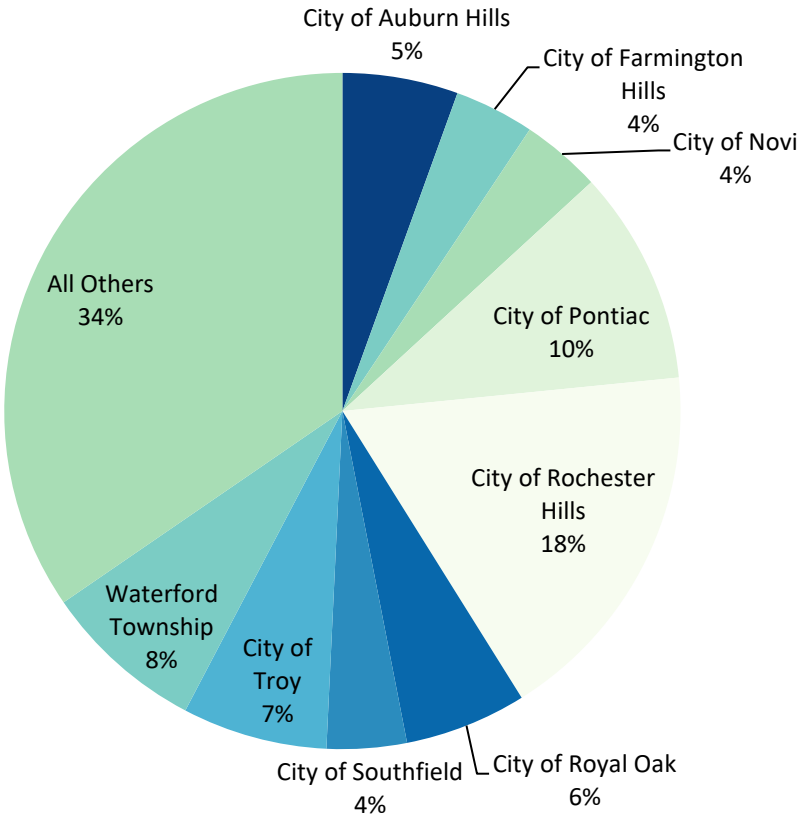
Please indicate which community in Oakland County you live in.



Value	Percent	Count
Addison Township	0.5%	4
City of Auburn Hills	0.9%	7
City of Berkley	1.7%	13
Village of Beverly Hills	0.7%	5
City of Birmingham	0.7%	5
Village of Bloomfield	0.1%	1
City of Bloomfield Hills	1.2%	9
Bloomfield Township	2.4%	18
Brandon Township	2.7%	20
City of Clarkston	1.6%	12
City of Clawson	1.6%	12
Commerce Township	2.5%	19
City of Farmington Hills	3.6%	27
City of Farmington	0.9%	7
City of Fenton	0.1%	1
City of Ferndale	2.5%	19
Village of Franklin	0.3%	2
City of Hazel Park	0.3%	2
Highland Township	1.2%	9
Holly Township	1.2%	9
Village of Holly	0.4%	3
Independence Township	2.3%	17

Village of Lake Orion	0.3%	2
City of Lathrup Village	0.3%	2
Village of Leonard	0.1%	1
Lyon Township	0.9%	7
City of Madison Heights	0.9%	7
Milford Township	0.3%	2
Village of Milford	0.4%	3
City of Northville	0.3%	2
Novi Township	0.4%	3
City of Novi	2.1%	16
City of Oak Park	0.9%	7
Oakland Township	1.3%	10
City of Orchard Lake	0.3%	2
Orion Township	1.9%	14
Village of Ortonville	0.1%	1
Oxford Township	2.9%	22
Village of Oxford	0.4%	3
City of Pleasant Ridge	0.3%	2
City of Pontiac	2.0%	15
City of Rochester Hills	12.6%	94
City of Rochester	0.9%	7
Rose Township	0.8%	6
City of Royal Oak	12.6%	94
City of South Lyon	0.9%	7
City of Southfield	1.3%	10
Southfield Township	0.1%	1
Springfield Township	1.5%	11
City of Sylvan Lake	0.5%	4
City of Troy	7.1%	53
City of Walled Lake	0.7%	5
Waterford Township	8.4%	63
West Bloomfield Township	3.2%	24
White Lake Township	2.9%	22
City of Wixom	0.3%	2
Not Applicable	0.1%	1
Prefer not to answer	0.3%	2
	Total	748

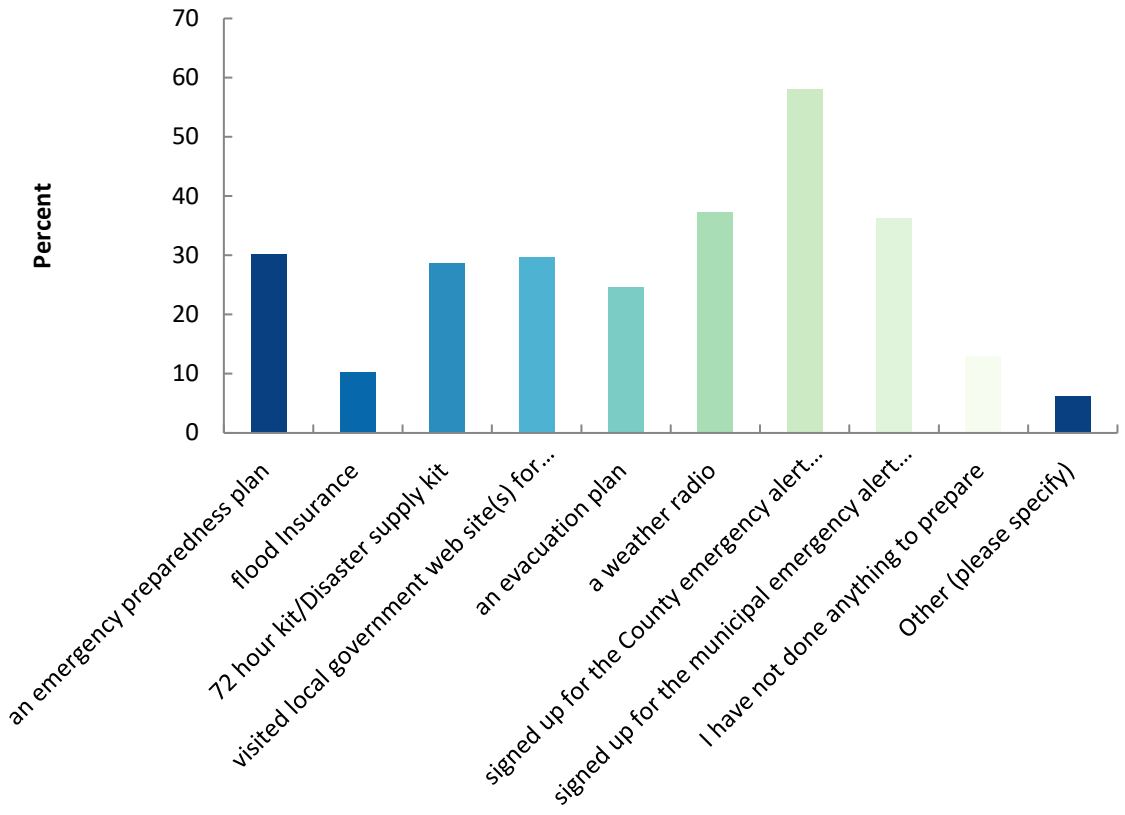
Please indicate which community in Oakland County you work in.



Value	Percent	Count
Addison Township	0.3%	1
City of Auburn Hills	5.5%	20
City of Berkley	1.1%	4
Village of Beverly Hills	0.5%	2
Village of Bingham Farms	0.5%	2
City of Birmingham	1.6%	6
City of Bloomfield Hills	2.2%	8
Bloomfield Township	2.5%	9
Brandon Township	0.5%	2
City of Clarkston	1.1%	4
City of Clawson	1.4%	5
Commerce Township	0.8%	3
City of Farmington Hills	3.8%	14
City of Farmington	0.8%	3
City of Ferndale	1.6%	6
City of Hazel Park	0.3%	1
Highland Township	1.1%	4
Holly Township	0.5%	2
Independence Township	0.5%	2
City of Keego Harbor	0.3%	1
Lyon Township	0.3%	1
City of Madison Heights	1.4%	5

Milford Township	1.1%	4
City of Northville	0.8%	3
Novi Township	0.3%	1
City of Novi	3.8%	14
City of Oak Park	0.5%	2
Oakland Township	0.5%	2
Orion Township	0.3%	1
Oxford Township	1.6%	6
City of Pleasant Ridge	0.3%	1
City of Pontiac	10.2%	37
City of Rochester Hills	17.6%	64
City of Rochester	1.9%	7
Rose Township	0.3%	1
City of Royal Oak	5.8%	21
City of South Lyon	0.5%	2
City of Southfield	3.8%	14
Southfield Township	0.5%	2
Springfield Township	0.8%	3
City of Sylvan Lake	0.3%	1
City of Troy	6.9%	25
City of Walled Lake	0.5%	2
Waterford Township	7.7%	28
West Bloomfield Township	1.4%	5
White Lake Township	1.1%	4
City of Wixom	0.5%	2
Other	0.8%	3
Not Applicable	0.8%	3
Prefer not to answer	0.3%	1
	Total	364

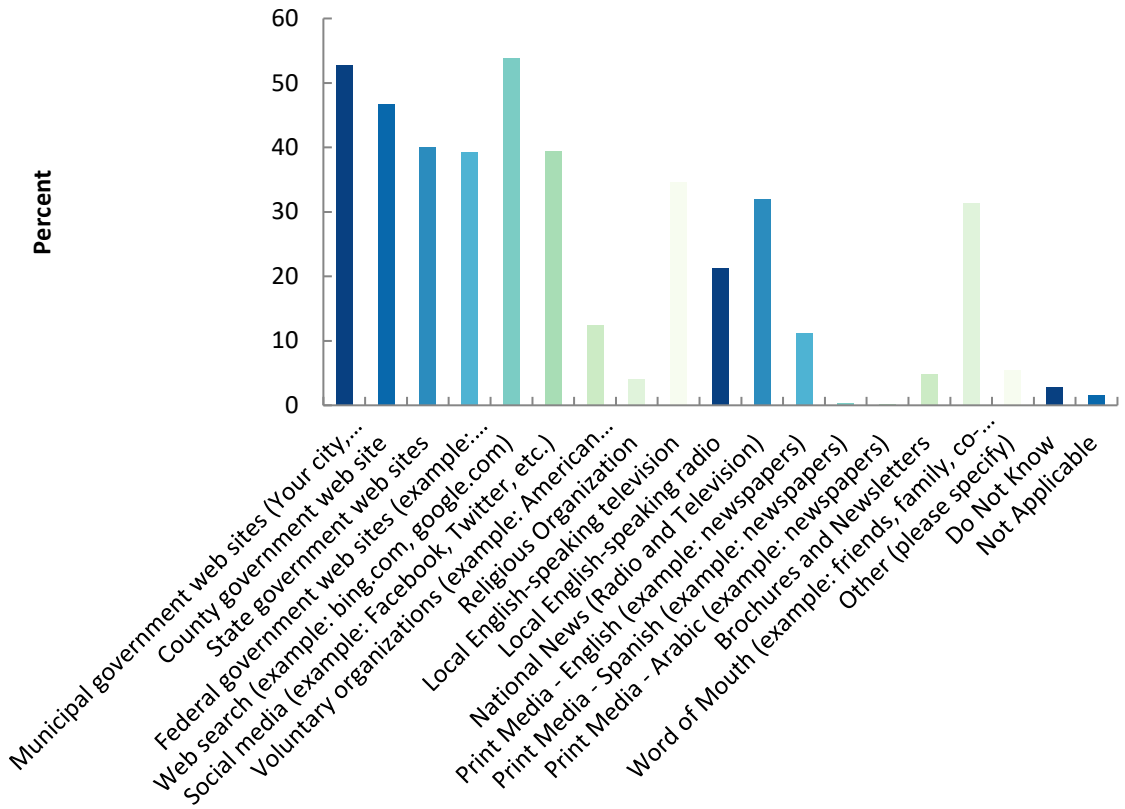
Please indicate those activities you have done to prepare for emergencies and disasters. Please select ALL that apply. I have…



Value	Percent	Count
an emergency preparedness plan	30.2%	227
flood Insurance	10.2%	77
72 hour kit/Disaster supply kit	28.6%	215
visited local government web site(s) for emergency preparedness information	29.7%	223
an evacuation plan	24.5%	184
a weather radio	37.2%	280
signed up for the County emergency alert system (i.e., OakAlert)	58.0%	436
signed up for the municipal emergency alert system (i.e., from your city)	36.3%	273
I have not done anything to prepare	12.9%	97
Other (please specify)	6.1%	46

Other (please specify)	Count
REDACTED	1
Total	44

Please indicate where you go to obtain emergency and disaster related information? Please select ALL that apply.

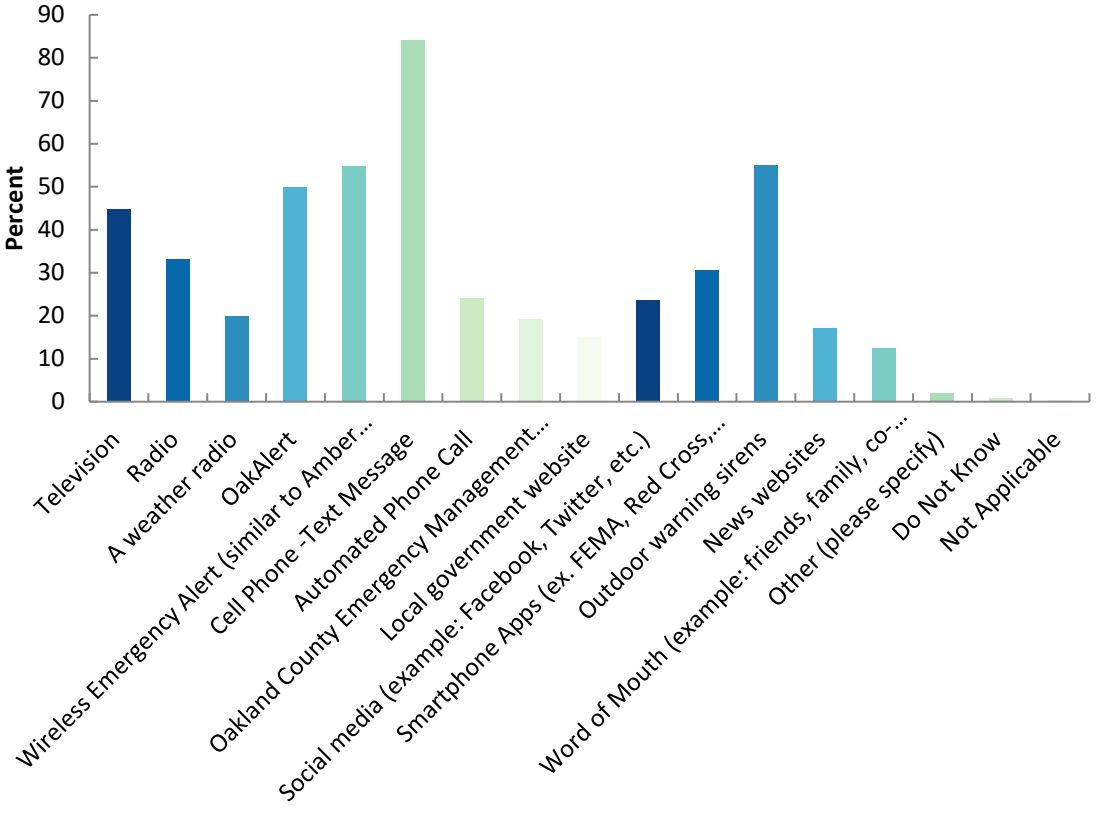


Value	Percent	Count
Municipal government web sites (Your city, village or township government)	52.8%	397
County government web site	46.7%	351
State government web sites	40.0%	301
Federal government web sites (example: www.fema.gov)	39.2%	295
Web search (example: bing.com, google.com)	53.9%	405
Social media (example: Facebook, Twitter, etc.)	39.4%	296
Voluntary organizations (example: American Red Cross, Salvation Army, etc.)	12.5%	94
Religious Organization	4.1%	31
Local English-speaking television	34.6%	260
Local English-speaking radio	21.3%	160
National News (Radio and Television)	31.9%	240

Print Media - English (example: newspapers)	11.2%	84
Print Media - Spanish (example: newspapers)	0.3%	2
Print Media - Arabic (example: newspapers)	0.1%	1
Brochures and Newsletters	4.9%	37
Word of Mouth (example: friends, family, co-workers)	31.3%	235
Other (please specify)	5.5%	41
Do Not Know	2.8%	21
Not Applicable	1.6%	12

Other (please specify)	Count
REDACTED	
Total	41

How do you prefer to receive emergency alerts? Please select ALL that apply.



Value	Percent	Count
Television	44.8%	338
Radio	33.2%	250
A weather radio	19.8%	149

OakAlert	49.9%	376
Wireless Emergency Alert (similar to Amber Alerts)	54.9%	414
Cell Phone -Text Message	84.2%	635
Automated Phone Call	24.0%	181
Oakland County Emergency Management website	19.1%	144
Local government website	15.0%	113
Social media (example: Facebook, Twitter, etc.)	23.5%	177
Smartphone Apps (ex. FEMA, Red Cross, Weather Channel, AccuWeather, etc.)	30.6%	231
Outdoor warning sirens	55.0%	415
News websites	17.1%	129
Word of Mouth (example: friends, family, co-workers)	12.5%	94
Other (please specify)	1.9%	14
Do Not Know	0.8%	6
Not Applicable	0.4%	3

Other (please specify)	Count
REDACTED	
Total	14

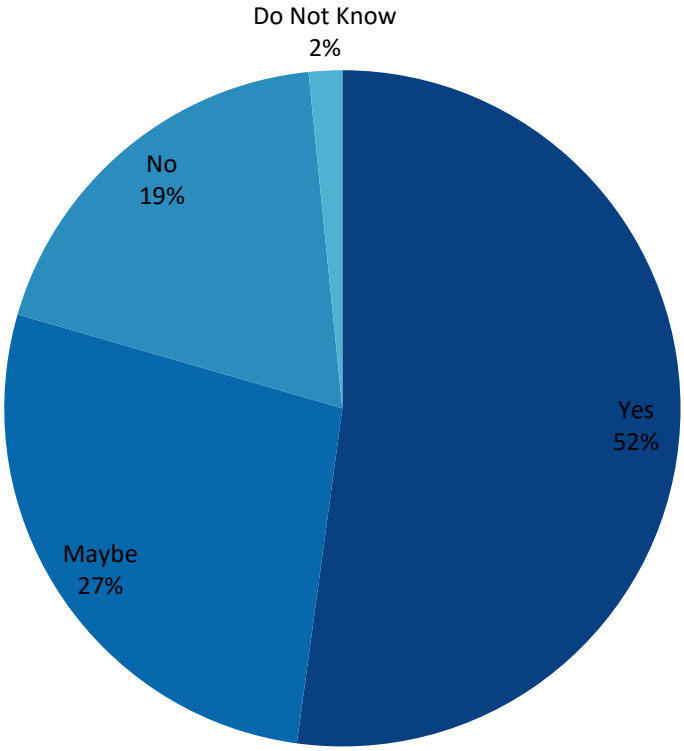
Would you agree or disagree with the following statements?

	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Do Not Know		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Oakland County is providing the services necessary to prepare me for a disaster.	52	6.9%	250	33.3%	260	34.6%	52	6.9%	21	2.8%	116	15.4%	751
I am familiar with Oakland County's web site and can easily obtain information about emergencies and disasters.	57	7.7%	220	29.5%	202	27.1%	142	19.1%	54	7.2%	70	9.4%	745
During times of emergency, information from Oakland County is provided in a language or format I can understand.	245	32.8%	281	37.6%	114	15.2%	14	1.9%	5	0.7%	89	11.9%	748
I can easily obtain emergency information from Oakland County in times of crisis.	79	10.6%	221	29.7%	224	30.1%	41	5.5%	21	2.8%	157	21.1%	743

Please indicate how Oakland County, your city, and/or your township can better assist you in preparing for emergencies and disasters (example: provide preparedness materials in my language).

ResponseID	Response
REDACTED	REDACTED

If a disaster (i.e. snow storm) impacted Oakland County, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days? (Example: We have adequate food, water, essential supplies, and heat; and access to backup power, if needed).



Value	Percent	Count
Yes	52.1%	391
Maybe	27.3%	205
No	18.9%	142
Do Not Know	1.6%	12
	Total	750

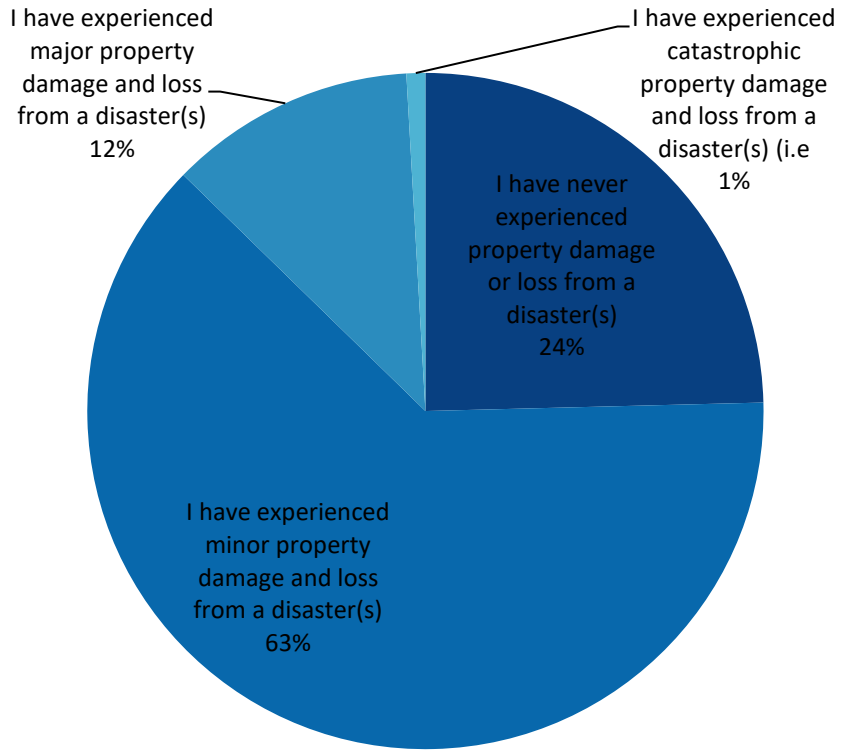
Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk.

- Low Risk = Low impact on threat to life and property damage
- Medium Risk = Medium impact on threat to life and property damage
- High Risk = High impact on threat to life and property damage

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Civil Disorder/Riot	429	65.2%	160	24.3%	61	9.3%	8	1.2%	658
Active Shooter/Assailant	250	37.8%	273	41.3%	132	20.0%	6	0.9%	661
Dam Failure	451	68.4%	43	6.5%	10	1.5%	155	23.5%	659
Drought	353	53.6%	217	32.9%	66	10.0%	23	3.5%	659
Earthquake	550	83.7%	43	6.5%	10	1.5%	54	8.2%	657
Extreme Cold Incident	89	13.5%	289	43.8%	281	42.6%	1	0.2%	660
Extreme Heat Incident	128	19.4%	325	49.2%	204	30.9%	3	0.5%	660
Flooding	272	41.5%	287	43.8%	88	13.4%	9	1.4%	656
Fog	266	40.4%	273	41.5%	113	17.2%	6	0.9%	658
Gas/Oil Shortages	221	33.6%	320	48.6%	113	17.2%	4	0.6%	658
Hazardous Materials Release (example: Chemical Spill)	248	37.5%	281	42.5%	125	18.9%	7	1.1%	661
Infrastructure Failure (example: Bridge Collapse)	295	44.8%	270	41.0%	77	11.7%	16	2.4%	658
Major Transportation Accident/Incident	185	28.0%	301	45.6%	167	25.3%	7	1.1%	660
Public Health Emergency (example: Pandemic)	97	14.7%	317	47.9%	243	36.7%	5	0.8%	662
Radiological Incident (i.e., Nuclear Power Plant accident)	425	64.8%	137	20.9%	45	6.9%	49	7.5%	656
Severe Winter Storm/Heavy Snowfall/Ice Storm	30	4.5%	222	33.6%	406	61.4%	3	0.5%	661
Subsidence (Sinkhole)	378	57.4%	218	33.1%	46	7.0%	16	2.4%	658
Terrorism Incident	381	57.8%	206	31.3%	65	9.9%	7	1.1%	659
Thunderstorms	65	9.8%	248	37.5%	346	52.3%	2	0.3%	661
Tornado and High Winds	50	7.6%	329	49.7%	282	42.6%	1	0.2%	662

Utility Failure	64	9.7%	237	35.9%	357	54.1%	2	0.3%	660
Wildfires	454	68.8%	152	23.0%	23	3.5%	31	4.7%	660

Please select the answer that best describes your experience.



Value	Percent	Count
I have never experienced property damage or loss from a disaster(s)	24.6%	163
I have experienced minor property damage and loss from a disaster(s)	62.7%	416
I have experienced major property damage and loss from a disaster(s)	11.8%	78
I have experienced catastrophic property damage and loss from a disaster(s) (i.e., total loss of home/property).	0.9%	6
	Total	663

If you have experienced any damage(s) or injury(ies) from a disaster, please list the hazard(s) that caused the damages/losses and/or injuries (Example: flooding, wind, winter storm)

ResponseID	Response
REDACTED	REDACTED

If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (Example: my home, on a roadway or intersection, at work, on vacation, etc.)

ResponseID	Response
REDACTED	REDACTED

If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (Example: basement flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.)

ResponseID	Response
REDACTED	REDACTED

Based on YOUR PERCEPTION of your community's hazards, to what degree of emphasis would you expect your community to mitigate the following hazards?

Mitigation definition: The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses from emergencies and disasters. Mitigation forms the foundation for a community's long-term strategy to reduce disaster losses, such as loss of life and property damage.

- No Mitigation Needed = No mitigation on this hazard is expected or needed
- Low Priority = This hazard should be mitigated, but is not a high priority compared to other hazards
- Medium Priority = It is important to mitigate this hazard
- High Priority = It is a high priority to emphasize mitigation for this hazard

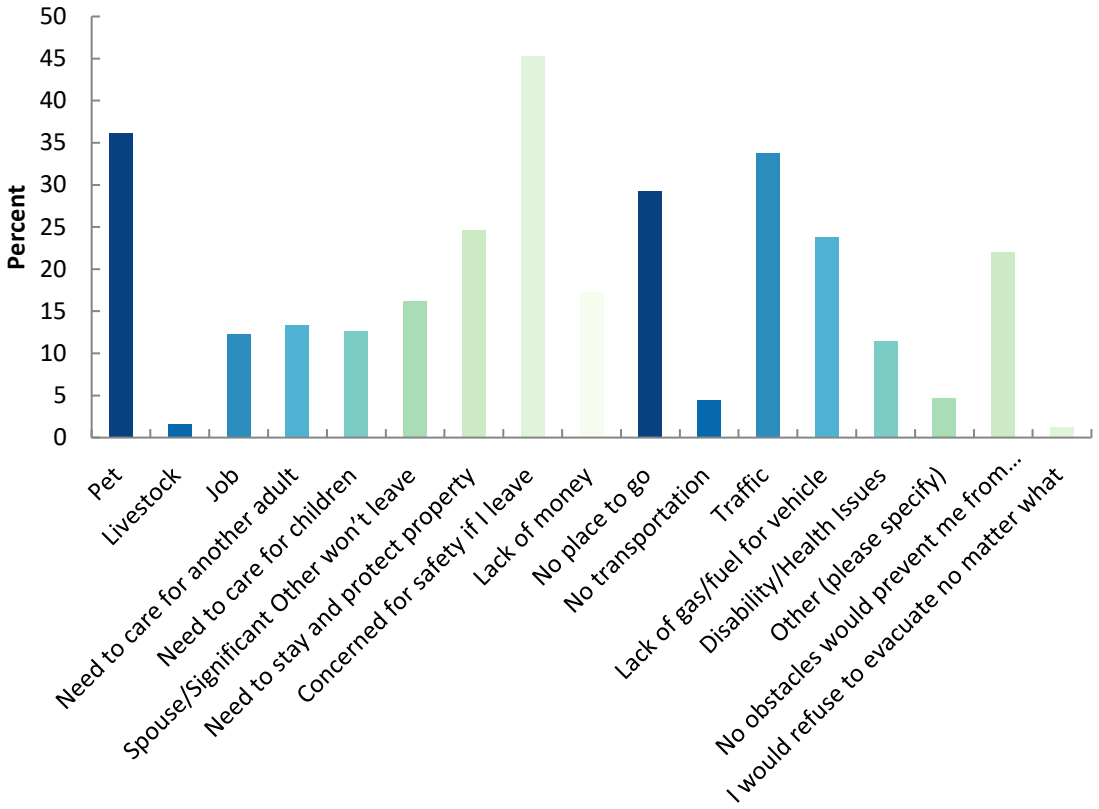
	No Mitigation Needed		Low Priority		Medium Priority		High Priority		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Civil Disorder/Riot	92	14.3%	215	33.3%	158	24.5%	180	27.9%	645
Active Shooter/Assailant	29	4.5%	81	12.5%	206	31.8%	331	51.2%	647
Dam Failure	315	48.9%	200	31.1%	76	11.8%	53	8.2%	644
Drought	168	26.0%	300	46.4%	132	20.4%	47	7.3%	647
Earthquake	305	47.1%	257	39.7%	49	7.6%	37	5.7%	648
Extreme Cold Incident	30	4.6%	144	22.3%	255	39.5%	217	33.6%	646
Extreme Heat Incident	34	5.3%	174	27.0%	259	40.2%	178	27.6%	645
Flooding	49	7.6%	192	29.7%	230	35.6%	175	27.1%	646
Fog	267	41.2%	278	42.9%	76	11.7%	27	4.2%	648
Gas/Oil Shortages	90	13.9%	233	35.9%	216	33.3%	110	16.9%	649
Hazardous Materials Release (example: Chemical Spill)	44	6.8%	159	24.5%	211	32.6%	234	36.1%	648
Infrastructure Failure (example: Bridge Collapse)	50	7.7%	167	25.8%	212	32.8%	218	33.7%	647
Major Transportation Accident/Incident	53	8.2%	156	24.1%	244	37.7%	194	30.0%	647
Public Health Emergency (example: Pandemic)	37	5.7%	106	16.4%	218	33.7%	286	44.2%	647
Radiological Incident (i.e., Nuclear Power Plant accident)	133	20.6%	239	36.9%	104	16.1%	171	26.4%	647
Severe Winter Storm/Heavy Snowfall/Ice Storm	14	2.2%	69	10.7%	219	34.0%	342	53.1%	644
Subsidence (Sinkhole)	137	21.2%	272	42.1%	159	24.6%	78	12.1%	646

Terrorism Incident	71	11.0%	186	28.7%	172	26.5%	219	33.8%	648
Thunderstorms	60	9.3%	190	29.4%	191	29.6%	205	31.7%	646
Tornado and High Winds	15	2.3%	118	18.3%	244	37.8%	269	41.6%	646
Utility Failure	14	2.2%	64	9.9%	185	28.7%	382	59.2%	645
Wildfires	174	26.9%	272	42.1%	117	18.1%	83	12.8%	646

If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

	Very Likely		Somewhat Likely		Not Very Likely		Not Likely at All		Do Not Know		Not Applicable	
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %
Immediately evacuate as instructed.	332	51.4%	214	33.1%	42	6.5%	24	3.7%	32	5.0%	2	0.3%
I would first consult with family and friends outside my household before making a decision to evacuate.	223	35.1%	195	30.7%	100	15.7%	95	14.9%	12	1.9%	11	1.7%
Wait and see how bad the situation is going to be before deciding to evacuate.	91	14.4%	200	31.5%	166	26.2%	148	23.3%	23	3.6%	6	0.9%
Refuse to evacuate no matter what.	13	2.1%	17	2.7%	91	14.4%	453	71.5%	44	6.9%	16	2.5%

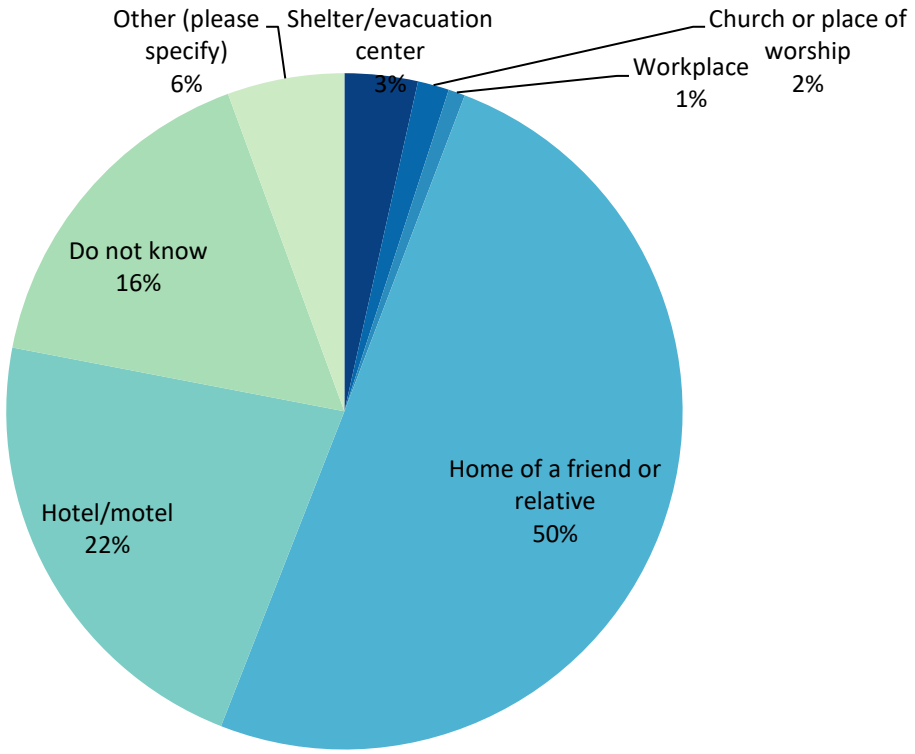
What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



Value	Percent	Count
Pet	36.1%	232
Livestock	1.6%	10
Job	12.3%	79
Need to care for another adult	13.4%	86
Need to care for children	12.6%	81
Spouse/Significant Other won't leave	16.2%	104
Need to stay and protect property	24.6%	158
Concerned for safety if I leave	45.3%	291
Lack of money	17.3%	111
No place to go	29.3%	188
No transportation	4.5%	29
Traffic	33.8%	217
Lack of gas/fuel for vehicle	23.8%	153
Disability/Health Issues	11.5%	74
Other (please specify)	4.7%	30
No obstacles would prevent me from evacuating	22.0%	141
I would refuse to evacuate no matter what	1.2%	8

Other (please specify)	Count
REDACTED	REDACTED
Total	30

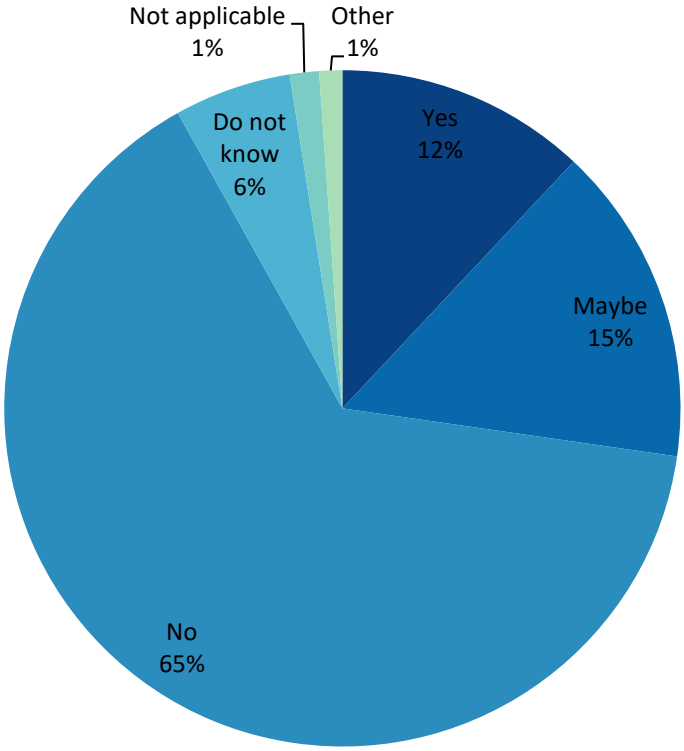
If you were to evacuate, where would you most likely stay? Please select the best answer.



Value	Percent	Count
Shelter/evacuation center	3.5%	23
Church or place of worship	1.5%	10
Workplace	0.8%	5
Home of a friend or relative	50.2%	325
Hotel/motel	22.1%	143
Do not know	16.4%	106
Other (please specify)	5.6%	36
	Total	648

Other (please specify)	Count
REDACTED	REDACTED
Total	36

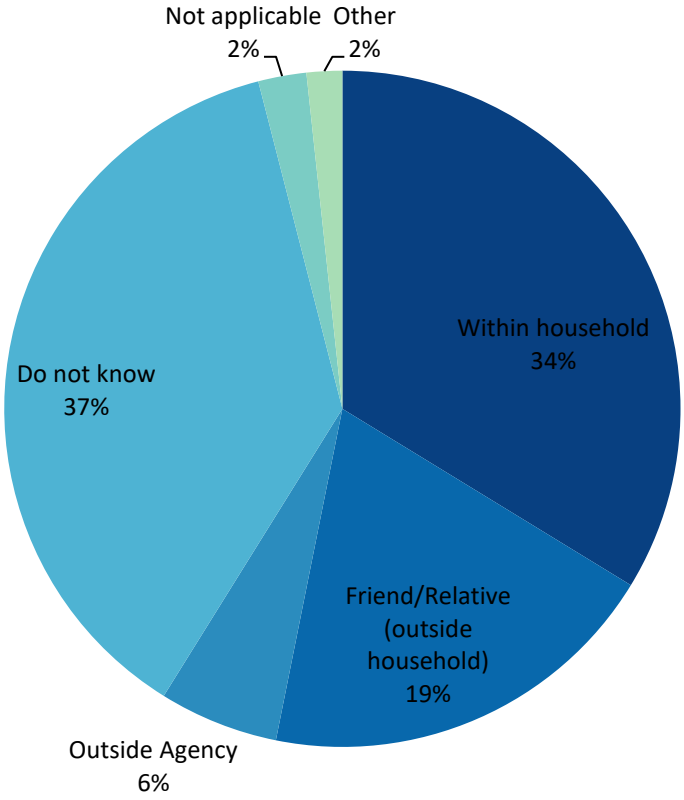
In an evacuation, would you or anyone in your household require special assistance? Examples include, but are not limited to: medical assistance, transportation, sheltering, language translation, support for service animals, etc.



Value	Percent	Count
Yes	12.0%	78
Maybe	15.3%	99
No	64.7%	419
Do not know	5.6%	36
Not applicable	1.4%	9
Other	1.1%	7
	Total	648

Other	Count
REDACTED	REDACTED
Total	7

If yes, would that assistance be provided by someone within your household, by an outside agency, or by a friend or relative outside your household?



Value	Percent	Count
Within household	33.7%	59
Friend/Relative (outside household)	19.4%	34
Outside Agency	5.7%	10
Do not know	37.1%	65
Not applicable	2.3%	4
Other	1.7%	3
	Total	175

Other	Count
REDACTED	REDACTED
Total	3

If applicable, please indicate what kind of outside assistance your household may need during an evacuation (i.e. Transportation, Medical, etc.)

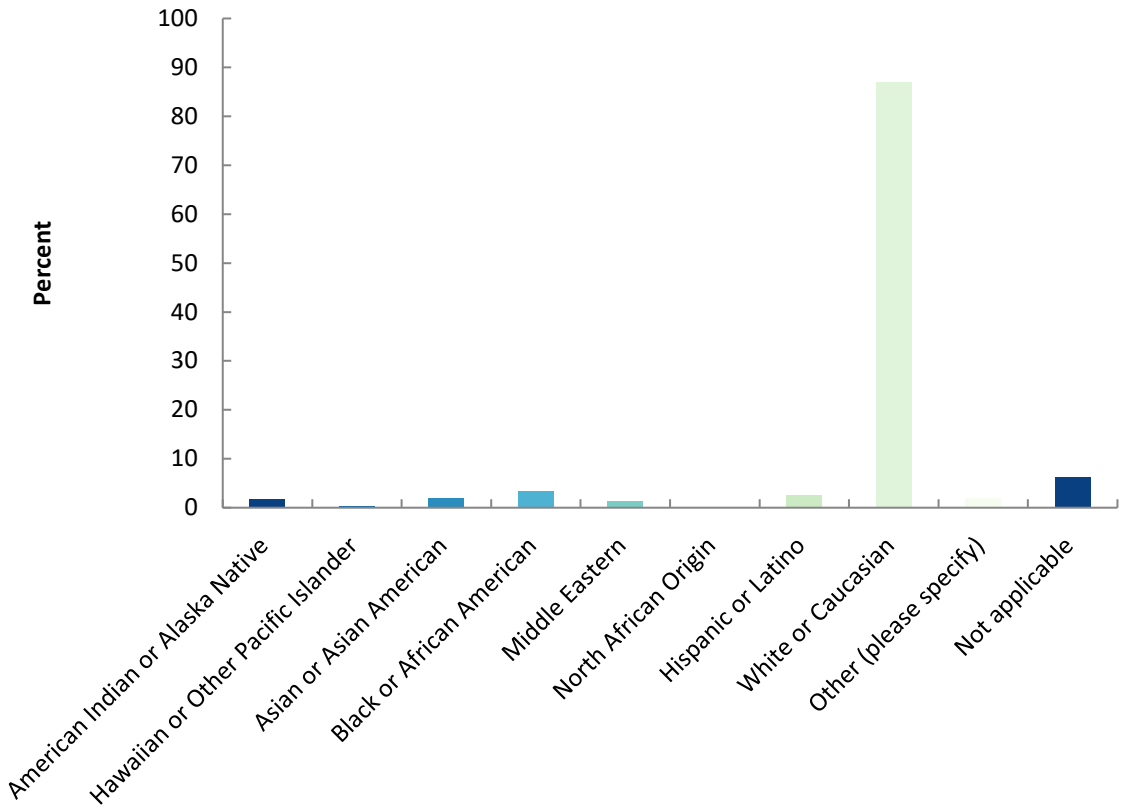
ResponseID	Response
REDACTED	REDACTED

What type of structure do you live in?

Value	Percent	Count
Detached single family home	87.6%	565
Duplex, triplex, quadruple home	1.4%	9
Multi-family building – 2 stories or more (apartment/condo)	6.5%	42
Mobile home	1.9%	12
Manufactured home	0.5%	3
Some other type of structure	0.3%	2
Not Applicable	0.5%	3
Other (please specify)	1.4%	9
	Total	645

Other (please specify)	Count
REDACTED	REDACTED
Total	9

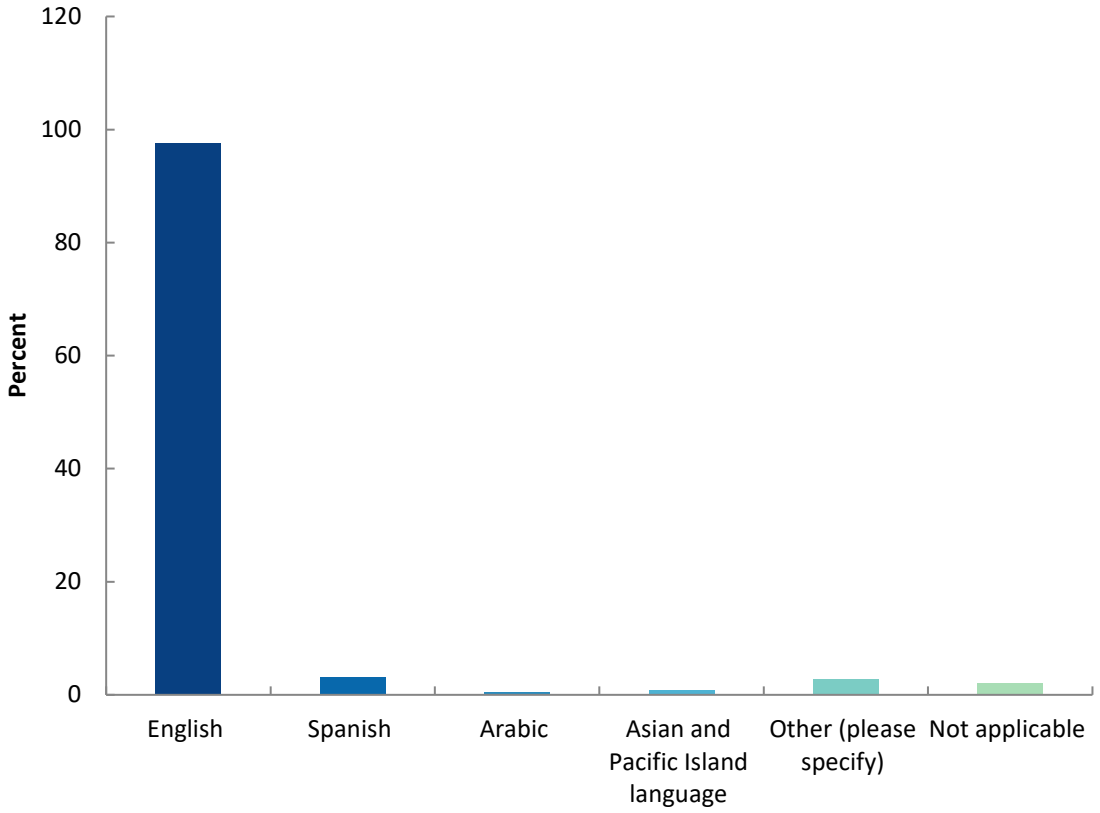
Which of the following best describes your race/ethnicity? Please select ALL that apply.



Value	Percent	Count
American Indian or Alaska Native	1.7%	11
Hawaiian or Other Pacific Islander	0.3%	2
Asian or Asian American	1.9%	12
Black or African American	3.3%	21
Middle Eastern	1.4%	9
North African Origin	0.2%	1
Hispanic or Latino	2.5%	16
White or Caucasian	87.0%	551
Other (please specify)	1.9%	12
Not applicable	6.2%	39

Other (please specify)	Count
REDACTED	REDACTED
Total	12

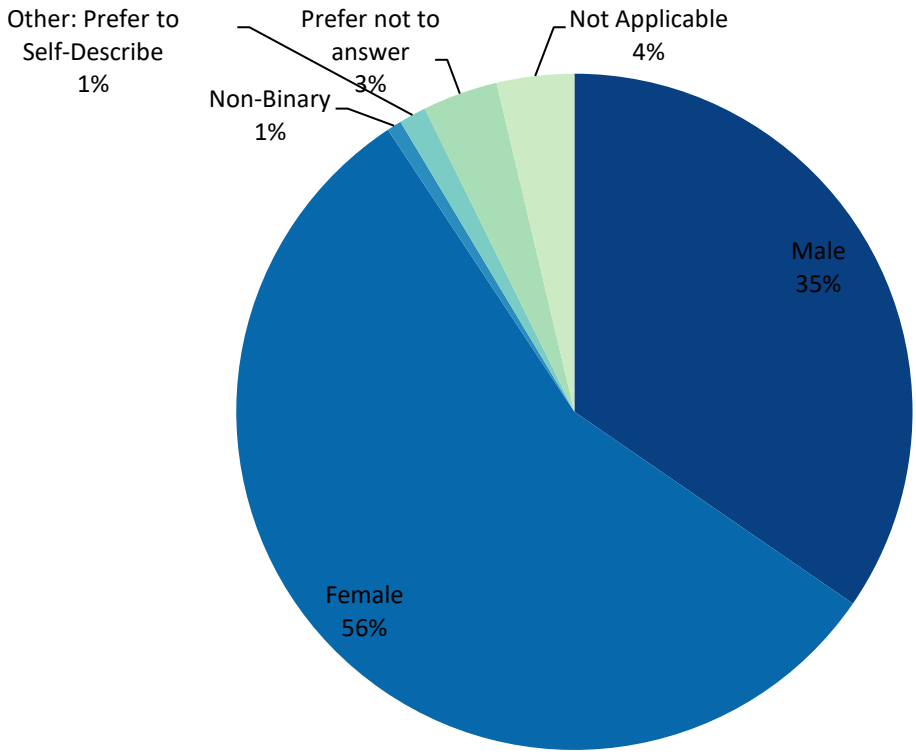
Please indicate the language(s) spoken in your household. Please select ALL that apply.



Value	Percent	Count
English	97.5%	623
Spanish	3.1%	20
Arabic	0.5%	3
Asian and Pacific Island language	0.8%	5
Other (please specify)	2.7%	17
Not applicable	2.0%	13

Other (please specify)	Count
REDACTED	REDACTED
Total	17

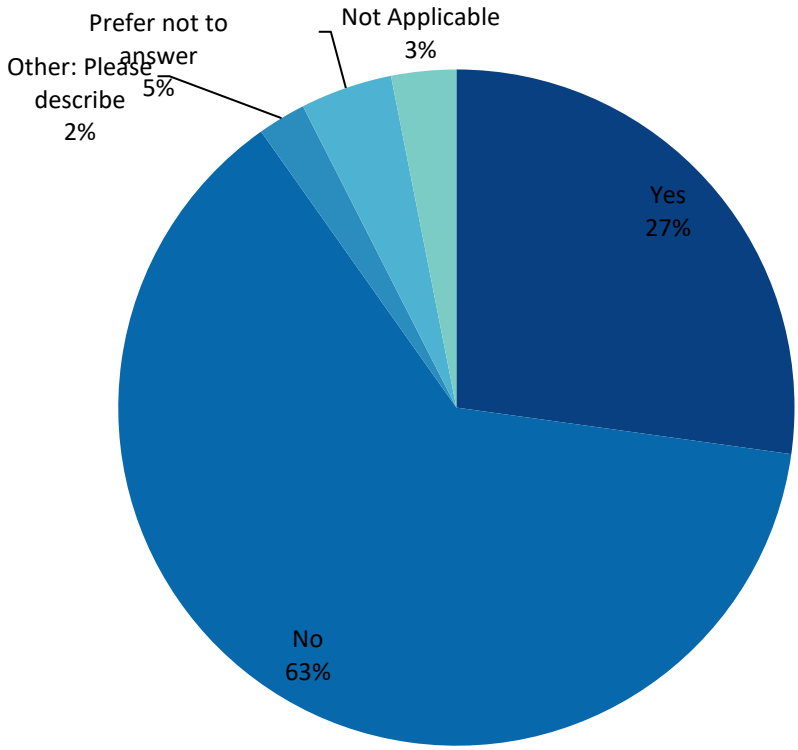
(OPTIONAL): Of the following, which best fits your gender identity (select all that apply)?



Value	Percent	Count
Male	34.6%	213
Female	56.1%	345
Non-Binary	0.7%	4
Other: Prefer to Self-Describe	1.3%	8
Prefer not to answer	3.6%	22
Not Applicable	3.7%	23
	Total	615

Other: Prefer to Self-Describe	Count
REDACTED	REDACTED
Total	8

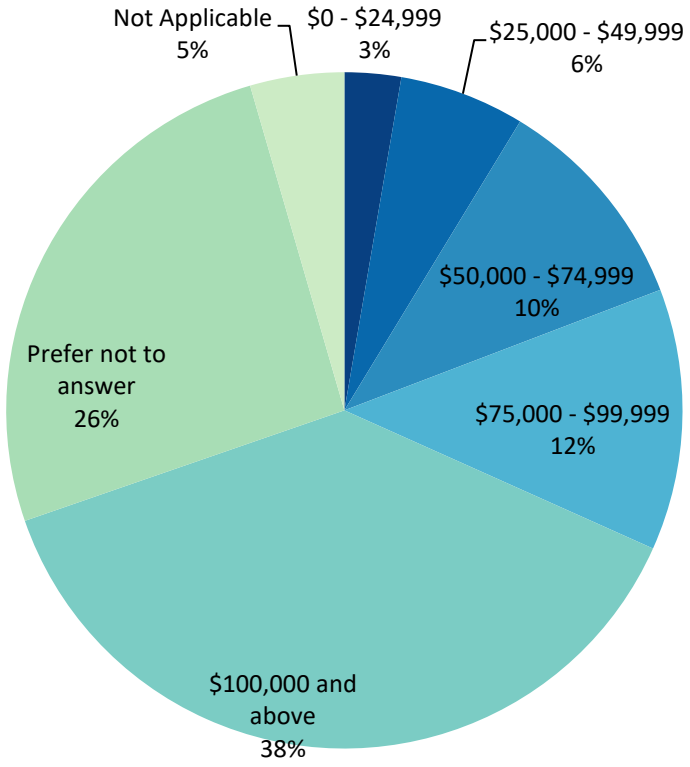
(OPTIONAL): Do you or anyone in your household have a disability, such as hearing/vision loss, PTSD, use of mobility assistive device, cognitive difficulties, autism, etc.?



Value	Percent	Count
Yes	27.2%	168
No	63.0%	389
Other: Please describe	2.3%	14
Prefer not to answer	4.4%	27
Not Applicable	3.1%	19
	Total	617

Other: Please describe	Count
REDACTED	REDACTED
Total	14

(OPTIONAL): What was your total household income in the past 12 months? Income includes: wages, salary, commission, bonuses, tips, income from investments, social security, retirement income, child support or alimony, and cash benefits.



Value	Percent	Count
$0 - $24,999	2.7%	16
$25,000 - $49,999	6.0%	36
$50,000 - $74,999	10.5%	63
$75,000 - $99,999	12.5%	75
$100,000 and above	38.0%	227
Prefer not to answer	25.8%	154
Not Applicable	4.5%	27
	Total	598

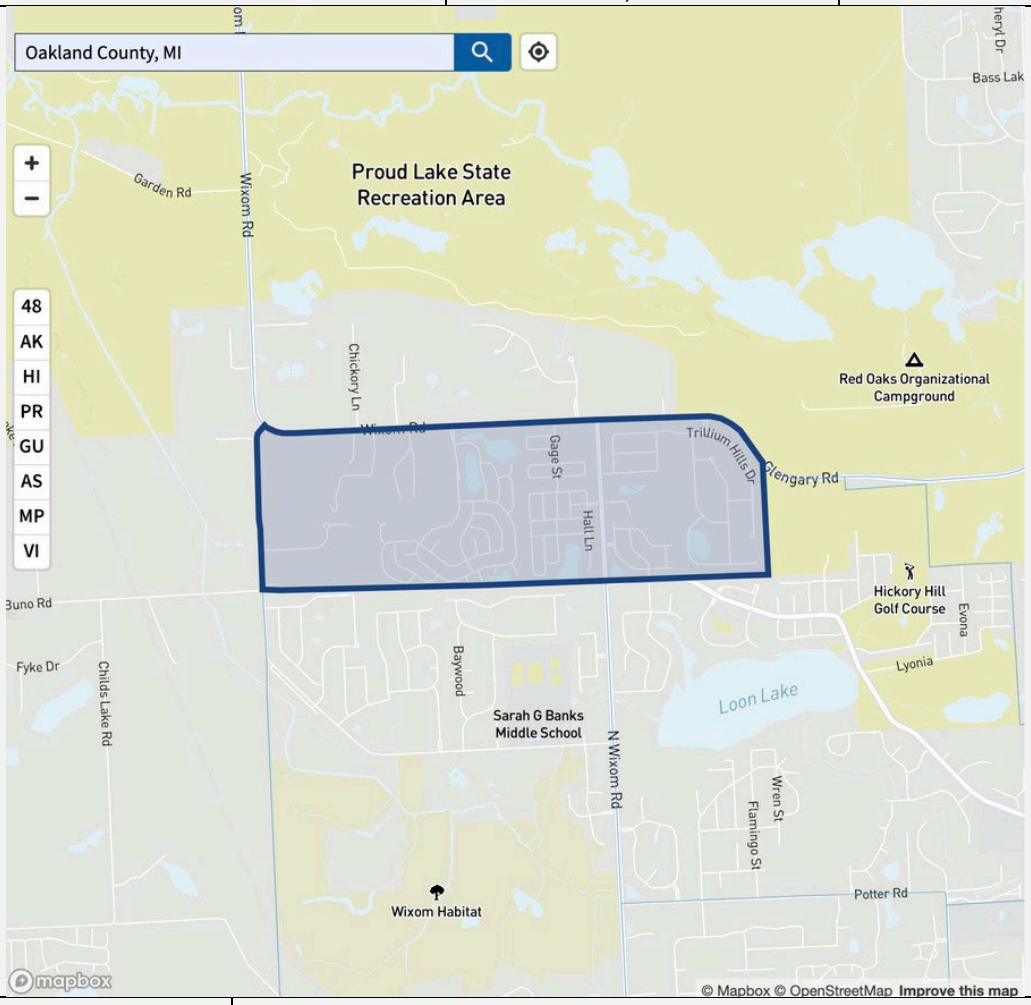
Appendix D: Jurisdiction Participation & Sign-in Sheets (FOUO)

Appendix E: Maps (FOUO)

Appendix F: Disadvantaged Communities

Figure F-110. Oakland County Census Tract 26125135000

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125135000	3,842	TRUE

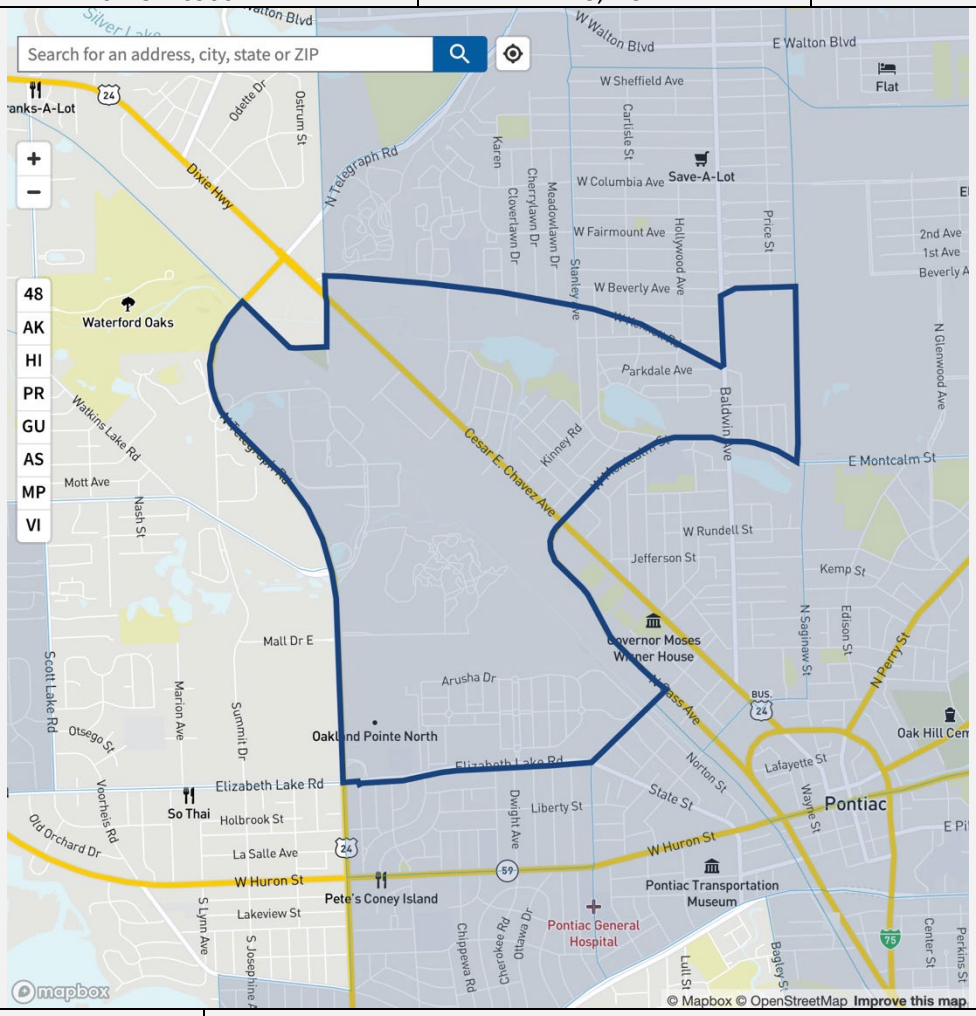


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Low Life Expectancy (95th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-111. Oakland County Census Tract 26125140900

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125140900	5,419	TRUE

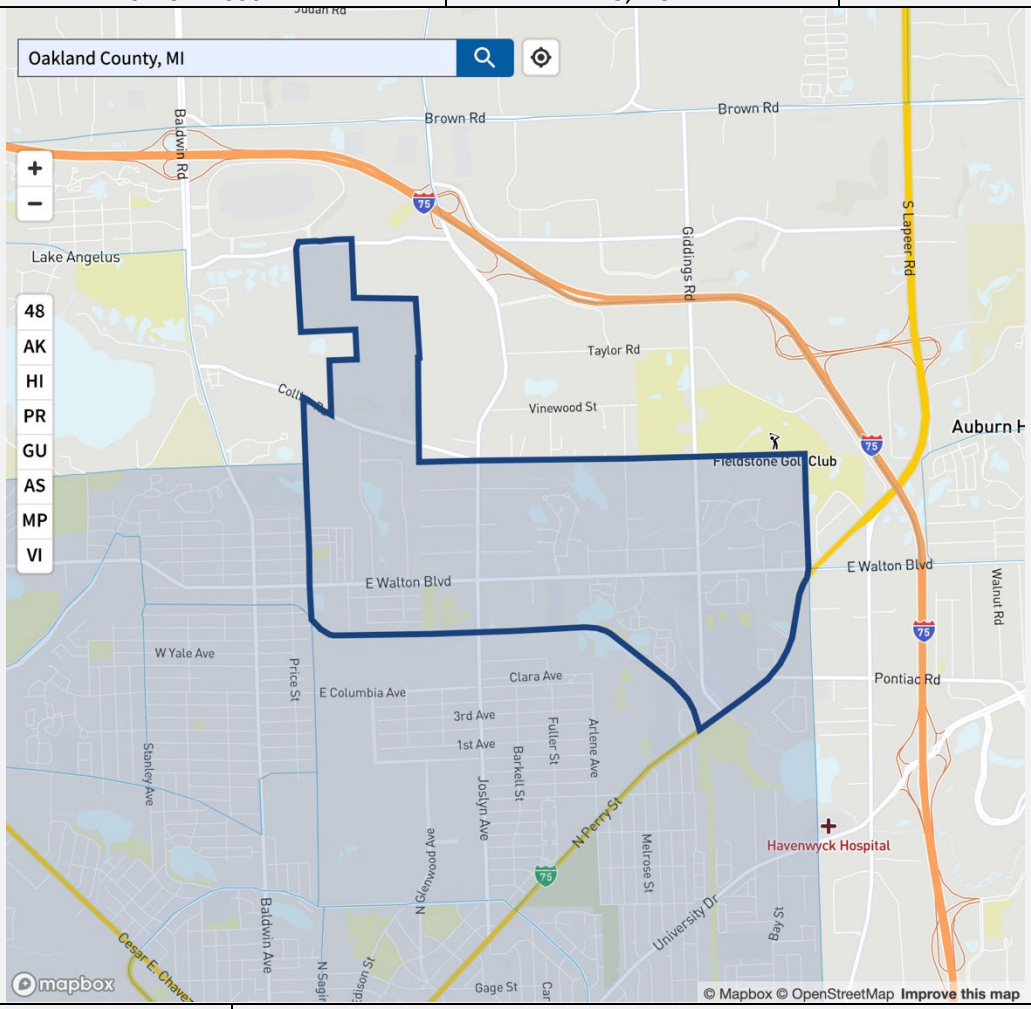


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Asthma (92nd)*
Waste & Wastewater	*Underground storage tanks and releases (95th), Wastewater Discharge Within 500 meters (92nd)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-112. Oakland County Census Tract 26125141000

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141000	5,225	TRUE

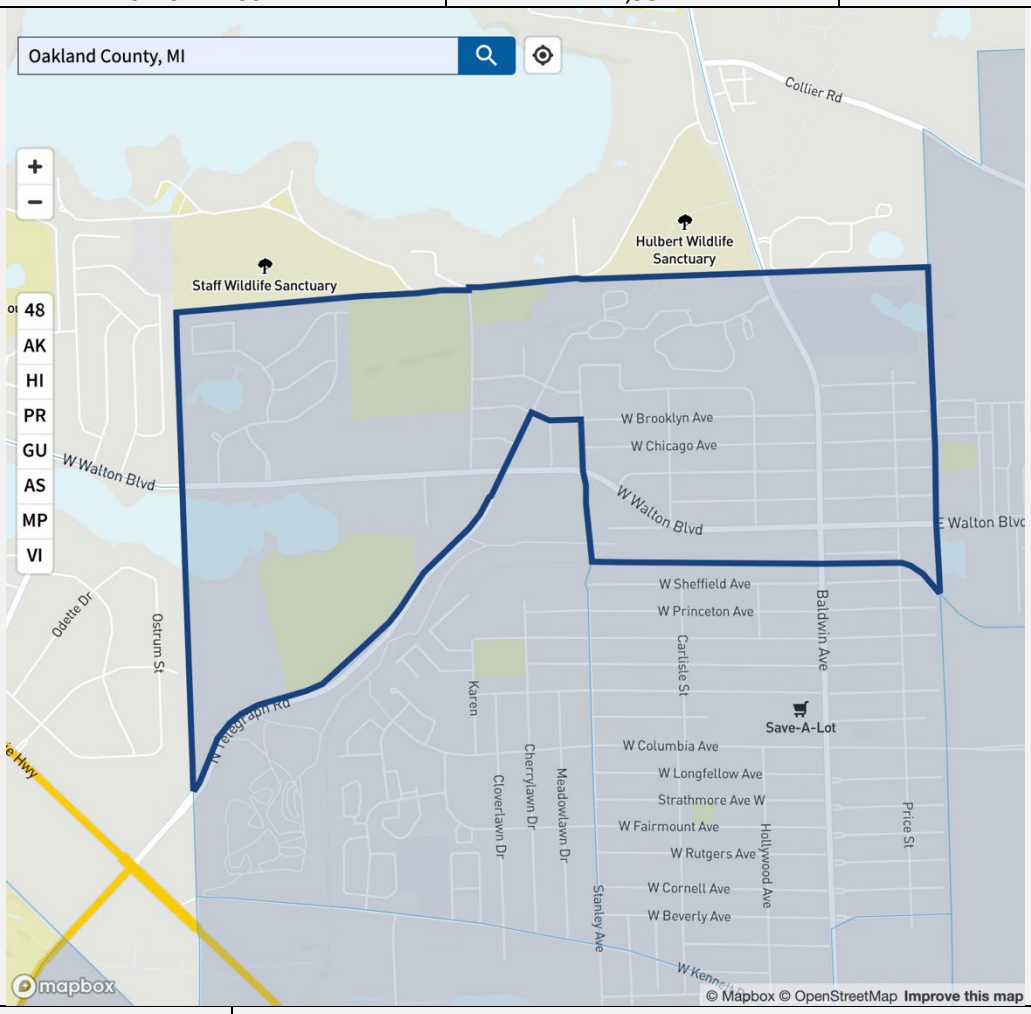


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (95th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-113. Oakland County Census Tract 26125141100

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141100	2,984	TRUE

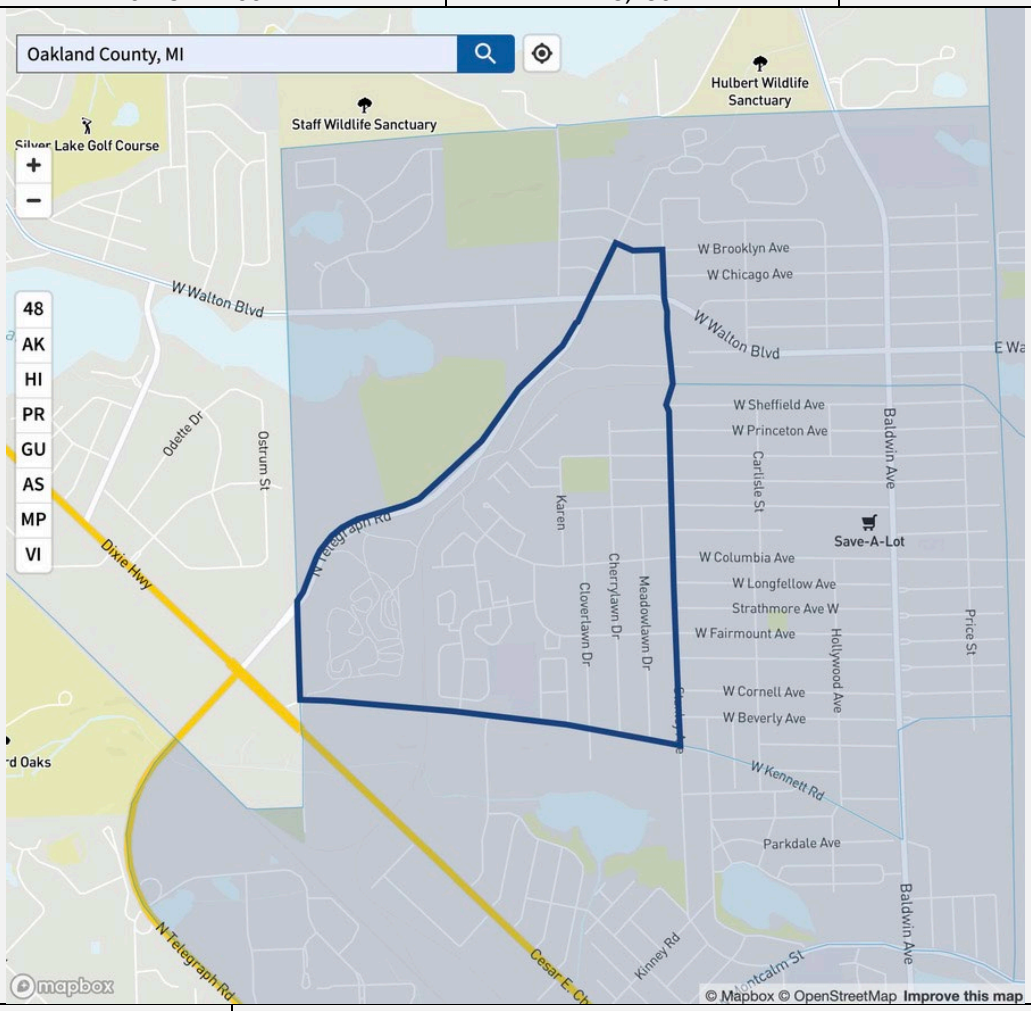


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (93rd)*
Workforce Development	*Unemployment (92nd), Less Than High School Education (15%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-114. Oakland County Census Tract 26125141200

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141200	3,136	TRUE

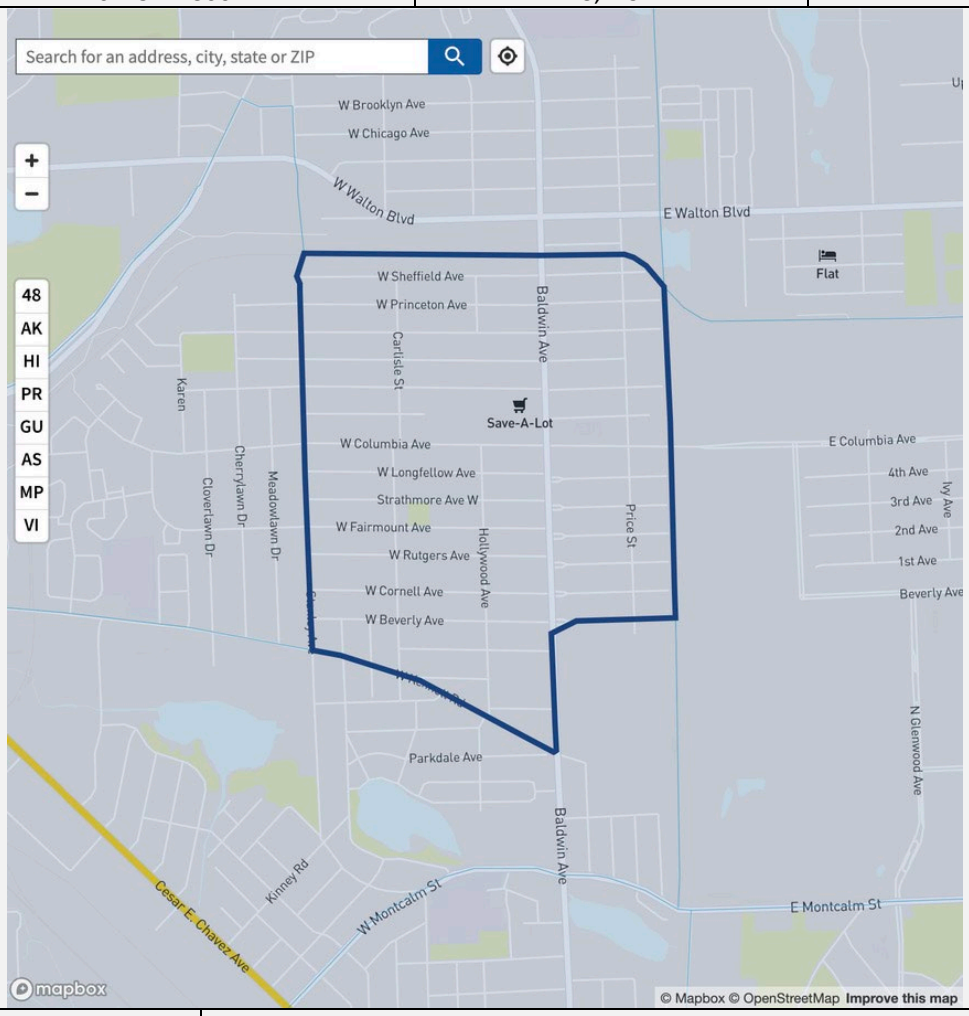


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (98th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (94th), Low Life Expectancy (99th)*
Workforce Development	*Low Median Income (99th), At or Below 100% Poverty Level (98th), Unemployment 94th), Less Than High School Education (22%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-115. Oakland County Census Tract 26125141300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141300	3,719	TRUE

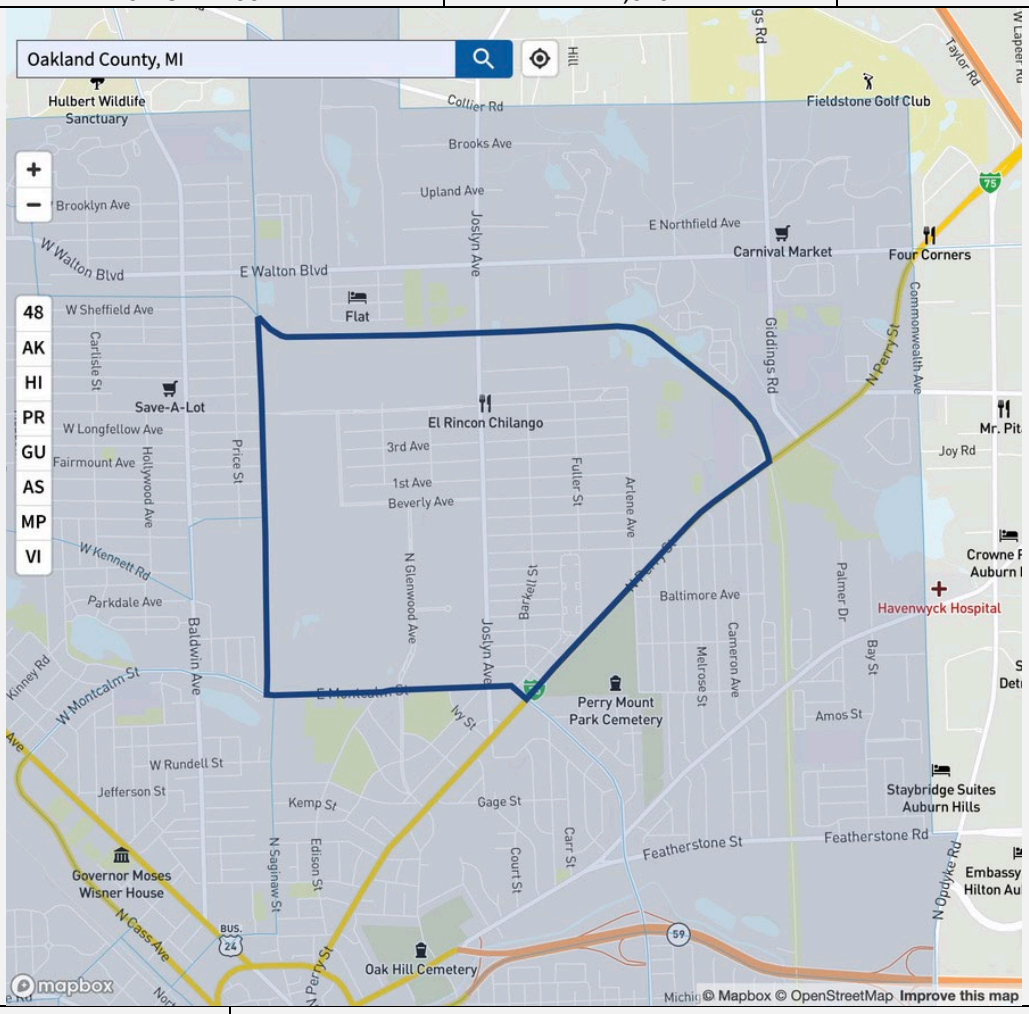


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Asthma (91st), Low Life Expectancy (94th)*
Waste & Wastewater	*Underground storage tanks and releases (94th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-116. Oakland County Census Tract 26125141400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141400	4,626	TRUE

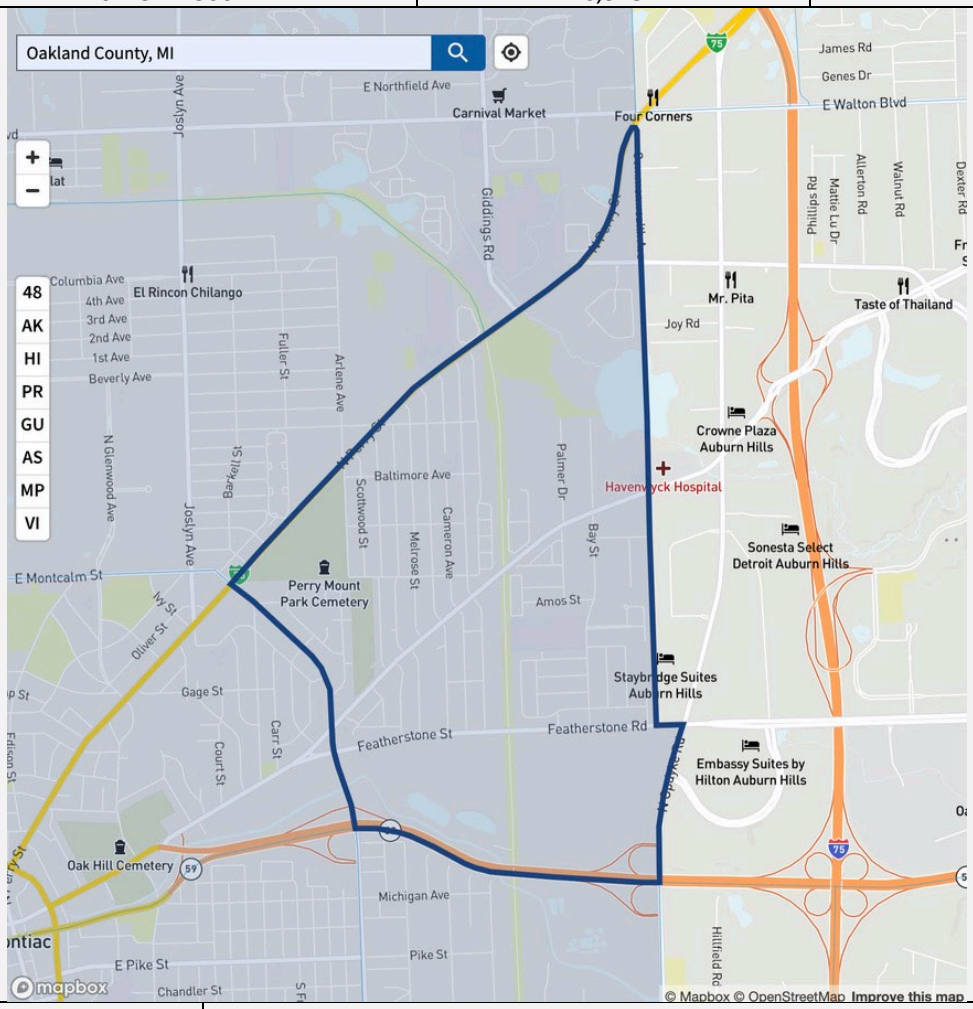


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (94th)*
Waste & Wastewater	*Underground storage tanks and releases (91st)*
Workforce Development	*Unemployment (95th), Less Than High School Education (25%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-117. Oakland County Census Tract 26125141500

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141500	6,378	TRUE

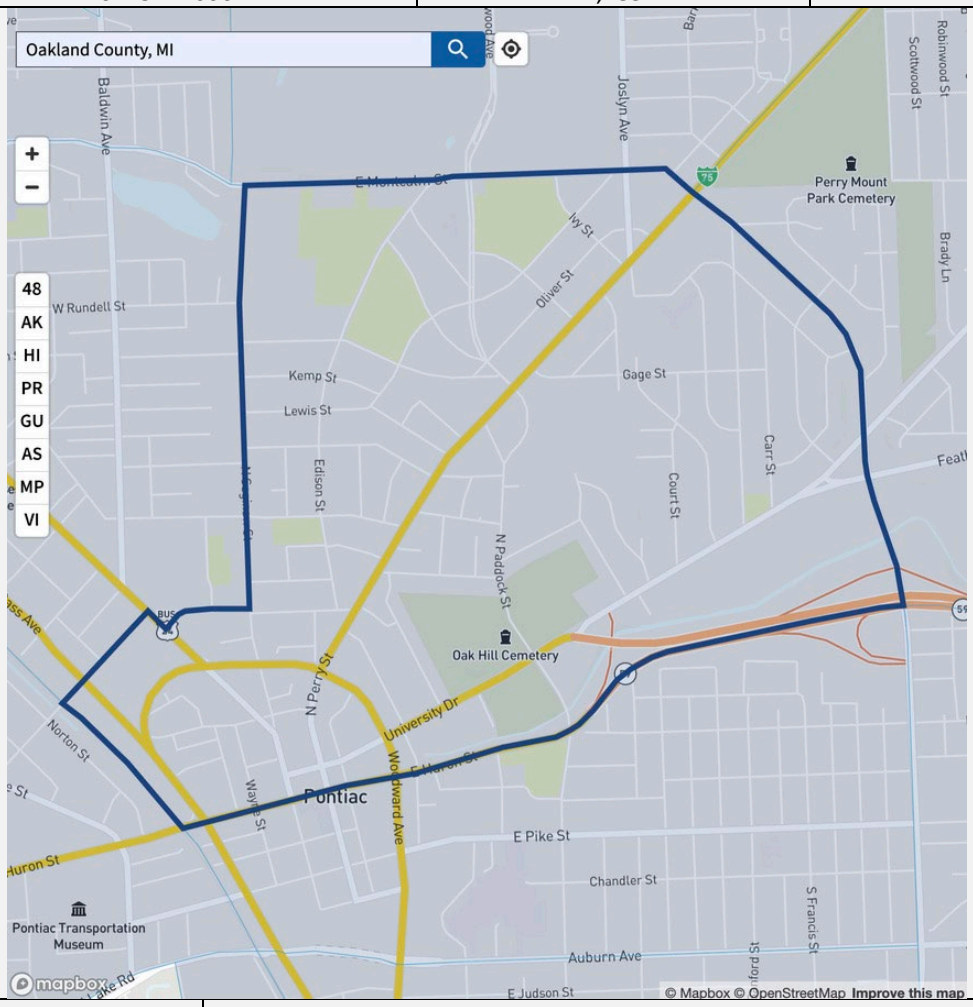


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (91st), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (91st)*
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans*
Workforce Development	*Unemployment (93rd), Less Than High School Education (18%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-118. Oakland County Census Tract 26125141600

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141600	4,485	TRUE

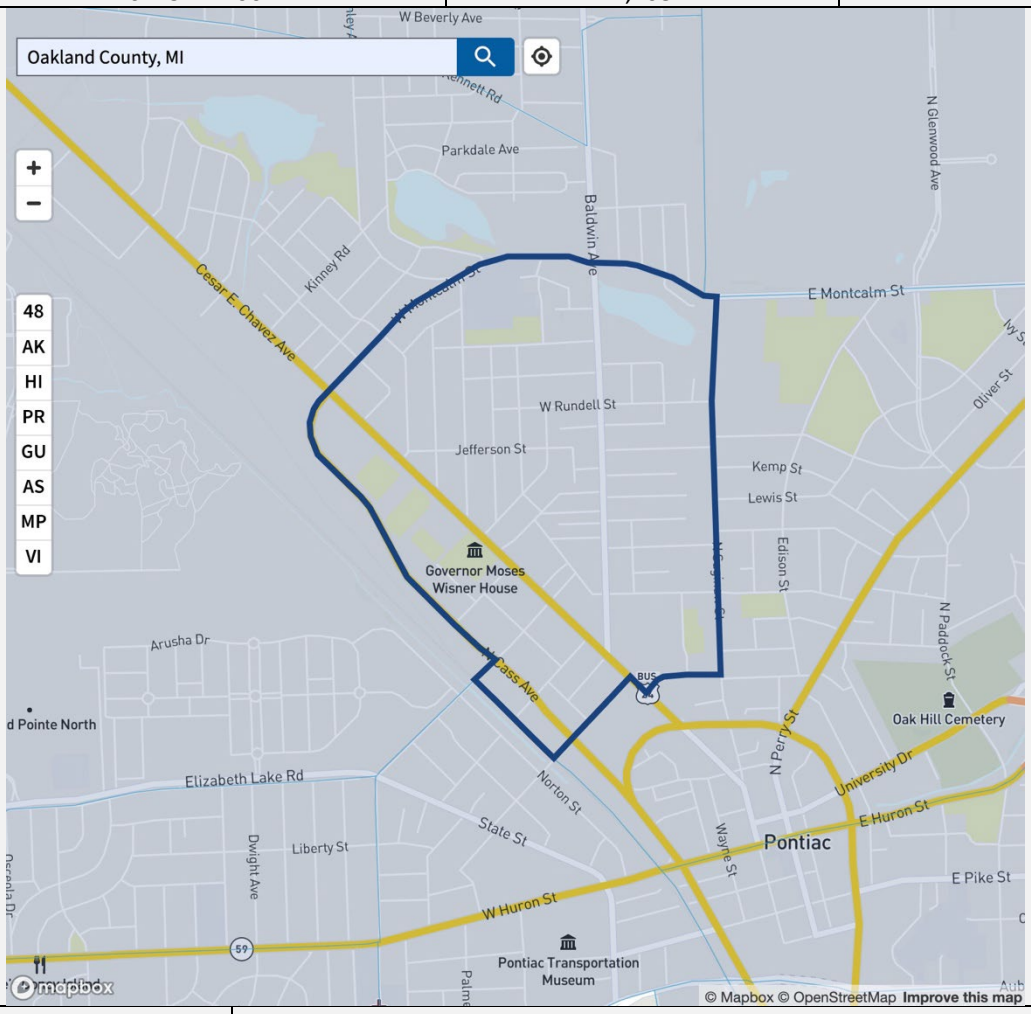


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (90th)*
Health	*Share of people who have been told they have asthma (95th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (90th), Low Life Expectancy (98th)*
Housing	*Lack of Indoor Plumbing (96th), Lead Paint (92nd)*
Transportation	*Count of vehicles at major roads within 500 meters (91st)*
Waste & Wastewater	*Underground storage tanks and releases (94th)*
Workforce Development	*Poverty (91st), Unemployment (96th), Less Than High School Education (21%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-119. Oakland County Census Tract 26125141700

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125141700	2,268	TRUE

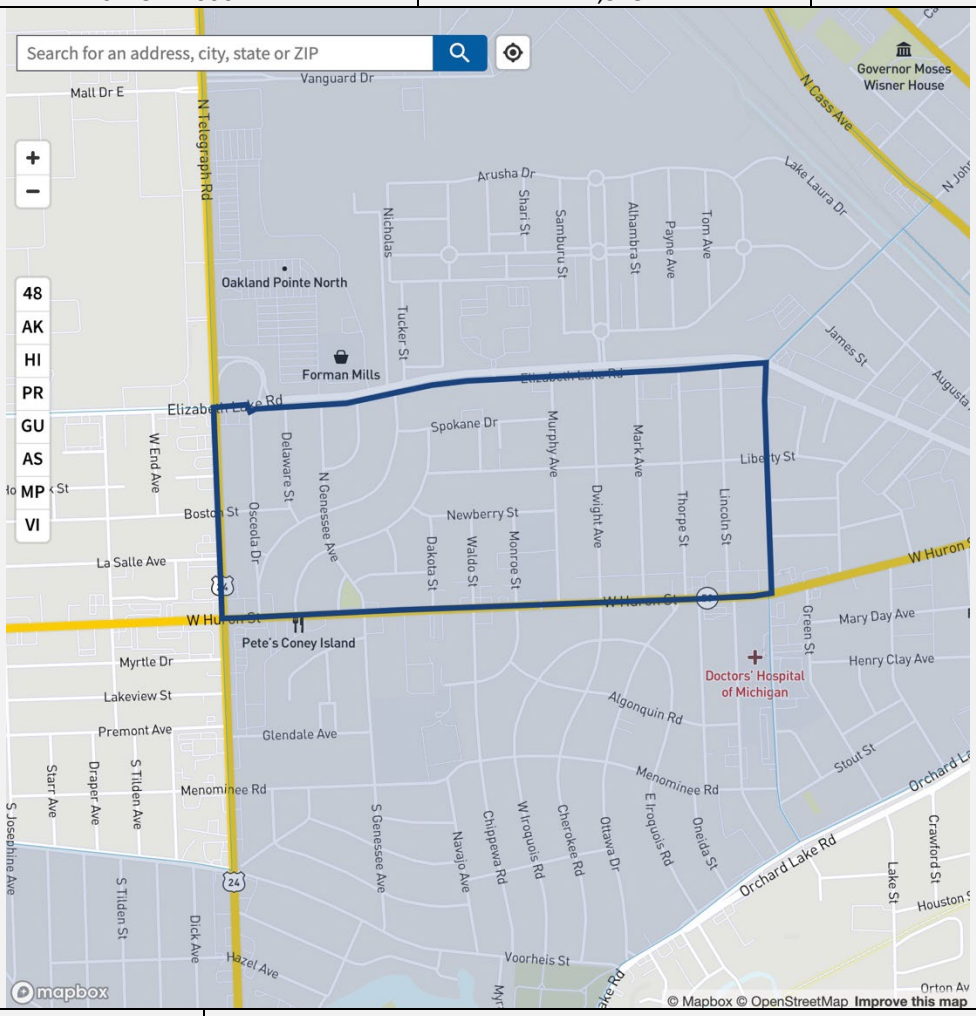


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (93rd)*
Health	*Share of people who have been told they have asthma (97th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (90th)*
Housing	*Share of homes without indoor kitchens or plumbing (98th)*
Waste & Wastewater	*Underground storage tanks and releases (95th)*
Workforce Development	*Low Median Income (92nd), At or Below 100% Poverty Level (95th), Unemployment 91st), Less Than High School Education (26%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-120. Oakland County Census Tract 26125142000

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142000	2,348	TRUE

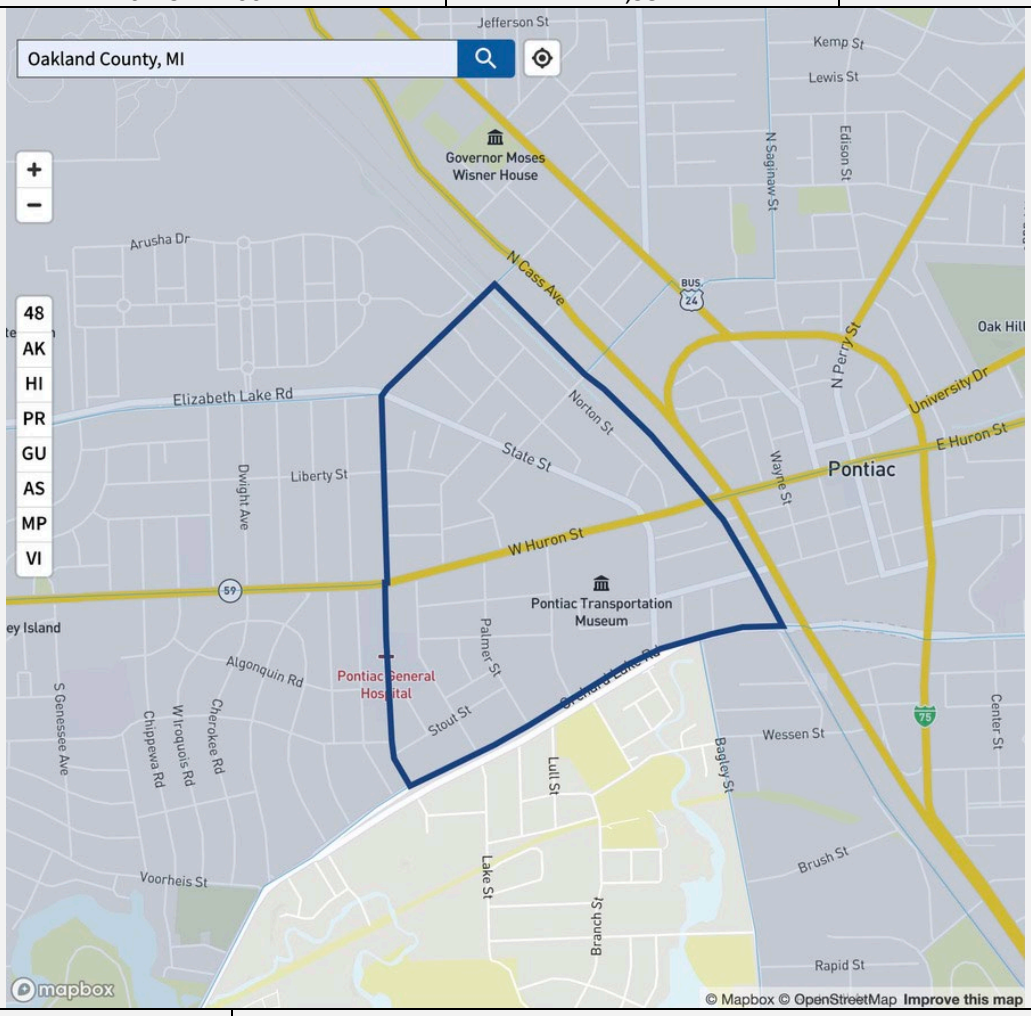


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (90th)*
Health	*Share of people who have been told they have asthma (97th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (92nd), Low life expectancy (96th)*
Housing	*Share of homes that are likely to have lead paint (95th)*
Transportation	*Count of vehicles at major roads within 500 meters (93rd)*
Waste & Wastewater	*Underground storage tanks and releases (95th)*
Workforce Development	*Low Median Income (95th), At or Below 100% Poverty Level (95th), Unemployment 91st), Less Than High School Education (13%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-121. Oakland County Census Tract 26125142100

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142100	1,584	TRUE

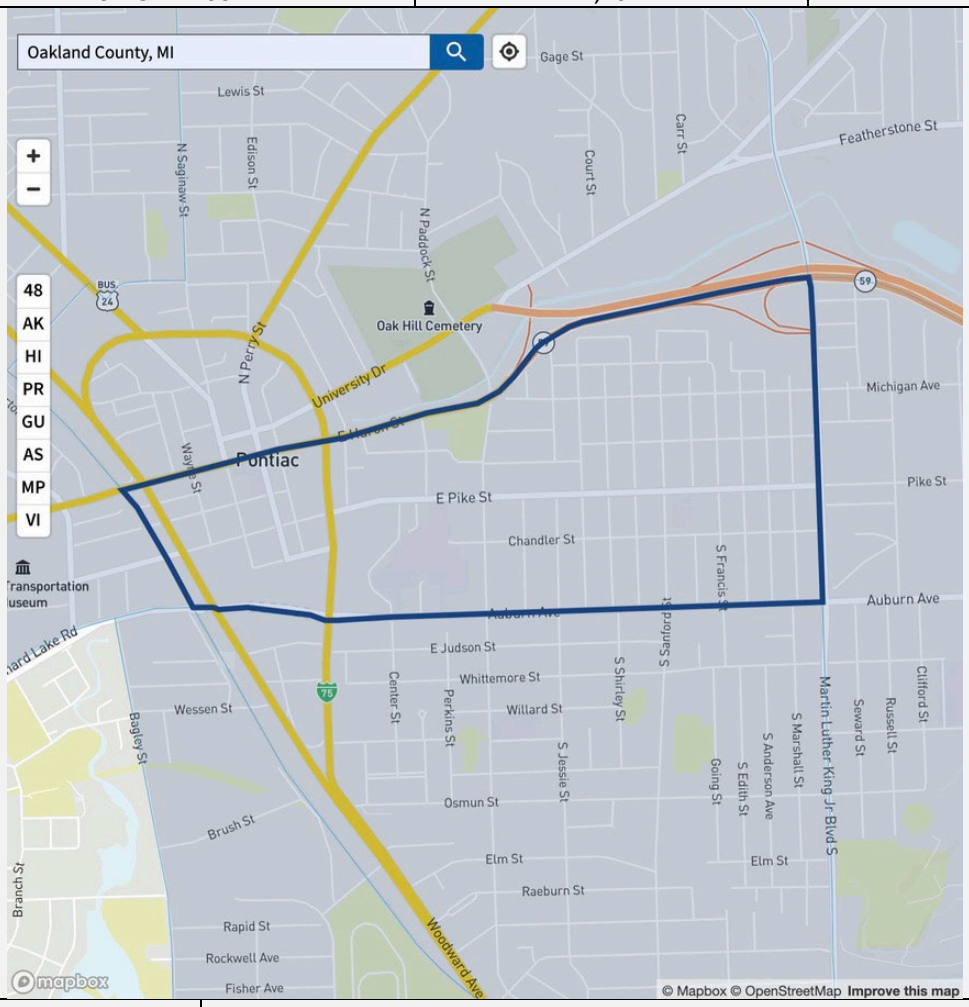


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (95th)*
Health	*Share of people who have been told they have asthma (97th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (93rd), Low Life Expectancy (91st)*
Housing	*Share of homes that are likely to have lead paint (95th)*
Transportation	*Count of vehicles at major roads within 500 meters (94th)*
Waste & Wastewater	*Underground storage tanks and releases (92nd)*
Workforce Development	*Low Median Income (92nd), At or Below 100% Poverty Level (92nd), Unemployment 98th), Less Than High School Education (27%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-122. Oakland County Census Tract 26125142200

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142200	2,764	TRUE

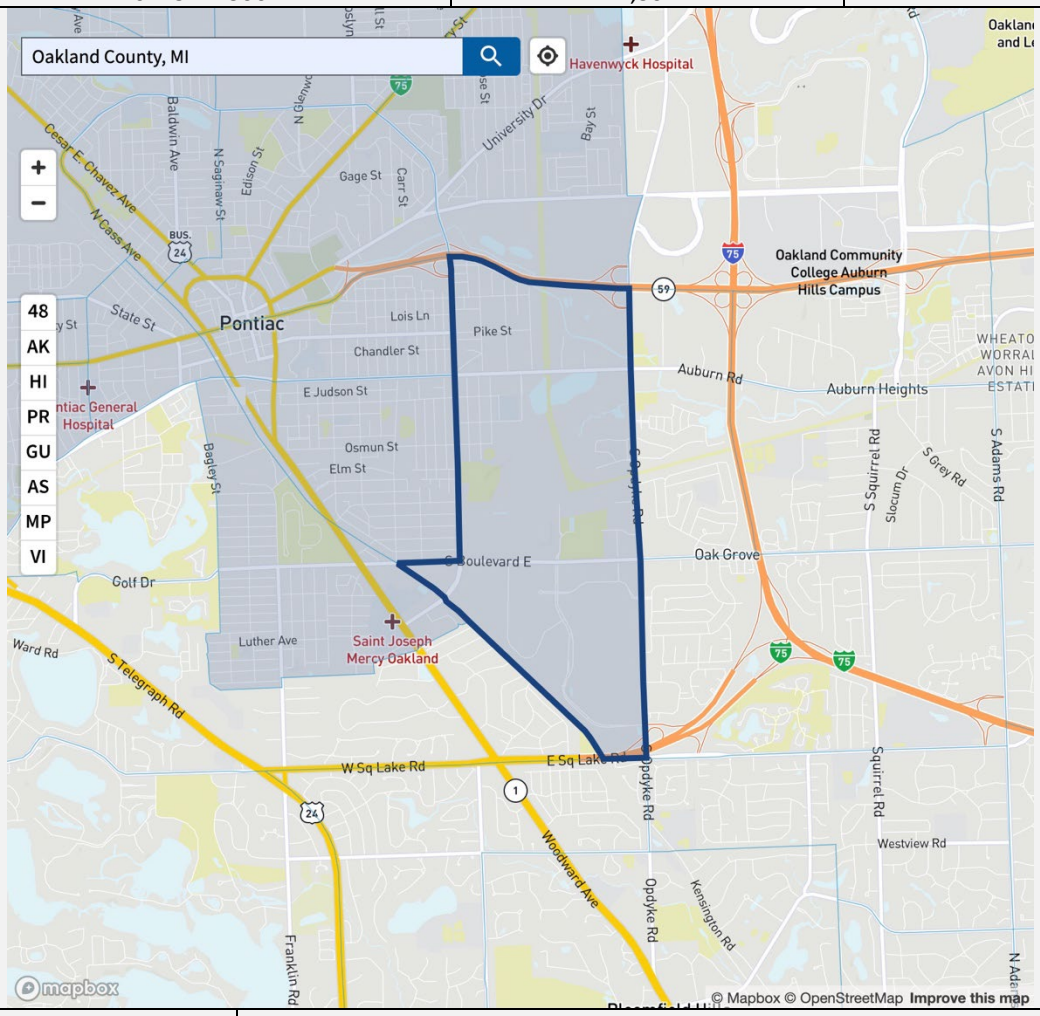


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (94th)*
Health	*Share of people who have been told they have asthma (99th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (98th), Heart Disease (94th), Low Life Expectancy (99th)*
Transportation	*Count of vehicles at major roads within 500 meters (92nd)*
Waste & Wastewater	*Underground storage tanks and releases (96th)*
Workforce Development	*Low Median Income (99th), Poverty (94th), Unemployment (93rd), Less Than High School Education (17%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-123. Oakland County Census Tract 26125142300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142300	2,307	TRUE

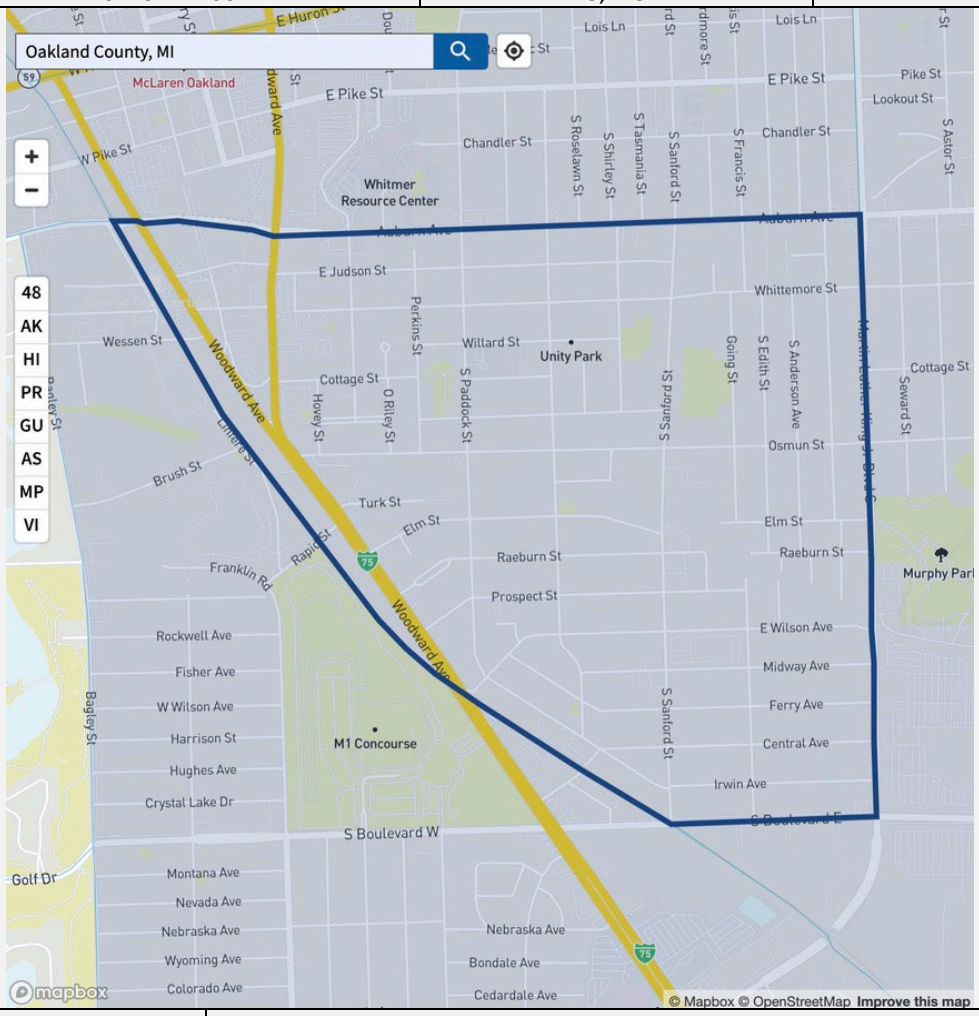


BURDEN	DESCRIPTION AND REPORTED DATA
Energy	*Average annual energy costs divided by household income (92nd)*
Health	*Share of people who have been told they have asthma (99th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (99th), Share of people ages 18 years and older who have been told they have heart disease (98th)*
Housing	*Historic underinvestment - Census tract has historically high barriers to accessing home loans*
Transportation	*Average of relative cost and time spent on transportation (90th)*
Waste & Wastewater	*Underground storage tanks and releases (92nd)*
Workforce Development	*Low Median Income (99th), At or Below 100% Poverty Level (98th), Unemployment 96th), Less Than High School Education (24%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-124. Oakland County Census Tract 26125142400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142400	3,428	TRUE

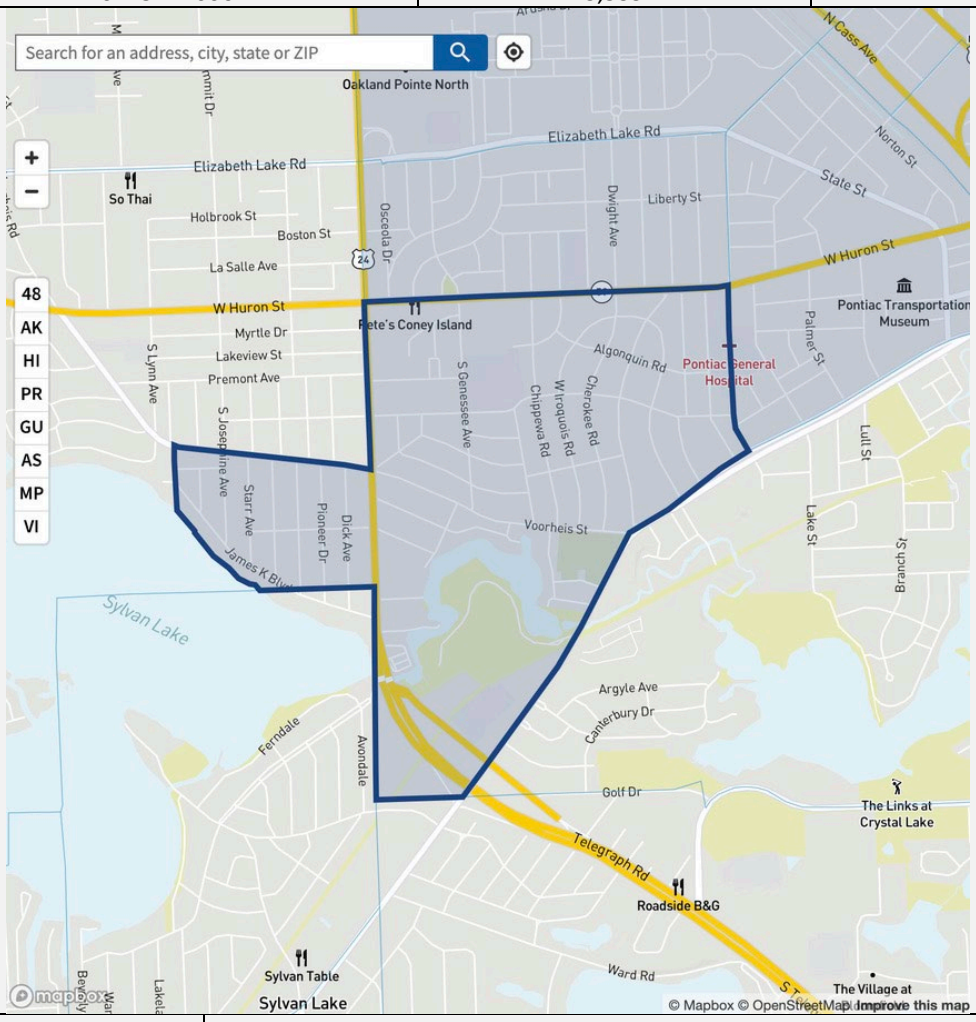


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (98th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (97th), Low Life Expectancy (98th)*
Waste & Wastewater	*Underground storage tanks and releases (98th)*
Workforce Development	*Low Median Income (91st), Less Than High School Education (21%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-125. Oakland County Census Tract 26125142600

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142600	3,539	TRUE

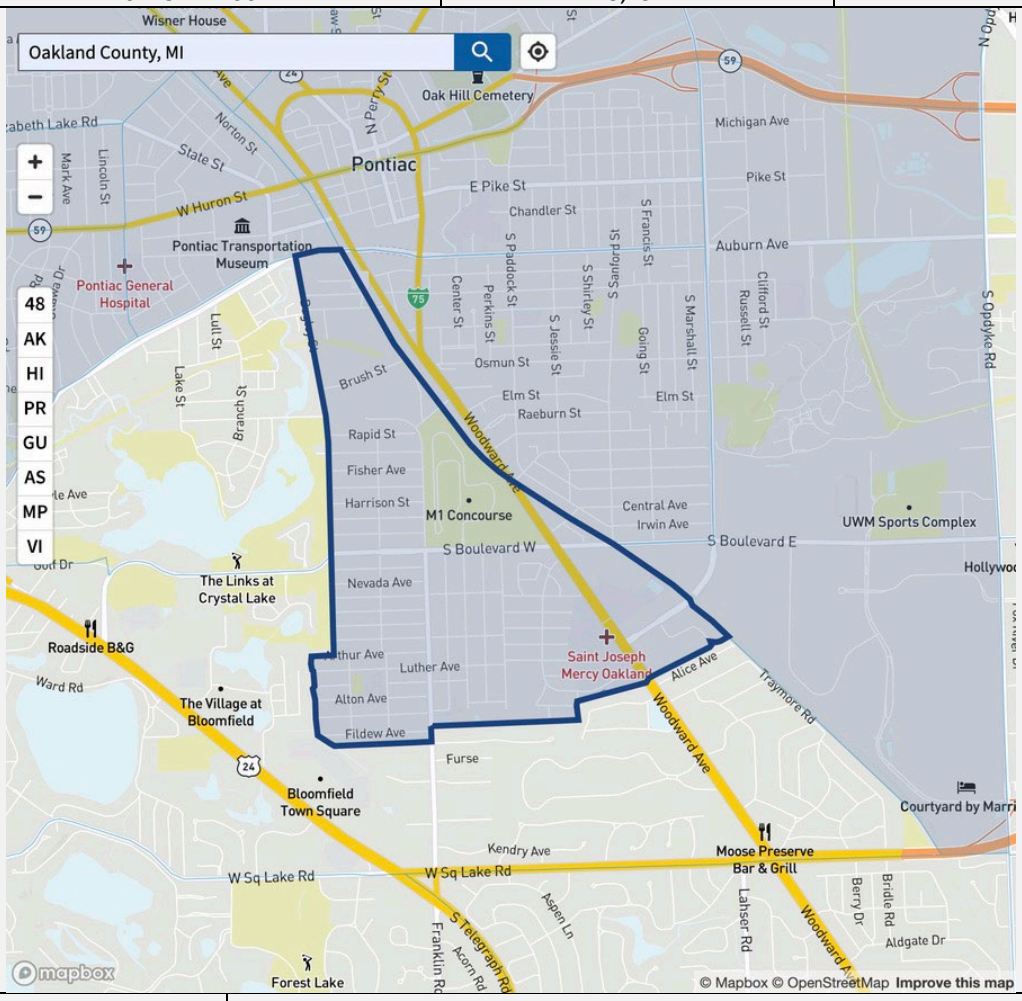


BURDEN	DESCRIPTION AND REPORTED DATA
Housing	*Share of homes that are likely to have lead paint (95th)*
Transportation	*Count of vehicles at major roads within 500 meters (92nd)*
Waste & Wastewater	*Underground storage tanks and releases (98th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-126. Oakland County Census Tract 26125142700

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125142700	3,797	TRUE

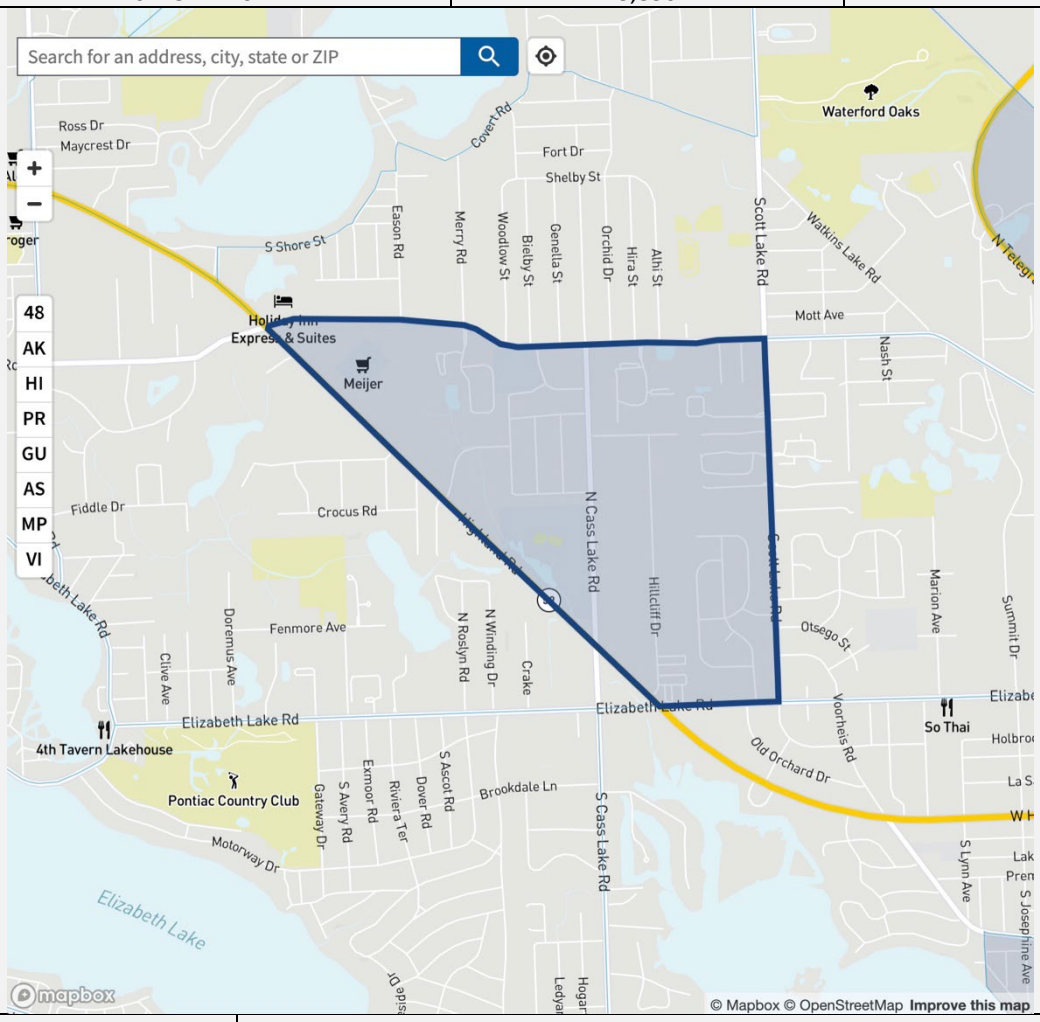


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (98th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (96th), Low Life Expectancy (96th)*
Housing	*Historic underinvestment - Census tract has historically high barriers to accessing home loans*
Waste & Wastewater	*Underground storage tanks and releases (94th)*
Workforce Development	*Low Median Income (92nd), Unemployment 94th), Less Than High School Education (12%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-127. Oakland County Census Tract 26125144701

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125144701	3,830	TRUE

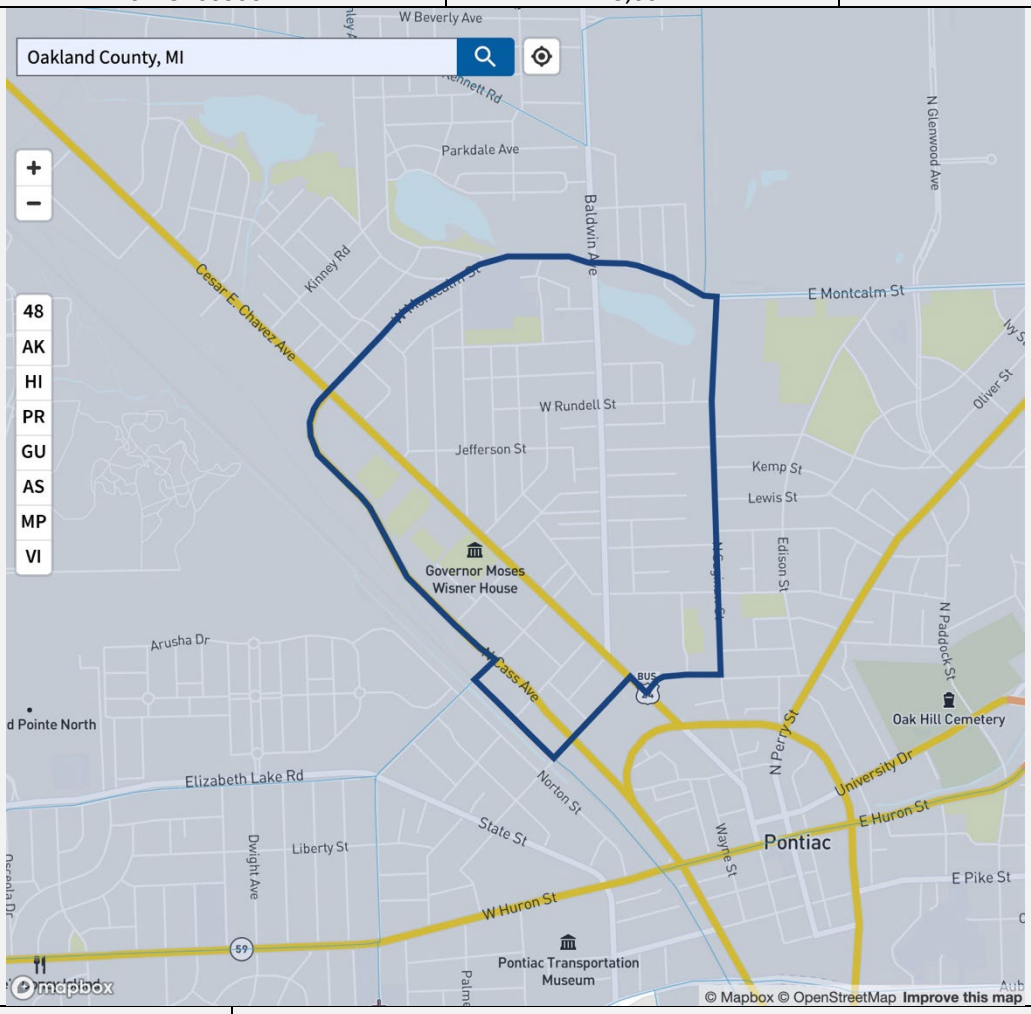


BURDEN	DESCRIPTION AND REPORTED DATA
Housing	*Lack of indoor plumbing (95th)*
Waste & Wastewater	*Underground storage tanks and releases (96th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-128. Oakland County Census Tract 26125160300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125160300	3,001	TRUE

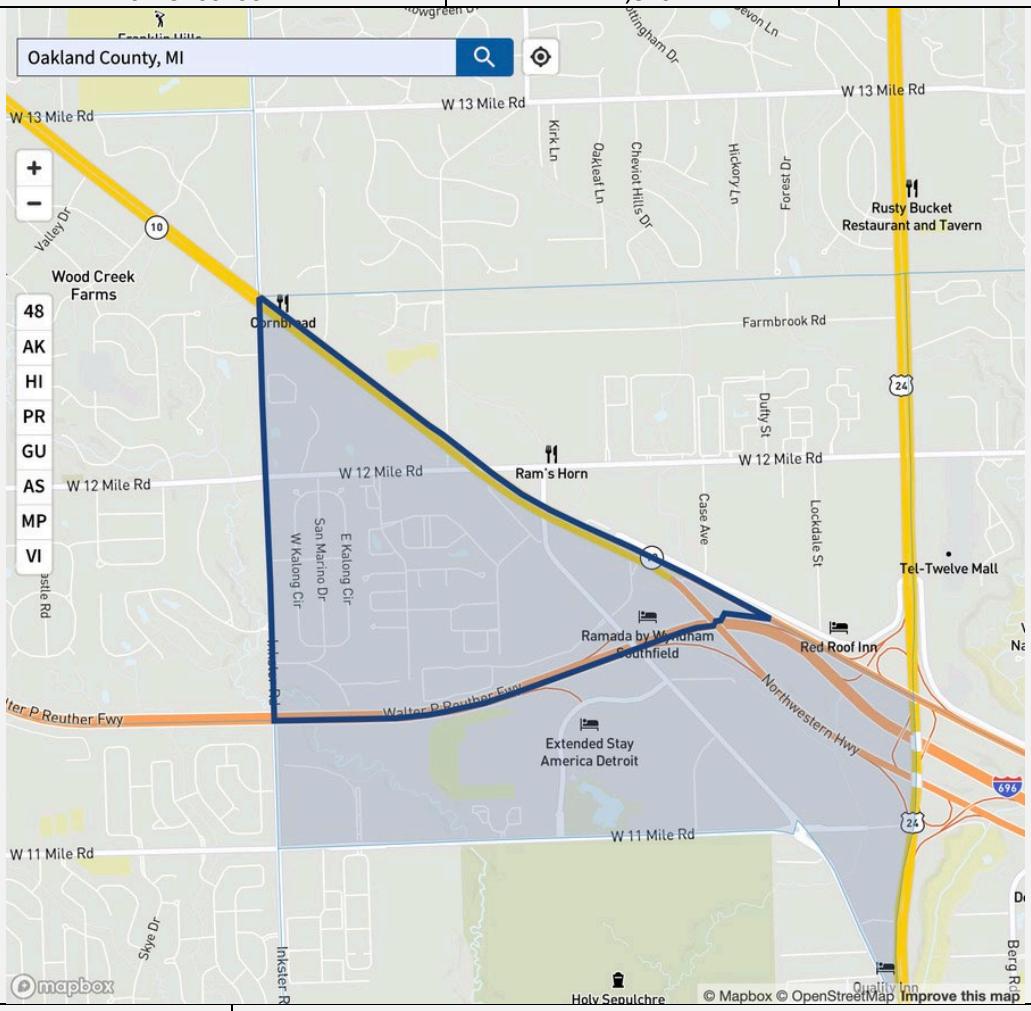


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (94th)*
Housing	*Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (96th)*
Legacy Pollution	*Presence of one or more Formerly Used Defense Site within the tract*
Transportation	*Count of vehicles at major roads within 500 meters (97th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-129. Oakland County Census Tract 26125160400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125160400	2,816	TRUE

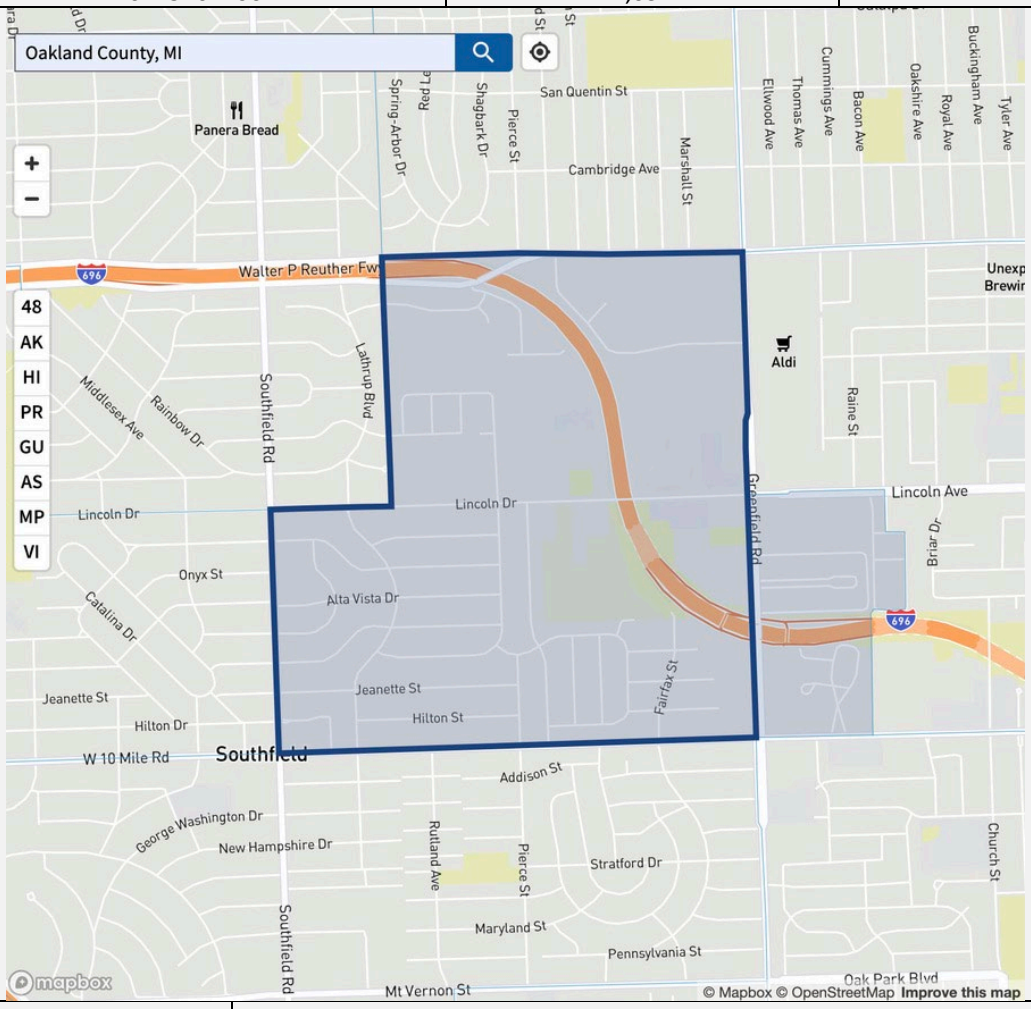


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (94th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (92nd)*
Housing	*Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (93rd)*
Transportation	*Count of vehicles at major roads within 500 meters (98th)*
Waste & Wastewater	*Underground storage tanks and releases (95th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-130. Oakland County Census Tract 26125161400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125161400	4,032	TRUE

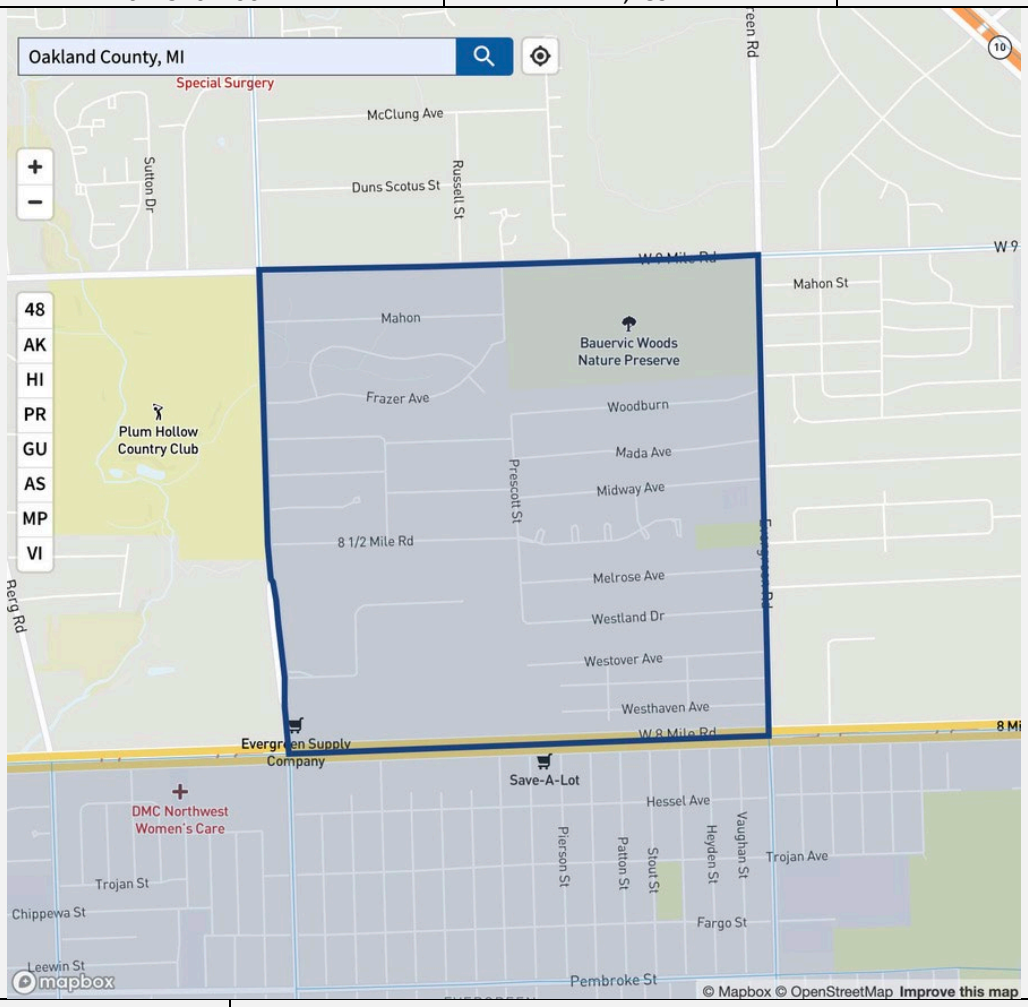


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (94th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (96th), Share of people ages 18 years and older who have been told they have heart disease (97th)*
Transportation	*Count of vehicles at major roads within 500 meters (98th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-131. Oakland County Census Tract 26125162400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125162400	2,289	TRUE

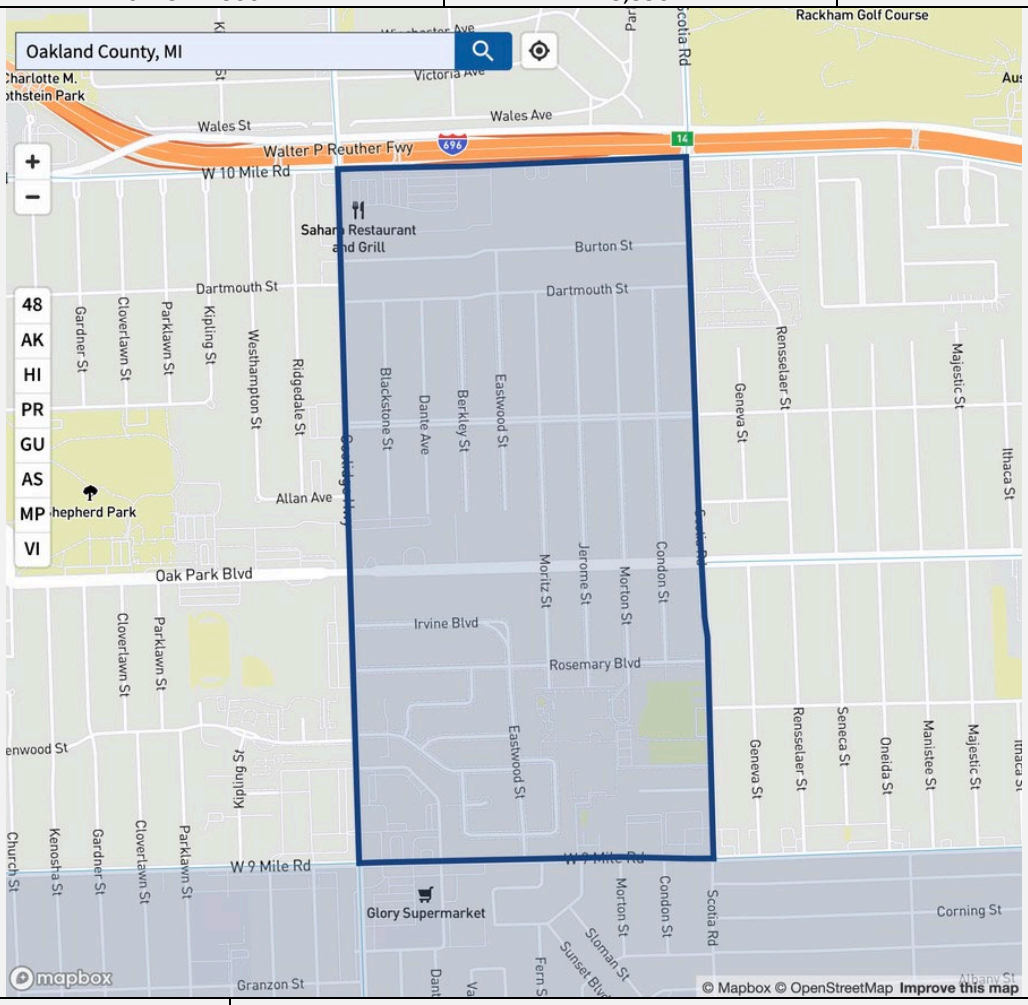


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (90th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-132. Oakland County Census Tract 26125171300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125171300	3,356	FALSE

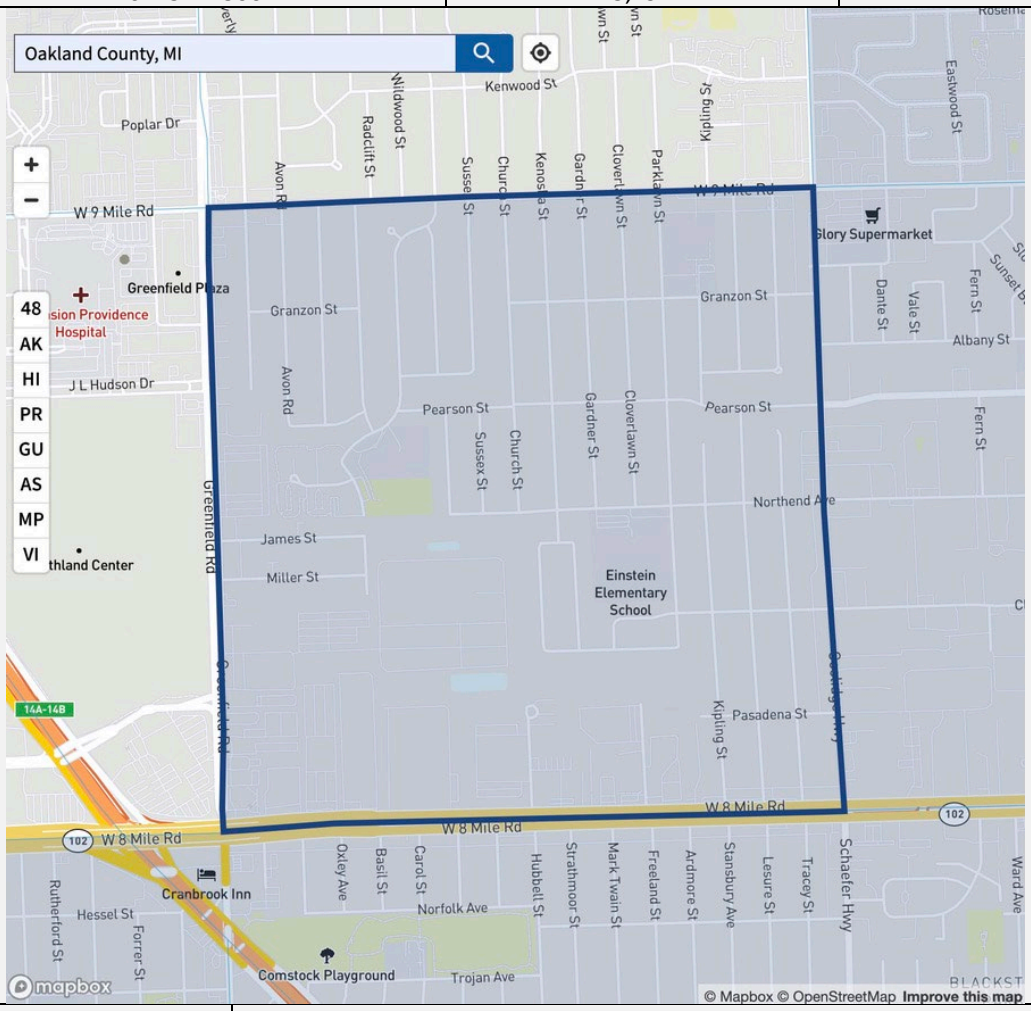


BURDEN	DESCRIPTION AND REPORTED DATA
Workforce Development	*Unemployment (90th), Less Than High School Education (12%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-133. Oakland County Census Tract 26125171500

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125171500	5,194	TRUE

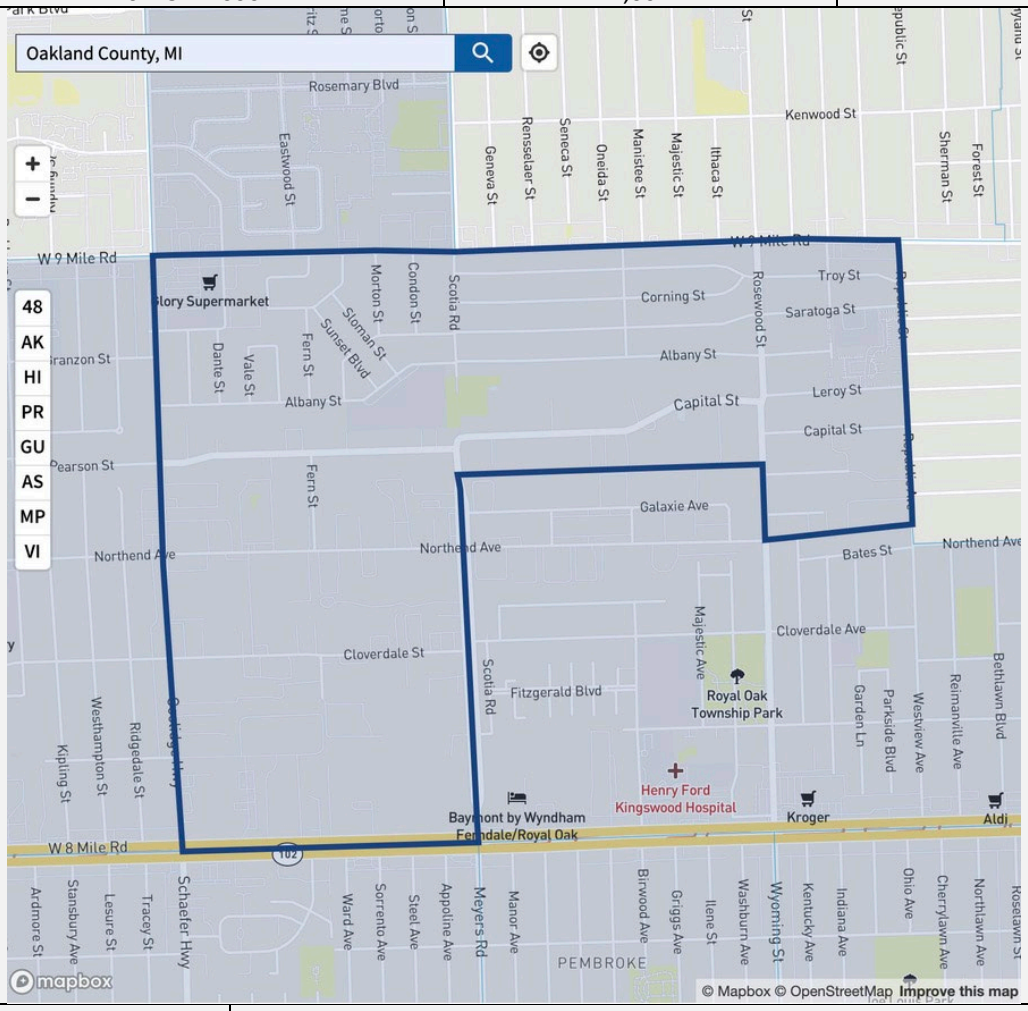


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (96th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (91st)*
Housing	*Share of homes that are likely to have lead paint (91st)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-134. Oakland County Census Tract 26125171600

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125171600	2,061	TRUE

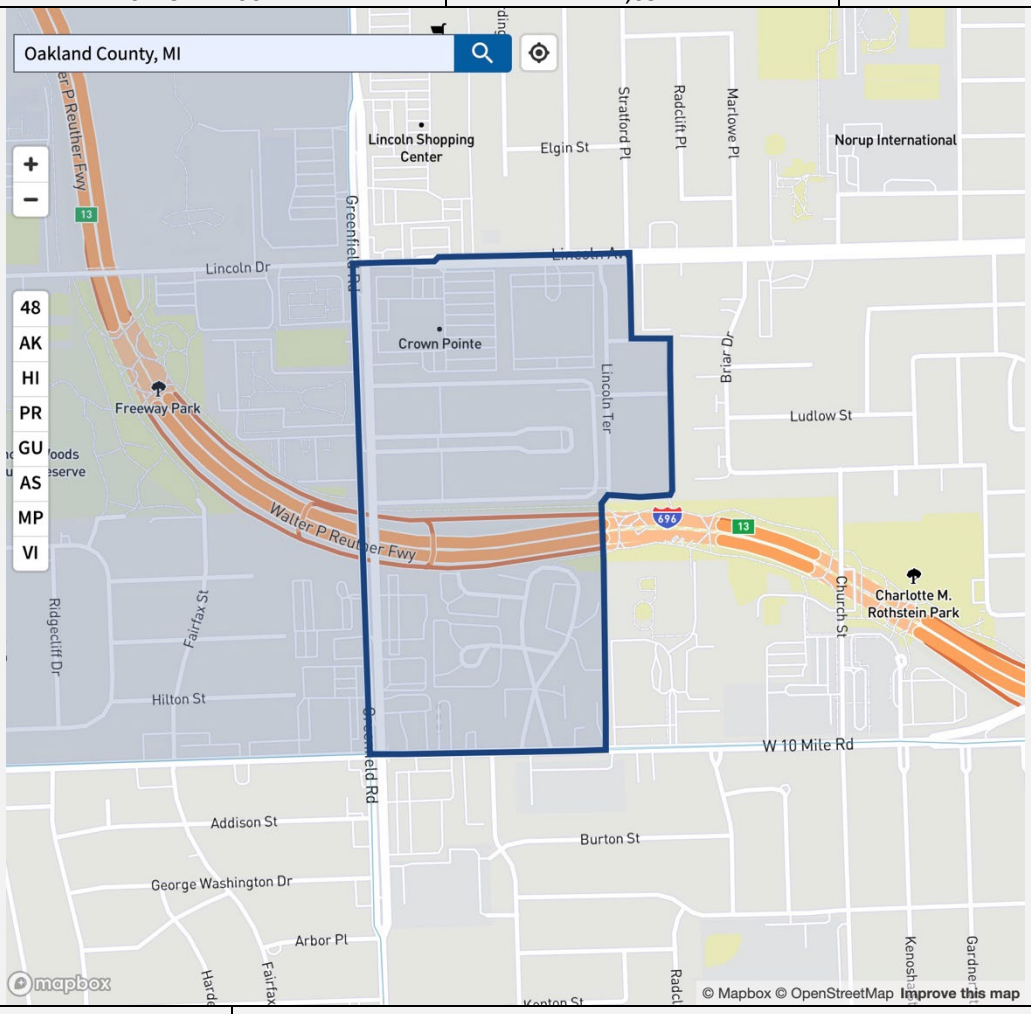


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (97th), Low Life Expectancy (97th)*
Housing	*Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (94th), Lack of Green Space (90th)*
Waste & Wastewater	*Underground storage tanks and releases (93rd)*
Workforce Development	*Low Median Income (90th), Less Than High School Education (16%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-135. Oakland County Census Tract 26125172400

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125172400	1,651	TRUE

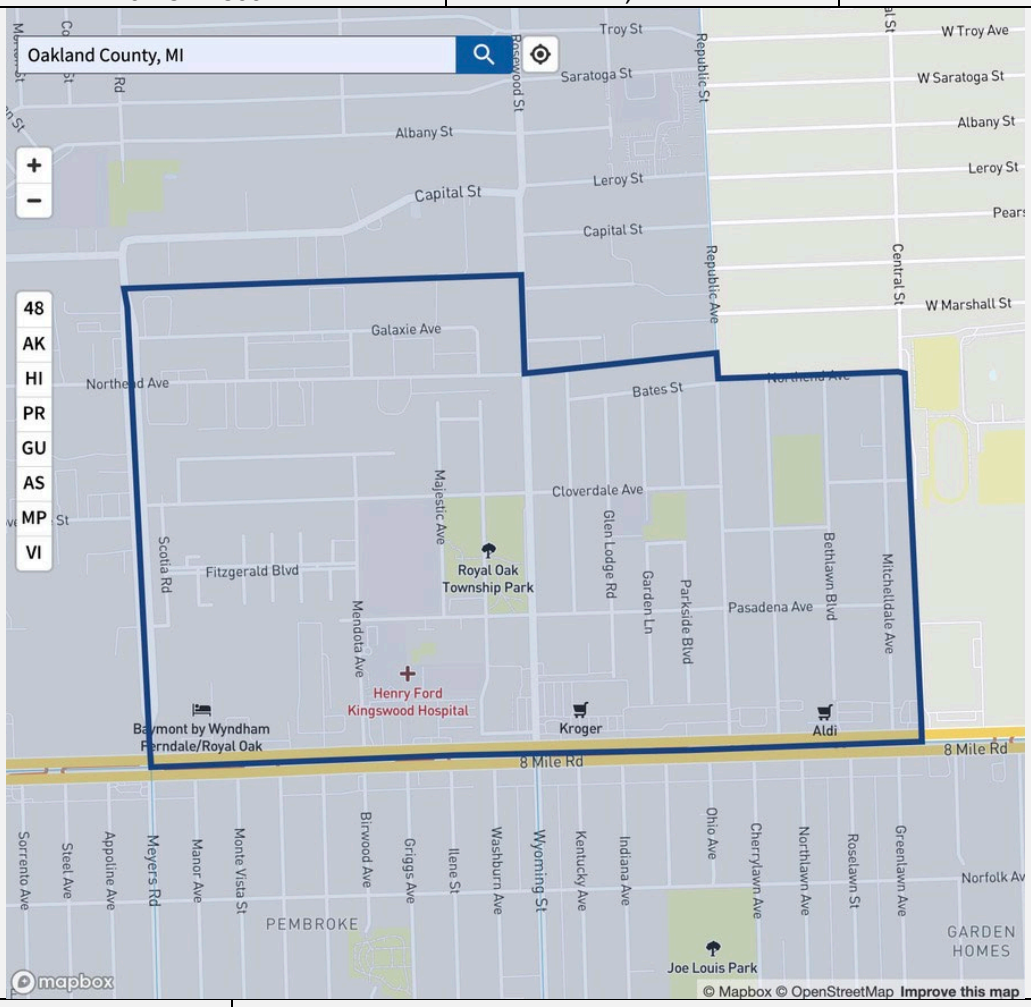


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (96th)*
Housing	*Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (94th), Lack of Green Space (96th)*
Transportation	*Count of vehicles at major roads within 500 meters (99th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-136. Oakland County Census Tract 26125172500

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125172500	2,411	TRUE

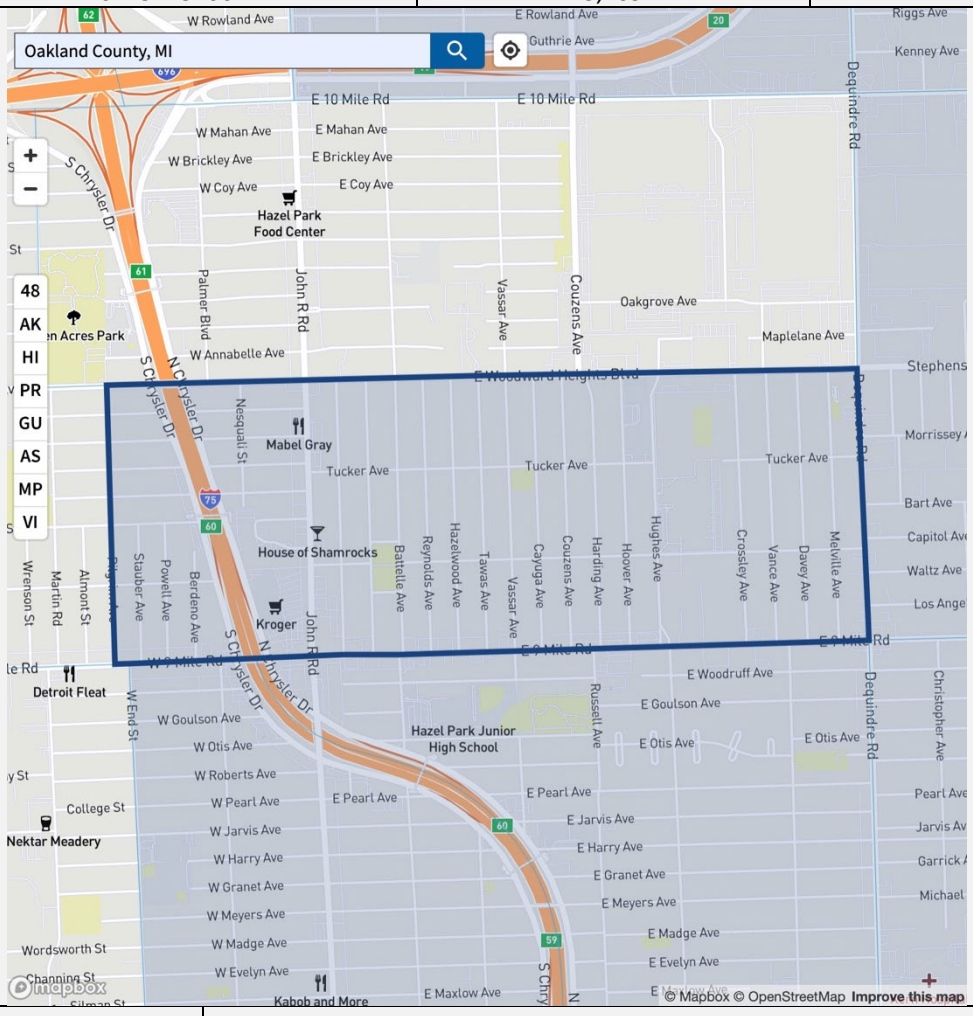


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (98th), Share of people ages 18 years and older who have diabetes other than diabetes during pregnancy (97th), Share of people ages 18 years and older who have been told they have heart disease (90th)*
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans, Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (91st)*
Transportation	*Count of vehicles at major roads within 500 meters (94th)*
Waste & Wastewater	*Underground storage tanks and releases (97th)*
Workforce Development	*Low Median Income (94th), Less Than High School Education (16%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-137. Oakland County Census Tract 26125175100

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125175100	5,169	TRUE

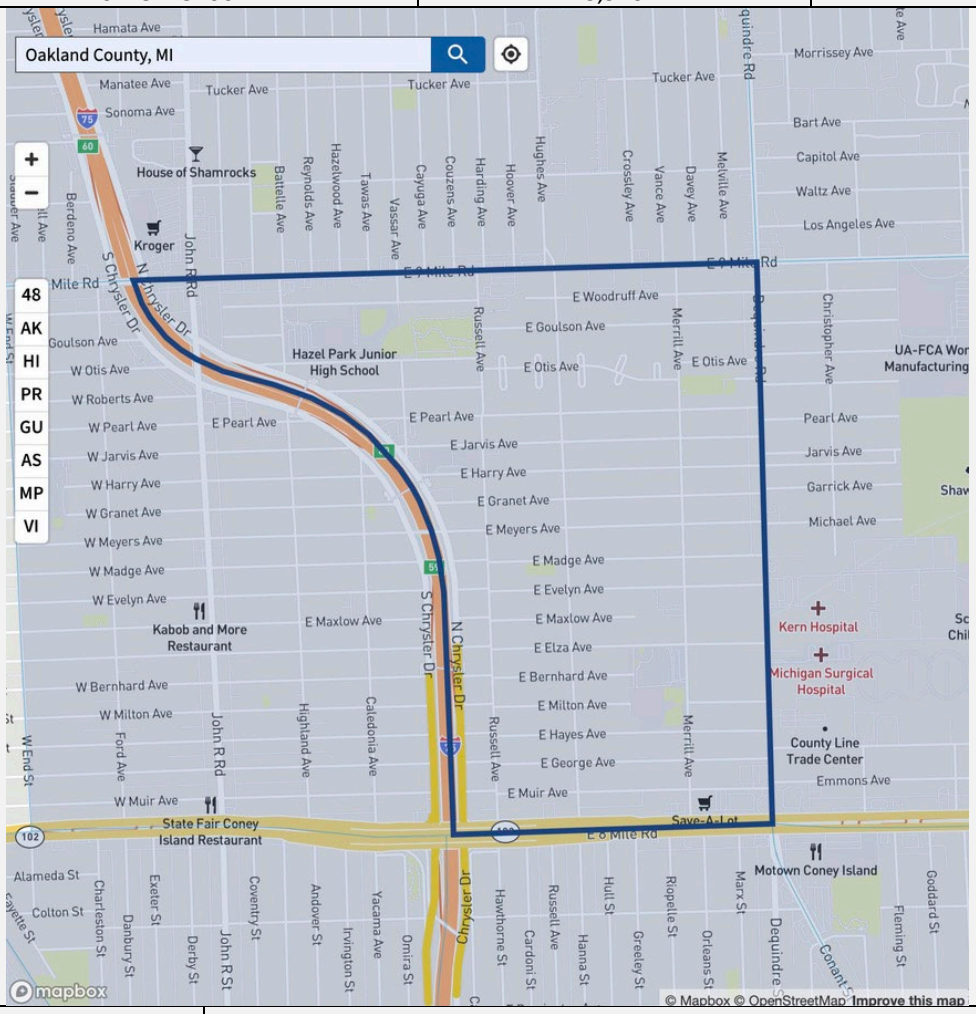


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (91st)*
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans*
Transportation	*Count of vehicles at major roads within 500 meters (96th)*
Waste & Wastewater	*Underground storage tanks and releases (95th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-138. Oakland County Census Tract 26125175200

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125175200	3,910	TRUE

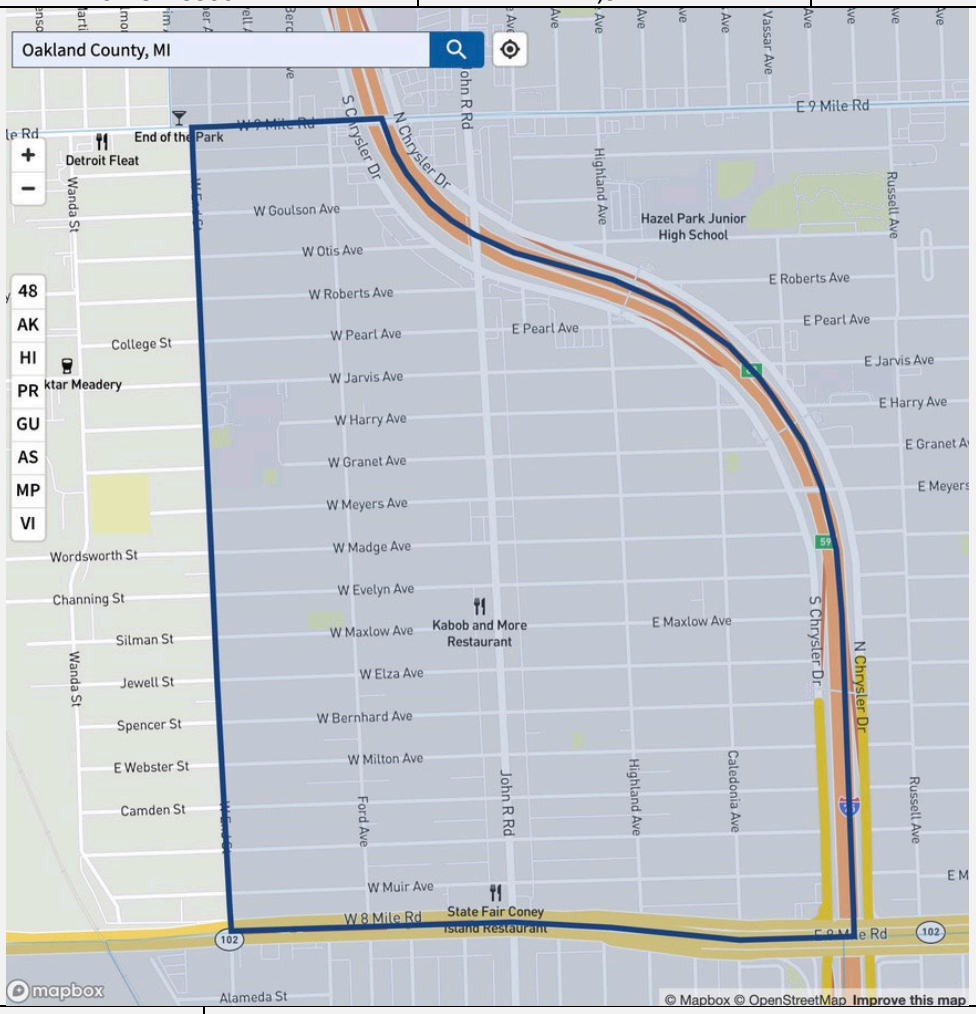


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (93rd)*
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans*
Transportation	*Count of vehicles at major roads within 500 meters (97th)*
Waste & Wastewater	*Underground storage tanks and releases (95th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-139. Oakland County Census Tract 26125175300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125175300	4,314	TRUE

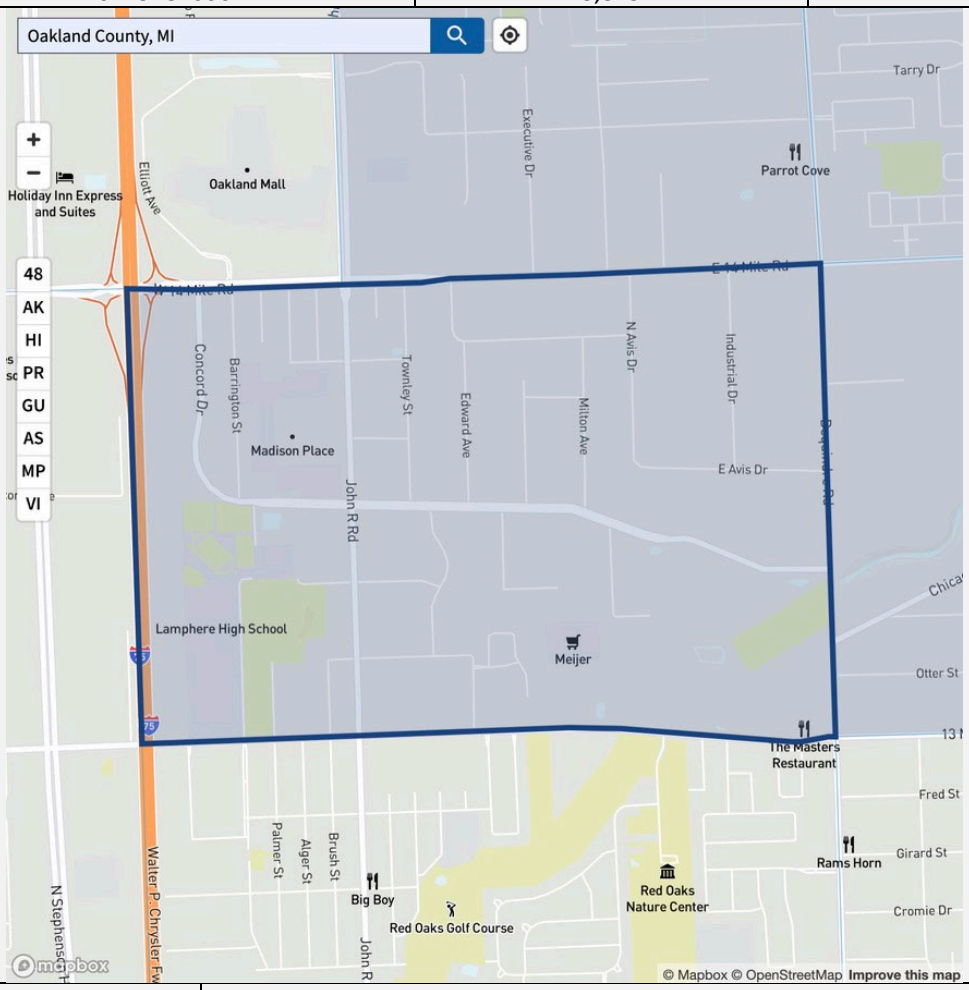


BURDEN	DESCRIPTION AND REPORTED DATA
Health	*Share of people who have been told they have asthma (91st), Low Life Expectancy (96th)*
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans*
Legacy Pollution	*Count of Risk Management Plan (RMP) facilities within 5 kilometers (90th)*
Transportation	*Count of vehicles at major roads within 500 meters (97th)*
Waste & Wastewater	*Underground storage tanks and releases (94th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-140. Oakland County Census Tract 26125181000

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125181000	3,875	TRUE

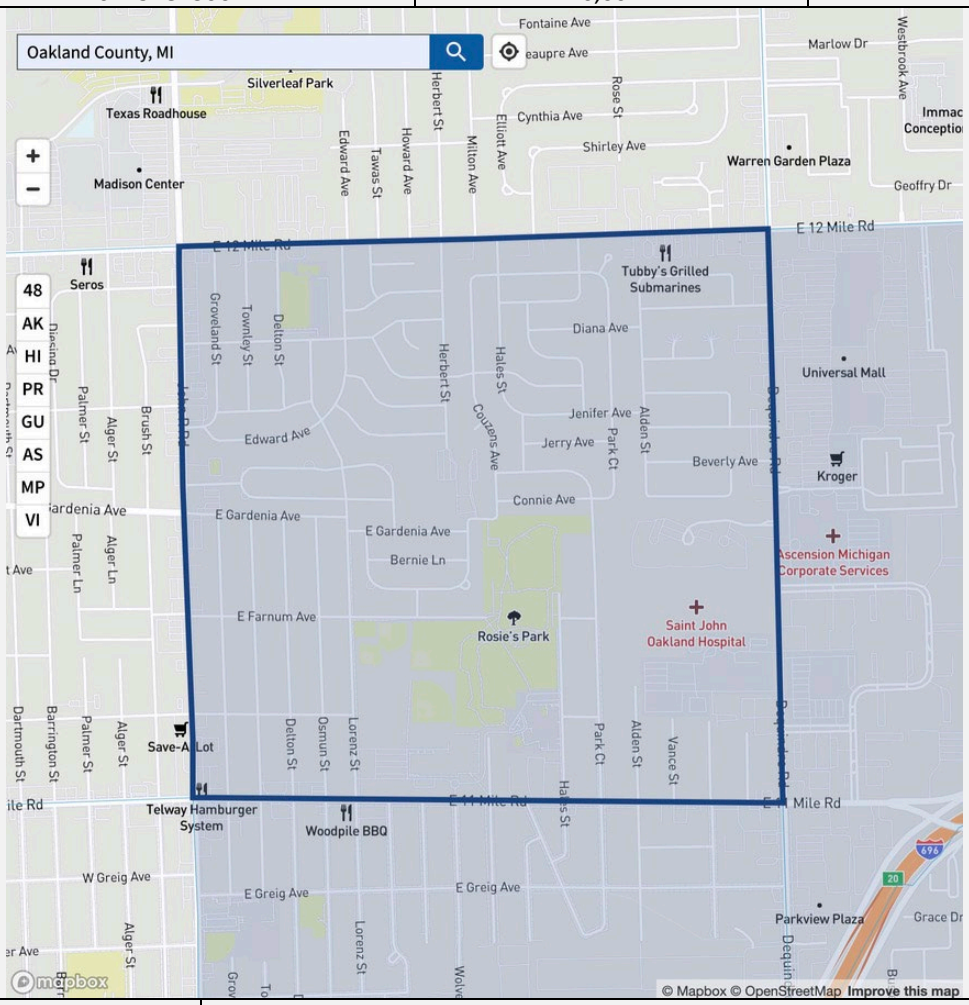


BURDEN	DESCRIPTION AND REPORTED DATA
Climate Change	*Projected risk to properties from projected floods, from tides, rain, riverine and storm surges within 30 years (92nd)*
Housing	*Share of households making less than 80% of the area median family income and spending more than 30% of income on housing (91st), Lack of Green Space (94th)*
Legacy Pollution	*Count of hazardous waste facilities within 5 kilometers (93rd)*
Transportation	*Count of vehicles at major roads within 500 meters (96th)*
Waste & Wastewater	*Underground storage tanks and releases (94th)*
Workforce Development	*Linguistic Isolation - Share of households where no one over age 14 speaks English very well (95th), Less Than High School Education (22%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-141. Oakland County Census Tract 26125181300

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125181300	6,002	TRUE

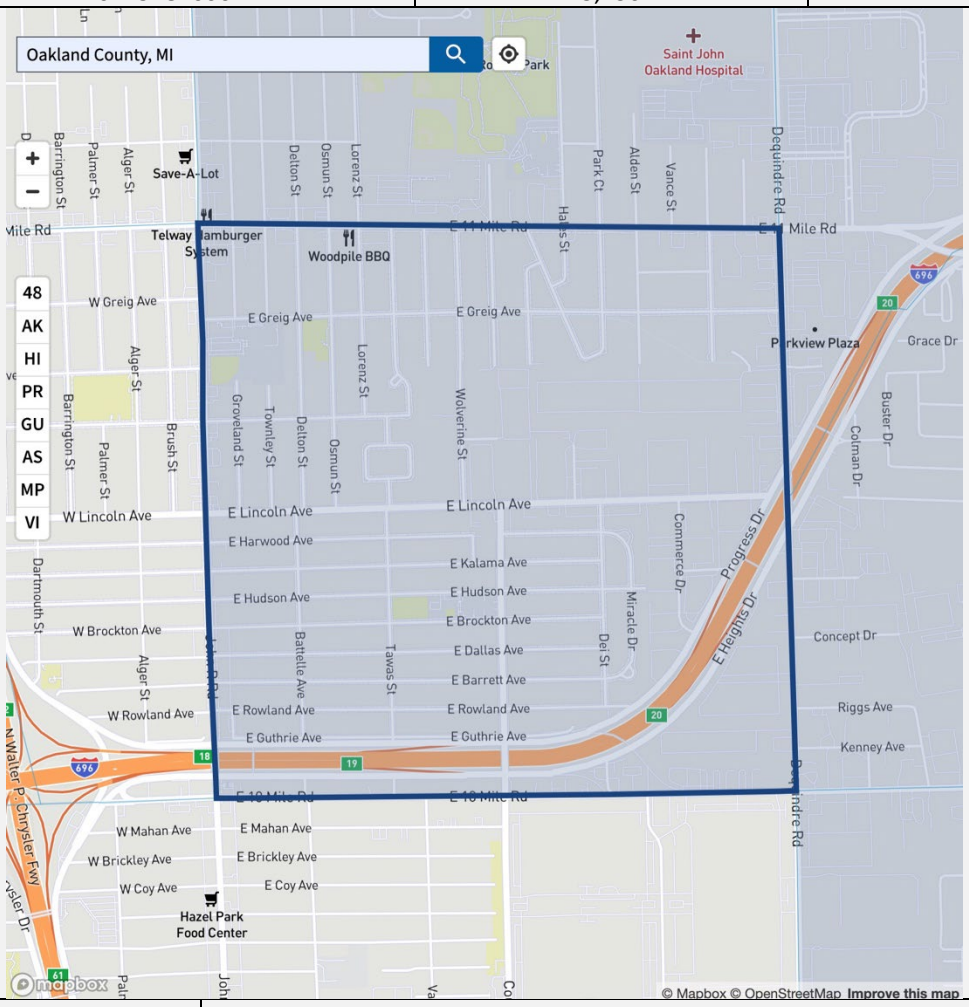


BURDEN	DESCRIPTION AND REPORTED DATA
Waste & Wastewater	*Underground storage tanks and releases (90th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-142. Oakland County Census Tract 26125181600

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125181600	5,236	TRUE

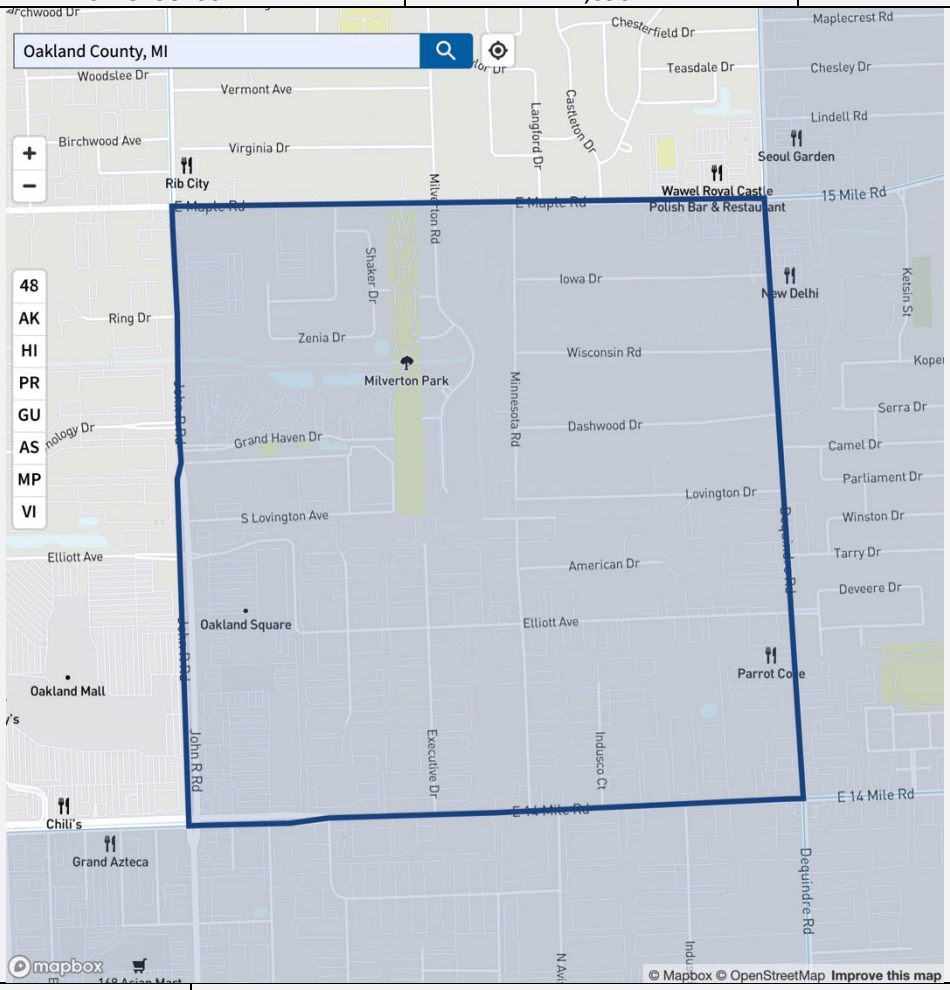


BURDEN	DESCRIPTION AND REPORTED DATA
Housing	*Historic underinvestment - Census tracts with historically high barriers to accessing home loans*
Transportation	*Count of vehicles at major roads within 500 meters (94th)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Figure F-143. Oakland County Census Tract 26125198100

OAKLAND COUNTY, MICHIGAN		
CLIMATE & ECONOMIC JUSTICE SCREENING TOOL - DISADVANTAGED CENSUS TRACT		
CENSUS TRACT 2010 ID	**CENSUS TRACT POPULATION**	**LOW INCOME TRACT?**
26125198100	2,696	FALSE



BURDEN	DESCRIPTION AND REPORTED DATA
Workforce Development	*Linguistic Isolation - Share of households where no one over age 14 speaks English very well (93rd), Low Median Income (92%)*

Source: U.S. Council on Environmental Quality – Climate & Economic Justice Screening Tool (2023)

Appendix G: Mitigation Action/Project Examples

Mitigation Action/Project Examples

***Instructions**: Please adapt the following examples to the mitigation needs of your jurisdiction and/or organization. These are only **examples**, and do not represent an all-inclusive list of potential actions.*

Some of the hazards listed below may not apply to your jurisdiction.

Mitigation planning is best accomplished from a multi-hazard perspective. Reducing the level of risk involving one natural or technological hazard may increase the risk of damage from another hazard. Consequently, it is important to consider that some mitigation alternatives may not be viable given a particular set of hazard conditions. For example, elevating a home on stilts to allow for water flow in a floodplain can be a good thing, but it becomes a problem if the home is in an earthquake zone and the ground starts shaking.

ALL HAZARDS

MOUs and Agreements

Local governments should establish mutual aid agreements for utility and communications systems, including 9-1-1. Mutual aid or interagency agreements have value for preventing or responding to other hazard or emergency situations, as fire and police departments often do.

- Establish Mutual-Aid Memorandum of Understandings (MOUs) and agreements with key organizations [List the Organization]

Planning and Preparedness

- Once a community is familiar with the location of its hazardous areas; it may adopt a land use plan, or modify an existing land use plan to:
  - Encourage greater development restrictions on the property.
  - Guide developments away from hazardous areas
  - Reduce density in the hazardous area
- **Real estate disclosure**: Real estate disclosure laws are important because they force a seller to advise a potential buyer about pre-existing conditions. This allows buyers to make more informed decisions about the potential risks involved in owning property, such as whether a property is located in a floodplain or if it had been previously damaged from flood water or any other type of hazard condition.
- Coordinate conservation, preservation, and mitigation actions with County/municipal Planning and Economic Development departments to ensure integration of programs across all communities

Warning, Public Information and Education

- **Family Disaster Plans and Supply Kits**: Communities can encourage residents to prepare themselves by stocking up with necessary items and planning for how family members should respond if any of a number of possible emergency or disaster events strike.
- Enhance awareness and preparedness of residents through the Community Emergency Response Team (CERT) and Medical Reserve Corps (MRC) programs and facilitate community training requests for emergency preparedness education
- Continue to enhance emergency preparedness information available to citizens and visitors through the county/municipality website and community outreach opportunities
- Make available "new resident" packets to inform residents of potential hazards and threats, and to inform them of warning and outreach tools that are available in the county/municipality.
- Develop a multi-faceted public awareness campaign to increase citizen enrollment in the jurisdiction's Emergency Notification System.
- Install electronic warning signage and permanent road closure barriers on key roads [List Road]
- Develop season-specific fliers or newsletters to address hazards and ways each resident (or part-time residents) can mitigate their own risks and mail to residents with their water/utility bill.
- Update [insert community] Website with Emergency Information or provide links to the County emergency management website
- Communities can encourage the use of National Oceanic and Atmospheric Administration (NOAA) weather radios among their residents. NOAA Weather Radio continuously broadcasts National Weather Service forecasts, warnings and other crucial weather information. NOAA Weather Radio also provides direct warnings to the public for natural, man-made, or technological hazards, and it is the primary trigger for activating our country's Emergency Alert System (EAS) on commercial radio, television, and cable systems.
- Work with emergency management to ensure adequate warning siren coverage and address any known gaps

NATURAL HAZARDS

Drought

- Support state and local tax credits for the installation of water-conserving plumbing and other devices as retrofits.
- Develop water conservation plans, preferably on a watershed basis, that includes emergency conservation measures or directives and the triggers for implementation of each measure or directive.

Extreme Heat/Cold

- Ensure that local plans are in place to manage extreme heat/cold events, especially should power outages accompany the extreme temperature event.
- Ensure that local communities have adequate shelter facilities with properly trained coordinators and/or managers that can address the needs of at-risk populations such as the elderly, the homeless, the disabled and families.
- Identify warming and/cooling facilities for at-risk populations
- Ensure that local communities have an adequate monitoring system for housebound at-risk populations.
- Bury water/sewer lines deeper under the streets to prevent frozen main lines
- Install SCADA monitoring on City Water and Sewer Systems

Winter Storms/Heavy Snow

- Ensure local plans include preparation for and management of the response to winter storm events and especially long-term disruption of power supplies and transportation infrastructure.
- To the extent practical, utilities should be designed and built to resist damage and loss of service during winter storm events, such as placing line underground where appropriate.
- Improve the traffic control on rural roads that are subject to snow drifting and white-out driving conditions.
- **Family and Traveler Emergency Preparedness**: A local or state government can produce and distribute family and traveler emergency preparedness information relating to severe winter weather hazards.
- **Driver Safety**: Safety strategies for severe weather events can be included in driver education classes and materials.
- **Animal Protection**: Farmers and other animal custodians should plan for addressing livestock or other animal needs.
- **Snow Fences**: Using snow fences or "living snow fences" (rows of trees or other vegetation) can limit blowing and drifting of snow over critical roadway segments.

Tornado, Straight-line Winds, Hail, Lightning and Severe Thunderstorms

- Identify hazard notification systems that are device-neutral or do not require a personal device to receive warnings.

- Obtain increased funding (or continued funding) for stand-alone safe rooms, safe rooms linked to schools and community facilities, and community shelters to prevent the future loss of life.
- Require manufactured homes to use tie-downs with anchors [If applicable]
- Establish severe weather protective areas within county/municipality parks and open space.
- Develop a sign retrofitting or new sign program to decrease their vulnerability to wind hazards.
- **Surge Protectors and Lightning Protection**: Surge protection can be installed on critical electronic equipment. Lightning protection devices and methods, such as lightning rods and grounding, can be installed on a community's communications infrastructure and other critical facilities.
- **Construction Standards and Techniques**: To strengthen public and private structures against severe wind damage, communities can require or encourage wind engineering measures and construction techniques that may include structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced pedestrian and garage doors, window shutters, waterproof adhesive sealing strips, or interlocking roof shingles. Also, architectural design can make roofs less susceptible to uplift.
- **Temporary Debris Disposal**: Temporary debris disposal sites can be protected by fencing and/or located away from populated areas.
- **Tree Management**: Tree pruning near power lines can reduce the potential for trees falling on and breaking power lines.

Flooding and Dam Failure

Ninety percent of federal disaster declarations are for flood events. Response and recovery costs can be extremely high, so where risks are apparent it makes sense to take actions that prevent damage from occurring. If flood damage cannot be fully prevented, there may be mitigation techniques that lessen the damage. Flooding addressed in this section can be from high ground water, overland flooding from rivers or streams, or from a dam failure.

- Support the update of out-of-date flood insurance maps.
- Support federal action to develop and disseminate maps that show flood hazards under future conditions such as increased impervious area upstream and potential effects of climate change. To the extent practicable, maps should predict the extent of flooding at least 50 years into the future.
- Consider additional stream gauges, especially in communities with repetitive flood events or repetitive (flood) loss structures.
- Relocate, elevate, and/or floodproof flood-prone property – especially those properties identified as historically or culturally significant to the community.
- Maintain dry-access roads by elevating them above the base flood elevation [if applicable]
- Roads are needed to get people and goods from place to place. In addition to planning for traffic control during floods, there are various construction and placement factors to consider when building roads. To maintain dry access, roads should be elevated above the base flood elevation. However, if a road creates a barrier it can cause water to pond. Where ponding is problematic, drainage and flow may be addressed by making changes to culvert size and placement. In situations where flood waters tend to wash roads out,

construction, reconstruction, or repair can include not only attention to drainage but also stabilization or armoring of vulnerable shoulders or embankments.

- Develop an integrated strategic flood warning plan that addresses the repair, repositioning, or upgrade of existing flood warning systems.
- Conduct channel stabilization, improvement, and restoration in [insert] to allow greater drainage and water flow capacity.
- Provide a public education program to inform residents about mitigation measures and means for them to protect themselves and their property during a flood.
- Land with structures may be purchased by and titled in the name of a local governing body that can remove structures and enforce permanent restrictions on development.
- Enhancement and expansion of greenspace
- **Zoning Ordinance Adoption or Amendments**: Examples of zoning methods that affect flood hazard mitigation include: 1) adopting ordinances that limit development in the floodplain; 2) limiting the density of developments in the floodplain; and 3) requiring that floodplains be kept as open space.
- **Subdivision Ordinances or Amendments**: Subdivision design standards can require elevation data collection during the platting process. Lots may be required to have buildable space above the base flood elevation.
- **Building Code Adoption or Amendments**: Requirements for building design standards and enforcement include the following possibilities: 1) that a residential structure be elevated; and 2) that a non-residential structure be elevated or floodproofed.
- **Conservation Easements**: Conservation easements may be used to protect environmentally significant portions of parcels from development. They do not restrict all use of the land. Rather, they direct development to areas of land that are not environmentally significant.
- **Purchase of Easement/Development Rights**: Compensating an owner for partial rights, such as easement or development rights, can prevent a property from being developed contrary to a community's plan to maintain open space. This may apply to undeveloped land generally or to farmland in particular.
- **Stormwater Management Ordinances or Amendments**: Stormwater ordinances may regulate development in upland areas in order to reduce stormwater run-off. Examples of erosion control techniques that may be employed within a watershed area include proper bank stabilization with sloping or grading techniques, planting vegetation on slopes, terracing hillsides, or installing riprap boulders or geotextile fabric.
- **Storm Drainage Systems**: Flood mitigation can involve installing, re-routing, or increasing the capacity of a storm drainage system that may involve detention and retention ponds, drainage easements, or creeks and streams. It can include separation of storm and sanitary sewerage systems as well as higher engineering standards for drain and sewer capacity.
- **Drainage System Maintenance**: At most times, a drainage system will do its job and move water to intended areas. However, if a system is not maintained, erosion, material dumping, or deterioration of man-made reinforcement materials may reduce the carrying capacity of a stream. Therefore, regular maintenance, such as sediment and debris clearance, is needed so that the stream may carry out its design function. Also important is detection and prevention/discouragement of discharges into storm-water/sewer systems from home footing drains, downspouts or sump pumps.

- **Multi-Jurisdiction Cooperation Within Watershed**: Forming a regional watershed council helps bring together resources for comprehensive analysis, planning, decision-making, and cooperation.
- **Post-Disaster Recovery Ordinance**: A post-disaster recovery ordinance regulates repair activity, generally depending on property location. It prepares a community to respond to a disaster event in an orderly fashion by requiring citizens to: 1) obtain permits for repairs, 2) refrain from making repairs, or 3) make repairs using standard methods.
- **Hazardous and Buoyant Material Protection**: Containers of hazardous materials such as petroleum or chemicals should not be located in a flood hazard area. If such a location is necessary, hazardous material containers need to be anchored, because the contents can contaminate water and multiply the damaging effects of flooding by causing fires or explosions, or by otherwise making structures unusable. Also, buoyant materials should be anchored, because if they float downstream, they may cause additional damage to buildings or bridges or may plug a stream resulting in higher flood heights.
- **Manufactured Homes**: Manufactured or mobile homes should be elevated above the base flood elevation and anchored, or more preferably, kept out of the floodplain.
- **Back-up Generators**: A community may consider back-up generators for pumping and lift stations in sanitary sewer systems, along with other measures (e.g., alarms, meters, remote controls, and switchgear upgrades).
- **Basement Backflow Prevention**: Depending on its infrastructure capabilities, a community may encourage the use of check valves, sump pumps, and backflow prevention devices in homes and buildings.

Earthquakes

- Local mapping of fault zones and liquefaction areas as a part of larger all-hazards mapping efforts.
- Local retrofit programs that use best engineering standards for structures located in seismic zones.
- Recognize the potential of earthquake-induced landslides in land-use and development plans.
- Require that local plans and codes in seismically-active areas include identification of fault zones, fault setbacks and seismic construction standards that are specific to the seismic risks faced (e.g. liquefaction vs. bedrock movement.)
- Seek grant funding and tax incentives to encourage the appropriate buy-out or retrofit of unprotected structures in seismically-active areas.
- Improve the structural integrity of essential facilities [Identify the facility]
- **School Survey Procedures**: Schools are critical facilities not only because of the special population they accommodate, but also because they are often identified as shelter sites for a community. Due to this sheltering role, it is essential that these buildings function after a seismic event. A community can develop a survey procedure and guidance document to inventory structural and non-structural hazards in and near school buildings. Survey results can be used to determine mitigation priorities that can be incorporated into capital improvement plans.
- **Buildings as Structural Hazards**: Homeowners and businesses can take simple measures to strengthen their buildings before the next earthquake. Bracing walls and bolting sill plates to the foundation are examples. Non-reinforced masonry buildings and

non-ductile concrete facilities are particularly vulnerable to ground shaking. These buildings should be strengthened and retrofitted against future seismic events.

- **Non-Structural Hazards**: Many injuries in earthquakes are caused by nonstructural hazards, such as attachments to buildings. These include lighting fixtures, windows (glass), pictures, tall bookcases, computers, ornamental decorations on the outside of the buildings (like parapets), gas lines, etc. Activities that can reduce the risk of injury and damage include: anchoring tall bookcases and file cabinets, installing latches on drawers and cabinet doors, restraining desktop computers and appliances, using flexible connections on gas and water lines, mounting framed pictures and mirrors securely, and anchoring and bracing propane tanks and gas cylinders.
- **Bridge Strengthening**: State and local highway departments should review construction plans for all bridges to determine their susceptibility to collapse. Problem bridges should be retrofitted.

Landslide/Avalanches

- Local mapping of landslide prone areas.
- Develop building codes for landslide prone areas, including for public and private infrastructure and building foundations.
- Support policies that protect steep slopes, preferably through natural means such as tree planting and conservation.
- **Grading Ordinances**: Grading ordinances require developers and landowners to obtain permits prior to filling or regrading. Such ordinances may also provide specific design standards.
- **Hillside Development Ordinances**: Hillside development ordinances are special purpose ordinances that set specific standards for construction on hillsides.
- **Restraining Structures**: Restraining structures may be designed and used to hold soil in place.
- **Vegetation Placement and Management Plans**: Various types of vegetation increase soil stability through root length and strength and by absorbing precipitation. Management plans are aimed at ensuring long-term maintenance of vegetation appropriate for an area.

Wildfires

- Continue to develop and require standards for homes and other structures in the wildland-urban interface—that emphasizes fire-safe construction.
- Recognize the importance and value of vegetation management ("defensible space") in the wildland-urban interface in rural and urbanizing areas and encourage the development of incentives for creating and maintaining defensible spaces around at-risk structures, such as using the Firewise Communities program.
- Require that planning include multiple and adequate ingress and egress routes to vulnerable areas.
- Increase the number of Fire Wise Communities in the county/municipality.
- Conduct forest mitigation procedures to reduce the amount of fuel loading especially in areas that have a high residential population.
- Improve rural roads to ensure that emergency vehicles can provide a quick response to keep Wildland Fires small.

- Roads and driveways should be kept accessible to emergency vehicles and fire equipment. Driveways should be relatively straight and flat, with at least some open spaces to turn. Bridges should be strong enough to support emergency vehicles, with clearance wide and high enough for two-way traffic and emergency vehicle access. Addresses should be visible from the road, and keys to gates around property should be provided to the local fire department.
- **Spotters**: Early detection of wildfires, while fires are smaller, can help make fire fighting more successful. Detection can be accomplished by fire spotters who work from either towers or planes.
- Establish a large scale evacuation plan of the wildland urban interface (WUI) including a mass sheltering plan for such an incident.
- Provide for public education forums to teach residents how to build "eye-pleasing" defensible space into their property.
- Conduct an analysis identifying areas in the county/municipality that may benefit from the installation of cisterns or hydrants to provide water delivery during firefighting operations.

MANMADE HAZARDS

Structural Fire

- Promote fire safety training and education
- Continue to conduct fire inspections
- **Fireplace and Chimney Maintenance**: Residents should be encouraged to inspect chimneys at least twice a year and clean them at least once a year. Safe fireplace/chimney use and maintenance includes spark arrestors and emphasis on proper storage of flammable items.
- **Smoke/Fire Detectors and Sprinklers**: Citizens can install and maintain smoke detectors and fire extinguishers on each floor of their homes or other buildings. This equipment should be tested and/or inspected regularly, and smoke detector batteries should be changed twice a year. Everyone in a household or building can be taught how to use a fire extinguisher. Other valuable fire mitigation systems include interior and exterior sprinkler systems.

Power Failure

Public utilities are critical infrastructure for any community. The potential for failure needs to be reviewed, and inadequacies need to be addressed.

- **Obtain Generators for Critical Infrastructure**
- A community may consider burying electric and telephone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards. Ideas may include:
  - Replacing poles with a better material (for example wood poles replaced with spun concrete)
  - Pad mounted transformers - elevated above BFE, or lowering and burying them in non-flood, high wind areas
  - Using multiples poles to support transformers
- **System Redundancies**: One place where redundancies are recommended is in utility and communications systems, especially lifeline systems, e.g., essential public utilities. The intention is that if one system fails, the other shadow system can take over.

- **Lightning Protection**: Electrical and communications systems should be protected from lightning strikes.
- **Tree Trimming**: Tree trimming and maintenance is important for preventing limb breakage and for safeguarding nearby utility lines. A model measure would be to establish a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public right-of-ways.
- **Digging Hotlines**: Most, if not all, states have a utility damage prevention hotline that people can call before digging.
- **Vulnerable Populations**: Communities can develop programs/networks for contacting and assisting elderly or homebound persons during periods of infrastructure failure.

HAZMAT

- Conduct a hazardous materials flow study for high volume road and rail ways within the county/municipality.
- Increase the number of personnel trained as HAZMAT technicians and specialists to elevate the county/municipality's response capability.
- **Public Awareness and Worker Education**: The Emergency Planning and Community Right-to-Know Act (EPCRA), also known as SARA Title III, provides an infrastructure at the state and local levels to plan for chemical emergencies. Facilities that store, use, or release certain chemicals may be subject to reporting requirements. Reported information is publicly available so that interested parties may become informed about potentially dangerous chemicals in their community. Employers must also communicate the hazards of workplace chemicals and ensure that workers receive education and training.
- **Industrial Site Buffering**: Hazardous material exposure can be prevented or reduced by separation and buffering between industrial areas and other land uses. Industrial areas should be located away from schools, nursing homes, hospitals, and other facilities with large or vulnerable populations.

Riot/Civil Disobedience

- Expand first responder preparedness, training, and planning for civil disobedience.
- Building Materials: Public buildings and critical facilities can be constructed or retrofitted using laminated glass, metal shutters, structural bracing, and other hazard-resistant, durable construction techniques.

Terrorism

- Expand first responder preparedness, training, and planning for terrorist attacks.

Active Shooter

- Reduce the ability of unauthorized persons to access schools and cause a severe act of violence in schools.
- Install access control and monitoring capabilities in schools.
- Improve the ability to locate school buses and provide for a quick response for emergencies.
- Install GPS trackers in school buses.

- Provide education programs for bus drivers to improve their ability to act and react during emergencies.
- Ensure that each school has emergency procedures and plans in place for severe acts of violence.
- Ensure that school plans are coordinated with local police and Sheriff's Office to ensure that the plan is supportable by local law enforcement units
- Ensure that school personnel are trained in how to respond to acts of violence in their school.
- Ensure that schools have equipment and supplies on hand to support procedures in case of an act of violence.
- Implement a school violence intervention program and a preparedness and prevention program.

Cybersecurity

- Every person and institution with computers that interface with other computers should consistently use computer data back-up systems and anti-virus software.
- Training for Public IT Employees
- Cybersecurity Devices/Services for Public IT Facilities
- Create county/city cybersecurity response plan/procedures
- Cybersecurity training for all public employees

Transportation Incident

Ground, air, and water transportation issues can pose risks to transportation users and to the general public.

- **Driver Education**: The risk of transportation accidents can be reduced through improvements in driver education, traffic law enforcement, and transportation planning that balances needs of public transportation conveyers with safety of the general public. Commercial operators also need training and skill enhancement programs.
- **Road Design**: Improved design, routing, and traffic control at problem roadway areas can reduce risk of transportation accidents. Designated truck routes, as well as enforcement of weight and truck travel restrictions, can help. In long-term planning, communities can consider establishing more connector roads to reduce congestion on arterial roads.
- **Mass Casualty Preparation**: It is important to consider training, planning, and preparedness for mass-casualty incidents involving all modes of transportation.
- Mass casualty equipment and supplies
- Increase signage and warnings

BIOLOGICAL HAZARDS

Disease/Pandemic

- Support the development of interdisciplinary teams of public health experts, physicians, scientists, media, and communications professionals to help build local capacity to

recognize and manage critical public health and safety issues, including disease/pandemic outbreaks in the immediate aftermath of detection before state and federal resources can be mobilized.

- Ensure local plans exist for managing pandemics and the associated increase in fatalities from pandemic.
- Enhance awareness and preparedness of residents through a public education program.
- Provide for education of First Responders to minimize the effects of disease on them and their families
- Provide education to first responders to minimize the effects of disease on response capability.
- Immunization against communicable diseases can be encouraged among residents of a community.
- The spread of communicable diseases can be thwarted by compartmentalizing ventilation systems in areas/facilities prone to crowding, or areas that may involve exposure to contagions or noxious atmospheres.

OAKLAND
COUNTY MICHIGAN

Volume II:
Participating Jurisdiction Annexes

MULTI-JURISDICTIONAL
HAZARD MITIGATION PLAN

2023

OAKLAND COUNTY MICHIGAN
All ways,
MOVING FORWARD

Table of Contents

Mitigation Strategies and Actions

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In this section, mitigation actions/projects were updated/amended, identified, evaluated, and prioritized.

The Mitigation Actions and Projects from the County and Municipalities are included in the following Volumes:

Volume II (This document):

- County Mitigation Actions (County Departments and Mitigation Actions that Apply to the County and All Participating Municipalities)
- Municipal Mitigation Actions (Cities, Townships, and Villages)

Each entities' Mitigation Actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed Mitigation Actions** - Completed actions since 2005

The Action Plan for each mitigation project is presented in a table format. The table is designed to capture important details intended to support the implementation of the project. It is also designed to facilitate and encourage the annual review and maintenance of each mitigation action by allowing the Lead Agency/Organization to document the yearly status of the project prior to and/or during the Annual Steering Committee meeting.

Table: Action Plan

Mitigation Action:	
Year Initiated	
Applicable Jurisdiction	
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	

Hazard(s) Mitigated	
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Mitigation Strategy/Action Timeline Parameters
While the preference is to provide definitive project completion dates, this is not possible for every mitigation strategy/action. Therefore, the parameters for the timeline (Projected Completion Date) are as follows:

- **Short-term**—To be completed in 1 to 5 years
- **Long-term**—To be completed in greater than 5 years
- **Ongoing**—Currently being implemented under existing programs but without a definite completion date

Mitigation Strategy/Action Benefit Analysis Parameters
Benefit ratings are defined as follows:

- **High**—Project will provide an immediate reduction of risk exposure for life and property.
- **Medium**—Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low**—Long-term benefits of the project are difficult to quantify in the short term.

Mitigation Strategy/Action Estimated Cost Parameters
While the preference is to provide definitive costs (dollar figures) for each mitigation strategy/action, this is not possible for every mitigation strategy/action. Therefore, the estimated costs for the mitigation initiatives identified in this plan are identified as high, medium, or low, using the following ranges:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (e.g., bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget or with staff time. The project is part of or can be part of an ongoing existing program.

Mitigation Strategy/Action Prioritization Process and Priority & Level of Importance
The action plan must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs (44 CFR, Section 201.6(c)(3)(iii)). The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) grant program. A less formal approach was

used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was conducted. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

The priorities are defined as follows:

- **High**—A project that addressed numerous goals or hazards, has benefits that exceed cost, has funding secured or is an ongoing project, and/or meets eligibility requirements for the HMGP or BRIC grant program. High priority projects can typically be completed in the short term (1 to 5 years).
- **Medium**—A project that addressed multiple goals and hazards, that has benefits that exceed costs, and for which funding has not been secured but that is grant eligible under HMGP, BRIC, or other grant programs. The project can be completed in the short term once funding is secured. Medium priority projects will become high priority projects once funding is secured.
- **Low**—A project that will address few or no goals, mitigate the risk of one or few hazards, has benefits that do not exceed the costs or are difficult to quantify, for which funding has not been secured, that is not eligible for HMGP or BRIC grant funding, and for which the timeline for completion is long term (1 to 10 years). Low priority projects may be eligible for other sources of grant funding from other programs.

For many of the strategies identified in this action plan, the partners may seek financial assistance under the BRIC, HMGP or other HMA programs, all of which may require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, the partners reserve the right to define "benefits" according to parameters that meet the goals of this plan.

To further support the prioritization process, all new mitigation actions were required to undergo the STAPLEE assessment, which includes seven criteria for evaluating a mitigation action: Social, Technical, Administrative, Political, Legal, Economic, and Environmental. The STAPLEE method provides a systematic approach that considers the opportunities and constraints of implementing a particular mitigation action. Each criterion is ranked from 1 (strongly disagree) to 5 (strongly agree) and calculated by adding together all seven criteria. The STAPLEE scoring worksheet is provided below.

The STAPLEE score and past feasibility analyses for past mitigation projects informed the **Priority and Level of Importance** score for each mitigation project.

1. Oakland County

Community Profile and Description

Oakland County's community profile and description is presented in Volume I: Community Profile.

Hazards

Oakland County's hazards are profiled in Volume I: Hazard Profile & Risk Assessment.

Mitigation Strategies and Actions

The Mitigation Actions and Projects from the County are included in this section:

- County Mitigation Actions (County Departments and Mitigation Actions that Apply to the County and All Participating Municipalities)

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed Mitigation Actions** - Completed actions since 2005

New Mitigation Actions

Oakland County EOC Saferoom and Secondary Power	
Year Initiated	2023
Applicable Jurisdiction	Oakland County, Waterford Township
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$40,000,000
Potential Funding Source	BRIC Project Funding, Local Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2027
Actual Completion Date	N/A

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Oakland County has completed the planning phase of constructing a new, state-of-the-art, Emergency Operations Center (EOC). The EOC will also house the county's 911 dispatch center, and a public meeting space. BRIC project funding would be utilized to enhance and harden the structural integrity of the designed EOC to withstand severe weather conditions, including tornadoes and high wind events. Integration of secondary power sources to ensure continuity of operations for the new construction is also part of the proposed BRIC project. Facilities such as this are complex and technologically sophisticated, and more importantly designed and engineered to withstand high wind velocities resistant to airborne debris.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Plan, Design and Implement Green Infrastructure Projects in the County	
Year Initiated	2023
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Clinton River Watershed Council, Oakland County Community Development
Supporting Agencies/ Organizations	other watersheds: Huron River Council, Friends of the Rouge
Applicable Goal(s)	2, 3, 4, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Increased resilience
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Clinton River Watershed Council works with government partners on resilience and green infrastructure projects - from planning to design and implementations from large scale to small scale.
2023 Plan Update Status and Changes in Priority	New project

Ongoing Mitigation Actions

Install additional outdoor warning sirens	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security and individual municipalities
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Cost for sirens and installation, staff time and repair and maintenance. The anticipated level of expenditures would include 3 sirens per year from Oakland County funding and an additional 2 grant-funded sirens per year.
Potential Funding Source	County and municipal general funds, public/private partnerships, BRIC, HMGP
Benefits (Loss Avoided)	Saving lives, protecting property and enhancing public education regarding what early weather warning systems are available and the actions to take. Full County siren coverage could save lives by providing early warning in areas not currently served.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period. It is anticipated that up to 25 sirens would be installed throughout the 5-year Plan period. A total of 35 new sirens are required for complete coverage across Oakland County.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil

	Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Install additional outdoor warning sirens in the community and enhance and maintain early weather warning/alert systems and networks. The Oakland County Emergency Management and Homeland Security will continue to study population densities and identify locations for new sirens, meet with community representatives to obtain buy-in and funding commitments and request Oakland County Board of Commissioner's approval for County cost-share. Initiatives Needed: The County will continue to maintain and improve proactive public information programs to instruct the public regarding the proper response to emergency situations, including how and where to get information (e.g. Early Weather Warning System [sirens], Emergency Alert Notification System, NOAA, Emergency Alert System). The County will also continue to review adjacent county operating guidelines to improve coordination for activating early weather warning systems when an adjoining county (or community) has an incident that could impact Oakland County, study demographic shifts to assure warning system coverage and install devices as needed. The County will continue ongoing communication with municipalities to assess needs, identify funding sources and develop programs to promote citizen involvement and awareness for severe weather and other hazard preparedness.
2023 Plan Update Status and Changes in Priority	Ongoing

Provide hazmat and other emergency training and equipment	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	City, Township, and Village first responders and Oakland County Emergency Management & Homeland Security
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Staff time, printing and postage costs, mileage for meetings, cost for contractors and instructors, backfill and overtime for students and purchase of training materials and supplies.
Potential Funding Source	County and municipal general funds, HSGP
Benefits (Loss Avoided)	Protection of lives and the environment through enhanced response capabilities. All responders will have the same basic knowledge of the Incident Command System and how to work within this system to assure a smooth operation.
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide additional hazmat and other emergency training and equipment to first responders (including, but not limited to, fire, police, and civilian responders). Specific tasks include: conducting a survey to assess current training programs, identifying training needs, developing a plan of action, providing training (either internal or through other venues) informing local leaders and interested parties, and publicizing available training programs. Additional tasks include: identifying emergency messages needed and the method(s) required to deliver them to the public, identifying National Incident Management System (NIMS) and ICS requirements, and providing these as needed. Initiatives Needed: The Oakland County Emergency Management and Homeland Security should continue facilitating hazmat and hazard/emergency response training programs for uniformed personnel. Training will include Incident Command System (ICS) procedures, hazmat response, and other emergency procedures/information required in disaster events. The Oakland County Emergency Management and Homeland Security will continue to assess current training programs, identify additional training needs, establish a steering committee(s) to oversee implementation and develop a charter (giving approval and support, announcement, the definition of work, and project activities).
2023 Plan Update Status and Changes in Priority	Ongoing

Acquire redundant power sources for backup power at critical facilities	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security and municipalities
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	Staff time for educating public and municipal officials, printing, engineering/consultant fees, and redundant power source installation costs.
Potential Funding Source	County and municipal general funds, BRIC, HMGP
Benefits (Loss Avoided)	Provision of key services/operation of critical facilities during emergencies.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Tornadoes, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Encourage municipalities, businesses and citizens to acquire redundant power sources for backup power at critical facilities in the event of power failures, and to ensure readiness at critical facilities by encouraging facilities to perform regular maintenance and equipment checks, and pre- plan for fuel needs. The Oakland County Emergency Management and Homeland Security and LEPC should assist with prioritizing critical infrastructures, identifying and educating individuals regarding the need for alternate fuel and redundant power, identifying engineering changes required, identifying costs and acquiring internal/outside funding. Initiatives Needed: The Oakland County Emergency Management and Homeland Security will continue to research alternate methods of providing redundant power sources; educating the public and municipal officials regarding the need and availability of redundant power sources; seek alternate or supplemental funding for generators and/or solar power, hydroelectric and fuel cell power sources and allocate supplemental funding for installation and maintenance. Collectively, County and community officials will continue to identify specific, critical facilities and assess capabilities for redundant power, identify needed corrective actions and identify training needs.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing throughout 5-year Plan period. 2023 Update: Ongoing

Implement rapid damage assessment	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Staff time, printing costs, paging system, supplies, and training costs.
Potential Funding Source	County and municipal general funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduce the amount of time to efficiently and effectively deploy trained teams to assess damaged areas after an event has occurred improve allocation of response resources and provide the information necessary for Public Act 390 Disaster Declarations.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Survey local entities for organized groups of people with assessment experience, identify and train groups, equip with supplies, develop a notification method and develop an MOU with these organizations. Initiatives Needed: Continue to organize additional groups to conduct work, develop policy on response and develop a uniform method for reporting.

2023 Plan Update Status and Changes in Priority	Ongoing

Encourage residents to receive immunizations against communicable diseases	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Health Division
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Staff time and equipment, print and mailing costs, training costs, and the cost of vaccines and immunizations.
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Protect citizens in Oakland County against vaccine preventable disease. Anticipated Funding Source(s): County general fund and state and federal grants. Schedule: Ongoing throughout 5-year Plan period.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Public Health Emergencies: Pandemic/Epidemic
Action/Implementation Plan and Project Description, if applicable	Continue to implement Oakland County Health Division (OCHD) mass immunization and media campaign emergency preparedness plans, provide health care providers hazard MCIR training, provide vaccine training and resources to health care providers, and send out recall/reminder letters to residents, if needed. Initiatives Needed: Continue to provide mass immunization outreach clinics geographically placed throughout the County, continue to provide media coverage to educate the public regarding immunizations, enhance communication with health care providers, use the Michigan Care Improvement Registry (MCIR) to record and evaluate immunization records for all people regardless of age, use the MCIR to generate reminder/recall letters for those who need or will need immunizations and coordinate the receiving and distribution of vaccines to health care providers.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Over the past 5 years we have been working to communicate with the public about the importance of vaccinating against communicable diseases. Will continue to push the message to the community.

	2023 Update: This is an ongoing initiative, especially in the post-COVID-19 era.

Obtain communication boosters for deficient areas of the OakWin Radio System **Note:** *Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county. Implementation is almost complete.*	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Law Enforcement, Fire, Dispatch
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Cost for installation, repair and maintenance and printing and postage costs for public awareness material. Initial cost estimates - $2 million to $3 million.
Potential Funding Source	Oakland County Radio Fund
Benefits (Loss Avoided)	Provide improved OakWin Radio System coverage within Oakland County.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Obtain permission and install 2 towers and 10 cell sites in local jurisdictions. Initiatives Needed: Determine additional towers and cell site locations to provide maximum coverage.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved

	communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county.

Increase public awareness for disease outbreaks	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Health Division
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 5
Estimated Cost & Analysis (Low, Medium, High)	Staff time for review, development and training and technology.
Potential Funding Source	County general funds, Public Health grants/funds
Benefits (Loss Avoided)	Improve readiness to respond to an emergency and effectively disseminate updated, accurate information and improve efficiency and penetration of information into the community.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Terrorism/ Weapons of Mass Destruction, Public Health Emergencies: Pandemic/Epidemic
Action/Implementation Plan and Project Description, if applicable	Increase public awareness of the causes, symptoms and protective actions for disease outbreaks and other potential public health emergencies. Identify gaps in the CERC plan in addressing specific public health emergencies and in reaching special populations; identify and address training needs for media communications, information development and design and disseminating information and assess the need for additional or new technology or methodologies, such as social media. Initiatives Needed: Review and update, as needed, the Oakland County Health Division Emergency Preparedness Unit's Crisis and Emergency Risk Communications (CERC) Plan and assess the need for creating communication and educational materials.

2023 Plan Update Status and Changes in Priority	Ongoing

Pre-arrange heating/cooling centers/shelters for vulnerable populations	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security, local municipalities, American Red Cross
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	No costs anticipated to County or local municipality.
Potential Funding Source	County and municipal general funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Having a pro-active plan for assessing heating and cooling emergencies that will effectively allocate resources in the most efficient and effective manner.
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout the 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Extreme Heat, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Pre-arrange heating/cooling centers/shelters for vulnerable (special needs) populations, stranded motorists, etc. Analyze and/or stage where staff can identify populations in need of getting to the facilities; determine available staff and related resources (make sure facilities are ADA compliant); identify available sources for necessary equipment, supplies and rations; have trained certified medical staff available at facility; and have a MOUs from local communities, schools, etc. regarding services. Initiatives Needed: Continue to work with local units of government to identify local vulnerable populations, including transient populations; identify potential facilities that meet the American Red Cross standards and have emergency backup generators, water and food in the event that the hazard extends more than 24 hours; use written or electronic notification to increase public awareness of these facilities and what should and shouldn't be brought; supply or arrange for transportation for the elderly and/or home-bound residents to the facilities; identify and provide the hours of operation and staffing and volunteer needs for the facilities and clarify with local units of

	government their emergency response requirements from the County, state or federal government.
2023 Plan Update Status and Changes in Priority	Ongoing

Pre-plan for debris management staging and storage areas	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security and local municipalities
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Personnel, equipment and planning costs.
Potential Funding Source	County and municipal general funds, public and private partnerships, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Clear roads for rapid response of emergency personnel and to aid in sanitation for health concerns.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Earthquake, Flooding, Tornadoes, Severe Winter Storm, Oil and Gas Well Accidents, Socio-Political Hazards (Civil Disturbance, Social Unrest), Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Pre-plan for debris management staging and storage areas. Contract with local trucking and construction companies and encourage local municipalities to establish mutual aid agreements to assist each other. Initiatives Needed: Identify landfills and facilities with storage capabilities in the County, identify contractors with equipment and trucks to pick up and remove debris, and determine if the County has an adequate fleet of trucks and equipment to respond to an emergency.
2023 Plan Update Status and Changes in Priority	Ongoing

Deliver and distribute public information materials	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security

Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Staff time for developing an educational program that incorporates various communication media (newsletters, pamphlets, news articles, website information and links), individuals trained in the material who can provide training, training sessions, publishing the materials and modification of the Oakland County website to incorporate the materials.
Potential Funding Source	County and municipal general funds, public and private partnerships, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Saving lives related to tornadoes and high winds; preparing the public (homes and businesses) to minimize harmful effects from tornadoes and high winds; enhance public education about the early warning systems that are available and actions to take and creating revenue for printers, website consultants and others used to prepare materials and provide the training outreach.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout the 5-year Plan period.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Deliver and distribute public information materials (newsletters, pamphlets, news articles, educational programs, website links, contact persons, etc.) to explain tornado and high wind hazards, personal and property protection measures and warning and response systems. Study the current tools and effectiveness for alerting the public for tornadoes and high winds; create a comprehensive list of all tornado/severe wind measures recommended, including personal and property protection measures; develop public information tools, such as newsletters, pamphlets, web information and

	links, educational programs related to preparedness and response to tornado or high winds for distribution; continue intensive informational and educational program for hazard warning and alerting systems and informational tools through the schools and local and County-wide organizations (i.e. Rotary Club, Chamber of Commerce, Optimists, etc.) including preparation and actions the public should take; coordinate with local jurisdictional authorities to provide dissemination of this information and provide their representatives with training and information through their public outreach and education programs and review the effectiveness of the program annually and improve as necessary. Initiatives Needed: Identify areas where additional tools and materials are needed; create a comprehensive list of all tornado or severe wind hazards, personal and property protection measures and warning and response systems currently in place that can be used for educational purposes; provide public information programs to instruct the public in preparedness and response to a tornado or high wind situation and where to get information; improve adjoining county communication to increase cooperation for activating early warning systems when an adjoining county (or community) has an incident that could impact residents in Oakland County; study the feasibility of implementing tools and training programs to educate the public (private and businesses) in preparedness and response to tornado and severe wind hazards; evaluate the effectiveness of the public education tools developed through surveys, website statistics and other means and improve tools and effectiveness of communication.
2023 Plan Update Status and Changes in Priority	Ongoing

Keep county roads accessible to emergency vehicles and equipment	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Road Commission of Oakland County, entity with jurisdiction of road system
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Personnel, equipment, fuel
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Will create a consistent County-wide plan Anticipated Funding Source(s): State and federal grants. Schedule: Ongoing throughout 5-year Plan period.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Assist agency, association, group or communities in need of a plan to complete their process. Initiatives Needed: Public programs are currently in place and utilized (winter maintenance and storm clean up) for public roads. Communities and associations that fall under private sector need to create a similar program for their roads and streets.
2023 Plan Update Status and Changes in Priority	Ongoing

Improve communications between municipalities in the event of a mass incident/ event	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Law Enforcement, Fire, Dispatch
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Secure funding for $500,000 from the UASI grants or other source for 2 MPSC interfaces for the Oakland County Sheriff's Office 9-1-1/Communications Center and an alternate PSAP at either Southfield or Farmington Hills.
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	This will provide and enhanced interoperable communications within Oakland County, the State of Michigan and surrounding counties.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing throughout 5-year Plan period

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Secure funding from the Southeast Michigan Urban Area Security Initiative (UASI) Board for the purchase of equipment and installation of an interface at a primary and alternate site for Oakland County. Initiatives Needed: Obtained approval for the Michigan Public Safety Commission (MPSC) 800 MHz interface for the Oakland County Sheriff's Office 9-1-1/Communications Center and, if additional funding is available, seek approval for an alternate interface at another PSAP within Oakland County.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Ongoing - Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county.

Work with Community Partners to Coordinate Response Efforts	
Year Initiated	2017
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Health Division
Supporting Agencies/ Organizations	American Red Cross, Long-term Care, Hospitals and other community partners
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)

Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Public Health Emergencies: Pandemic/Epidemic
Action/Implementation Plan and Project Description, if applicable	Work with community partners such as American Red Cross, Long-term Care, Hospitals and other community partners to coordinate response efforts and provide mass prophylaxis options. The coordination will assist with community outreach such as volunteer reception centers, family reunification and community resources centers.
2023 Plan Update Status and Changes in Priority	Ongoing

Water and Sewer Infrastructure Improvements	
Year Initiated	2017
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	The Water Resources Commissioner office, local water and sewer departments
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 5, 6,
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Replace lead and copper service lines in the water and sewer infrastructure.
2023 Plan Update Status and Changes in Priority	Ongoing

Emergency Fresh Water and Sewer Main Tie Ins	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Jurisdictions
Lead Agency / Organization / Position	GLWA, WRC, County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	$50,000,000
Potential Funding Source	HMGP, Loans, Taxes
Benefits (Loss Avoided)	Loss of water & sewage utility for Region
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Emergency fresh water & sewer main ties ins for regional utility/utilities.
2023 Plan Update Status and Changes in Priority	Ongoing

Mitigation Integration into Master Plan Review Process	
Year Initiated	2017
Applicable Jurisdiction	Oakland County and Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County Planning and Economic Development Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Oakland County staff time
Potential Funding Source	Annual budget
Benefits (Loss Avoided)	Enhance planning and plan integration
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure

	Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Incorporate hazard mitigation plan integration into County's local master plan review process. Municipalities proposing a master plan are required to submit their draft plan to Oakland County for review and comment. Oakland County Economic Development & Community Affairs Department, Planning Division staff will incorporate hazard mitigation into their review of local planning documents, in order to support plan integration.
2023 Plan Update Status and Changes in Priority	Ongoing

GIS Data to Support and Protect CIKR	
Year Initiated	2017
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County EDCA Planning Division
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3, 5
Estimated Cost & Analysis (Low, Medium, High)	Staff time
Potential Funding Source	Annual budget
Benefits (Loss Avoided)	Coordination
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents:

	Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Oakland County EDCA Planning Division will work with IT Department and other partners to identify/develop GIS data layers that support the protection of infrastructure, historic sites/districts, natural habitat, and critical assets.
2023 Plan Update Status and Changes in Priority	Ongoing

Utility Awareness Reporting	
Year Initiated	2017
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	All utility/DTE/Consumers Power
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3, 5
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Private, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Severe Winter Storms
Action/Implementation Plan and Project Description, if applicable	Increase public awareness & reporting. Encourage utility companies to have proactive maintenance programs, including inspection, preventative maintenance and report, including aggressive tree inspection and trimming.
2023 Plan Update Status and Changes in Priority	Ongoing

Update and Expand Infrastructure	
Year Initiated	2017
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	GLWD/DTE/Consumers
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Update & expand infrastructure: water, sewer, and electrical. S/E Michigan has infrastructure that is old and operating at or beyond capacity.
2023 Plan Update Status and Changes in Priority	Ongoing

Move electrical panels, mechanical, and generators above base flood elevation	
Year Initiated	2017
Applicable Jurisdiction	Oakland County, All Participating Jurisdictions, and Schools/Universities
Lead Agency / Organization / Position	Oakland County, All Participating Jurisdictions, and Schools/Universities
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium (from $10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Move electrical panels, mechanical, generators above base flood elevation (BFE) in facilities located in flood-prone areas.
2023 Plan Update Status and Changes in Priority	Ongoing

Enhancement and expansion of greenspace	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Planning Departments
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Ongoing

Multi-faceted Public Awareness Campaign	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Oakland County Emergency Management and Homeland Security
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium (from $10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life, safety, and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Multi-faceted Public Awareness Campaign to Increase Enrollment in Emergency Notification Systems
2023 Plan Update Status and Changes in Priority	Ongoing

Enhance interoperable radio communications systems throughout the County	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Law Enforcement, Fire, Public Works, Dispatch
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail

Action/Implementation Plan and Project Description, if applicable	Enhance interoperable radio communications systems throughout the County
2023 Plan Update Status and Changes in Priority	Ongoing

Identify Drainage Basins and Explore Early Warning Systems	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding Preserve/Protect life, safety, and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Identify Drainage Basins that Require Flood Warning Systems and Explore Early Warning Systems for Flash Floods
2023 Plan Update Status and Changes in Priority	Ongoing

Establish Severe Weather Protective Areas	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Park and Recreation Departments
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life, safety, and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Establish and/or designate Severe Weather Protective Areas (i.e. within county parks and open space or areas where popular events take place)
2023 Plan Update Status and Changes in Priority	Ongoing

Coordinate Conservation, Preservation, and Mitigation Actions	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Oakland County Planning and Economic Development and Local Planning Departments
Applicable Goal(s)	2, 5
Estimated Cost & Analysis (Low, Medium, High)	Medium (from $10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Plan integration across the County
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail

Action/Implementation Plan and Project Description, if applicable	Coordinate Conservation, Preservation, and Mitigation Actions with Oakland County Planning and Economic Development to Ensure Integration of Programs across all communities
2023 Plan Update Status and Changes in Priority	Ongoing

Elevate pad mounted transformers	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Utilities: Pad mounted transformers - elevated above BFE, or lowering and burying them in non-flood, high wind areas
2023 Plan Update Status and Changes in Priority	Ongoing

Use multiple poles to support transformers	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Use multiple poles to support transformers
2023 Plan Update Status and Changes in Priority	Ongoing

Utilities: Burying lines, where feasible	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Utilities: Burying lines, where feasible
2023 Plan Update Status and Changes in Priority	Ongoing

Replacing poles with a better material	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Utilities: Replacing poles with a better material (for example wood poles replaced with spun concrete)
2023 Plan Update Status and Changes in Priority	Ongoing

Elevating roadways in low-lying areas prone to overland flooding	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Road Commission of Oakland County
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Elevating roadways in low-lying areas prone to overland flooding
2023 Plan Update Status and Changes in Priority	Ongoing

Install Lightning/Ground Protection on Critical Infrastructure	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)

Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Medium (from $10,000 to $100,000)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storm, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Install Lightning/Ground Protection on Critical Infrastructure
2023 Plan Update Status and Changes in Priority	Ongoing

Mitigate invasive species/plants	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions
Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	Road Commission of Oakland County
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium (from $10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding Minimize invasive species
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Invasive Species
Action/Implementation Plan and Project Description, if applicable	Mitigate invasive species/plants, especially along roadways – clear vegetation
2023 Plan Update Status and Changes in Priority	Ongoing

Ensure safe drinking water throughout the County	
Year Initiated	2017
Applicable Jurisdiction	Oakland County & All Participating Jurisdictions

Lead Agency / Organization / Position	Oakland County & All Participating Jurisdictions
Supporting Agencies/ Organizations	WRC
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life, safety, and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Ensure safe drinking water throughout the County
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

The following section represents completed mitigation actions, and serves as an archive of identified and completed projects.

Utilize pubic warning systems for public health communications	
Year Initiated	2012
Applicable Jurisdiction	Oakland County
Lead Agency / Organization / Position	Oakland County Emergency Management & Homeland Security and Oakland County Health Divisions
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Labor and technology
Potential Funding Source	County and municipal general funds, state and federal grants and private funding sources.
Benefits (Loss Avoided)	Save lives, reduce economic impact and reduce the impact of a public health emergency.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Implement emergency notification system within 2-3 years.
Actual Completion Date	Complete
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Public Health Emergencies: Pandemic/Epidemic
Action/Implementation Plan and Project Description, if applicable	Study the warning systems currently in place, the effectiveness for alerting the public and providing localized alerting to specific communities affected; work with local communities and adjoining counties to notify the County as early as possible in the event of a public health occurrence; ongoing development of intensive information and education programs for public health emergency warning and alerting systems through the schools and local/County-wide organizations (fire/police departments, chambers of commerce, etc.); coordinate with local jurisdictional authorities to provide dissemination of information and provide their representatives with training and study networks currently in use for public health warning systems. Conduct a feasibility study with local units of government to establish what systems are already being used and possible means for funding a County-wide system and determine cost justification for an emergency alert notification system. Initiatives Needed: Acquire an emergency alert notification system and institute social media capabilities to notify governmental agencies and the public in the event of a public health emergency, continue public information programs that include response protocols to public health emergencies and how to get additional information, communicate with adjoining counties to increase cooperation for activating early warning systems when a public health emergency could impact residents and study the feasibility of local alerts to public health incidents that affect only local communities (vs. the County at large).
2023 Plan Update Status and Changes in Priority	2017 Update: Completed. Oakland County has purchased a mass notification system that allows both health and homeland security to send information.

2. Addison Township

Community Profile and Description

Addison Township is named for the pioneer settler Addison Chamberlain. The township is 37.2 square miles. As of the 2020 U.S. Census, the population is 6,256.

Hazards

Gas Leak and Explosion:

- The potential for a gas leak or explosion at the CMS pumping station is the primary concern for the community.
- Two major pipelines, a 36-inch crude oil pipeline, and a 24-inch natural gas pipeline, pass through the village, necessitating preparedness for potential incidents.
- The large number of trucks carrying hazardous materials on Lakeville and Rochester Roads add to the hazmat emergency risk.

Tornadoes and Extreme Weather Hazards:

- Tornadoes significantly threaten life safety and property, requiring a coordinated response and recovery effort.
- Extreme heat and cold may impact the effectiveness of shelters in regulating temperatures.
- Ice and sleet storms may cause power loss due to downed trees, potentially hindering emergency response.
- Winter storms can create access issues for those seeking help or emergency services, especially on dirt roads.

Civil Disturbance and Mass Casualties:

- Concerns exist about the potential for civil disturbances or mass casualties at large gatherings in the village.
- Limited gas station availability within a vast area poses gas shortages or supply disruptions risks.

Communication System Failure:

- During a communication system failure incident, individuals without landlines may be unable to call 911, emphasizing the need for alternative communication methods.

Structural Fires:

- Large structural fires may overwhelm available resources, such as the Mutual Aid Box Alarm System (MABAS), requiring additional planning and preparedness.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Addison Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland

	County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide hazmat training for the public safety departments.	
Year Initiated	2005
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	Addison Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Local Funds, HSGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties, enhance training
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	Provide hazmat training for the public safety departments.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. All current fire personnel are up to date on hazmat training operations. Will continue to train. 2023 Update: Ongoing

Implement additional training for pipeline (gas and oil) hazmat accidents.	
Year Initiated	2012
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	Addison Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6

Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Local Funds, HSGP, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Oil and Gas Well Accidents
Action/Implementation Plan and Project Description, if applicable	Implement additional training for pipeline (gas and oil) hazmat accidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Still training with the pipeline companies. 2023 Update: Ongoing and Still Annual Training with Pipeline Companies

Reduce OakWin Radio System dead zones.	
Year Initiated	2012
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	Addison Township Fire Department
Supporting Agencies/ Organizations	Oakland County Emergency Management and Homeland Security
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance interoperable communications
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous

	Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Coordinate with Oakland County to reduce dead zones in the OakWin Radio System. Since Addison Township is located in the northeastern part of Oakland County, it is far away from communication tower and there are a number of dead zones. Efforts are under way in the county to replace the OakWin Radio System.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Ongoing Should be completed by 2024 - Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county.

Provide additional resources to the Mutual Aid Box Alarm System (MABAS) to handle any hazmat incidents or major traffic accidents.	
Year Initiated	2012
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	Addison Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide additional resources to the Mutual Aid Box Alarm System (MABAS) to handle

	any hazmat incidents or major traffic accidents.
2023 Plan Update Status and Changes in Priority	Ongoing - had to add more years to complete (5 more)

Electrical Infrastructure Hardening	
Year Initiated	2017
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	DTE, Addison Township
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Utility Budget
Benefits (Loss Avoided)	Continued electrical service during hazardous conditions.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Make considerable efforts to protect the Electrical System Infrastructure from failing during wind and ice storms. Continuous efforts are being made with DTE to keep lines clear.
2023 Plan Update Status and Changes in Priority	Most of this has been completed - about 90% in the Township

Completed Mitigation Actions

Supply the public safety departments with testing equipment to detect hydrogen sulfide	
Year Initiated	Unknown
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High)	

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Seek funding to purchase a new tanker to fight building and hazmat accident fires	
Year Initiated	2012
Applicable Jurisdiction	Addison Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2015. We now have two 3,000 gallon of water tankers, one purchased in 2012 and one in 2015.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Complete

3. City of Auburn Hills

Community Profile and Description

The City of Auburn Hills is situated on the Clinton River, it was named by Aaron Webster, the first settler, for Auburn, New York. It is home to the world headquarters of Chrysler, The Palace of Auburn Hills (Former home of the Detroit Pistons), and Oakland University. The city has a total area of 16.6 square miles. As of the 2020 U.S. Census, the population is 24,360.

Hazards

Tornadoes and Large Events:

- Tornadoes pose a significant concern due to the large number of people attending events in the area.

HAZMAT Incidents:

- Both fixed locations and transportation-related hazmat incidents are a concern in Auburn Hills.
- Emergency response teams need additional training and equipment to respond adequately to potential hazardous material emergencies.
- The large volume of trucks traveling M-59 and I-75 presents a hazmat threat.
- Oakland University has an active radioactive device on campus, and two locations in Auburn Hills facilitate EV Battery testing.

Unused Facility Hazard:

- The Palace of Auburn Hills has been demolished and the site will be repurposed.

Civil Disturbance or Terrorist Hazard:

- Auburn Hills, home to many corporate world headquarters, increases the risk of civil disturbance or terrorist hazards.
- The impact of economic downturn and welfare policy changes may also affect city crime rates.
- Auburn Hills being home to major corporations and hosting large events, raises concerns about terrorism and potential weapons of mass destruction incidents.

Landfill Sites Hazards:

- Auburn Hills has two large landfill sites, one under frequent monitoring for high methane levels, potentially at risk of fire or explosion.

Vulnerable Population:

- The presence of senior housing facilities and care facilities for residents with memory loss requires special attention to their safety during hazards.

Flood-related Hazards:

- Auburn Road and other road locations flood consistently with heavy rain.

Active Shooter Incidents:

- Locations of concern include Great Lakes Crossing Mall and the downtown Auburn Hills amphitheater.

Socio-Political Incidents:

- Protests and civil disturbances have occurred at political events hosted by Oakland University.

Structural Fire Incidents:

- Two locations in Auburn Hills facilitate EV Battery testing.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Auburn Hills
Lead Agency/ Organization / Position	Auburn Hills Police Department, Auburn Hills Fire Department
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low

Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide funding for additional training and equipment to be used for hazmat and mass casualty accidents.	
Year Initiated	2005
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident,
Action/Implementation Plan and Project Description, if applicable	Provide funding for additional training and equipment to be used for hazmat and mass casualty accidents.
2023 Plan Update Status and Changes in Priority	Unknown

Provide emergency generators as needed to senior citizen facilities during power outages.	
Year Initiated	2005
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	Auburn Hills Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	Medium
Hazard(s) Mitigated	Severe Winter Storms, Tornadoes, Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Provide emergency generators as needed to senior citizen facilities during power outages.
2023 Plan Update Status and Changes in Priority	Unknown

Continue to coordinate training for hazmat and mass casualty incidents.	
Year Initiated	2012
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	Auburn Hills Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	General Funds, HSGP
Benefits (Loss Avoided)	Life safety

Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	Medium
Hazard(s) Mitigated	Tornadoes, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Continue to coordinate training for hazmat and mass casualty incidents.
2023 Plan Update Status and Changes in Priority	Multiple ongoing joint training sessions in 2023

Flood Mitigation at Auburn Road and Opdyke	
Year Initiated	2017
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	City of Auburn Hills DPW
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Flood mitigation for the area of Auburn Road and Opdyke. Floods consistently during rainstorms. Clinton Road is what floods. Floods with 1/2 inch of rain. County-owned road but impacts the city. Auburn Road - not sure who owns it. Need to verify. Opdyke Road is County-owned.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Re-engineer community roads that are susceptible to flooding around the Clinton River.	
Year Initiated	
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Stockpile Bottled Water to be Distributed During Power Outages	
Year Initiated	
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Removed Mitigation Actions

Continue to seek funding for backup generator power for senior citizen housing facilities during power outages.	
Year Initiated	2012
Applicable Jurisdiction	City of Auburn Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	

Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	Removed – just a duplicate from the 2005 action.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

4. City of Berkley

Community Profile and Description

The City of Berkley is a suburb of Detroit located along the Woodward Corridor in southeastern Oakland County, Michigan. Berkley was incorporated as a City to gain more oversight over taxes and other issues following a population decrease after the Wall Street Crash of 1929. As of the 2020 U.S. Census, the population is 15,194. The City of Berkley has a total area of 2.62 square miles.

Hazards

Fire and Tornado Hazards:

- Concerns about the 8-story senior citizen living facility's vulnerability to fire and tornadoes due to residents' physical limitations and the need for specialized equipment during emergencies.

Hazmat Emergency on Busy Roads:

- Woodward Avenue, Coolidge Highway, Greenfield Road, and 11 and 12 Mile Roads are frequently used by trucks carrying hazardous materials.
- The potential for a hazmat emergency exists in case of a traffic accident involving one of these trucks.

High Wind Hazards:

- Residents are worried about high winds knocking down trees and power lines, causing damage and disruptions.
- A significant storm event in August 2011 caused major damage.

Flooding Hazards:

- Heavy rain events have led to flooding throughout the city on multiple occasions:
  - September 11, 2011: 3 inches of rain in 1 hour.
  - August 11, 2014: 5 inches of rain.
  - August 18, 2017: 3 inches of rain, affecting around 700 homes.
- Overloaded sewer lines during heavy rain events cause basement flooding, prompting the need for basement backflow prevention devices and rain gardens in boulevards to reduce flooding.

Underground Petroleum Pipeline Hazards:

- An underground petroleum pipeline parallels Greenfield Road, posing potential risks of leaks or breaks that may lead to environmental and safety hazards.

Hazardous Materials Storage:

- A pool supply company on Twelve Mile Road stores significant quantities of hazardous materials, necessitating proper safety protocols and emergency response plans.

Active Shooter Incidents:

- Berkley collaborates with law enforcement agencies to create OAKTAC, which centralizes active shooter training to enhance preparedness and coordination during such incidents.

Infrastructure Failure Incidents:

- Power failure concerns require replacing an inadequate generator at DPW and adding a generator at the community center, allowing for sheltering through a microgrid system.
- Consideration for rebuilding the community center into a larger facility to support additional sheltering capacity and improve community resilience.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Replacement of Community Center	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley
Supporting Agencies/ Organizations	Parks and Recreation
Applicable Goal(s)	1, 3, 4
Estimated Cost & Analysis (Low, Medium, High)	10.5 Million
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	2026
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Replacement of the Community Center to provide additional shelter areas for the city
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Conduct Study of Determine Flood Mitigation Projects	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley
Supporting Agencies/ Organizations	Department of Public Works
Applicable Goal(s)	2, 4, 7
Estimated Cost & Analysis (Low, Medium, High)	$500,000
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Preserve life and reduce property damage
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Winter Storms, Flooding
Action/Implementation Plan and Project Description, if applicable	Study the city to determine the location of rain gardens and other flood mitigation projects
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Install a microgrid system to replace the old existing generator at DPW.	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley DPW
Supporting Agencies/ Organizations	City of Berkley
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$100,000
Potential Funding Source	BRIC, HMGP, and local funding
Benefits (Loss Avoided)	This system will allow the DPW to continue to function during a power outage, allowing a continued operation of the city infrastructure.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	The existing generator at the DPW facility is old and is becoming unreliable. A new system would allow a reliable power source to power the DPW system and support continued operation and maintenance of critical infrastructure.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Establish an alerting system for residents.	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	Public Safety
Supporting Agencies/ Organizations	City of Berkley
Applicable Goal(s)	1, 4, 5

Estimated Cost & Analysis (Low, Medium, High)	$50,000
Potential Funding Source	BRIC, HMGP, HSGP
Benefits (Loss Avoided)	This system would allow the city to alert resident of condition in their area that may impact life or property.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Establish an alerting system for residents so that they can be notified of emergencies. An example is CodeRed a cloud-based software solution that provides real time information to the community that can help save lives in the community.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Reduce Storm Water Runoff on City Property	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley Public Works
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 4
Estimated Cost & Analysis (Low, Medium, High)	$521,290
Potential Funding Source	BRIC, HMGP, Local Funds
Benefits (Loss Avoided)	Reduce storm water runoff on city owned land.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2026
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Implement the recommendations of the Great Lakes Storm Water Management Institute and the Clinton River Watershed Council to reduce storm water runoff on city owned land. Action would be taken at the following areas: Jaycee Park Permeable Pavement Curb Cut Rain Garden Rain Garden Griffith Ave Parking lots West Permeable Pavement Pavers Griffith Ave Parking lots East Bioretention Parks and Rec Parking lot Bioretention These projects will reduce the amount of storm water runoff by 91% in these areas.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Install a microgrid at the City Hall Public Safety Complex	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley Public Safety
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$250,000
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	This would allow Public Safety to continue to provide services during a power outage.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2027
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Install a microgrid at the City Hall, Public Safety Complex that could be expanded in the future to allow for charging of electric public safety vehicles. Include the library in this microgrid if feasible and cost effective. This would protect the critical infrastructure during times of extended power outages. Public Safety operates a Public Safety Answering Point (PSAP) at this

	facility that supports the City of Berkley, the City of Huntington Woods and the City of Pleasant Ridge.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Berkley
Lead Agency/ Organization / Position	City of Berkley Public Safety
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, HSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and

	underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Seek to improve communication and education between cities, villages, townships, counties, state and federal municipalities to be prepared for a major disaster, emergency or terror attack.	
Year Initiated	2012
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley
Supporting Agencies/ Organizations	City of Berkley Department of Public Safety
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local funds, HSGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek to improve communication and education between cities, villages, townships, counties, state and federal municipalities to be prepared for a major disaster, emergency or terror attack.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing The City of Berkley joined the Oakland County Law Enforcement Tactical Response Coordinating Group, or OAKTAC to take advantage of the multijurisdictional training provided. Two members of the Public Safety department have completed the Michigan State Police Homeland Security

	Professional Emergency Manager Program and joined the Oakland County Incident Management Team 2023 Update: Ongoing - training for all law enforcement and emergency management to maintain proficiency

Continue to seek funding to increase staffing levels in public safety.	
Year Initiated	2012
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	City of Berkley Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue to seek funding to increase staffing levels in public safety.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The funding is reviewed every year by the City Council during the annual budget review. 2023 Update: Ongoing Process

Flow Model the existing combined sanitary and storm sewer system.	
Year Initiated	2017
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	Department of Public Works

Supporting Agencies/ Organizations	County Drain Commissioner
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Phase I Study $70,500
Potential Funding Source	Phase I General Fund
Benefits (Loss Avoided)	Protect infrastructure and increase sewer capacity to mitigate flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Phase 1 Study 1st Qtr. 2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Develop a flow model that can be generated the potential for sewer backup based on a predicted rain event. Utilize the flow model to determine the appropriate locations for restricted covers on the existing catch basins to slow the inrush of water into the combined sewer system. Heavy rains on September 11, 2011, dropped 3 inches of rain in 1 hour causing flooding throughout the City. Heavy rains again in August 11, 2014, dropped 5 inches of rain causing flooding throughout the city. The City applied for and received a Storm water, Asset Management, and Wastewater (SAW) Grant of $602,142. This grant was used to locate and identify problem areas with the sewer infrastructure. Again, on August 18, 2017, heavy rains again in dropped 3 inches of rain causing flooding to approximately 700 homes throughout the city. The city authorized Hubbell, Roth & Clark (HRC), the city engineers, to prepare a Combined Sewer Capacity Study at a total cost not to exceed $70,500. This phase 1 study will determine capacity of the City of Berkley Combined Sewer System. Capacity Study Step-By-Step Process Determine data quality from the GIS database for this use HRC will review GIS data collected during the SAW project to determine accuracy of “z” elevations and find gaps in data. Collect additional field data as needed and upload to the GIS database. Determine and draw tributary areas for each manhole within the GIS database. Utilize the newly developed tributary areas and SEMCOG’s Impervious Area GIS layer to calculate runoff coefficients for each tributary area.

	Gather existing flow information and interceptor capacity from Oakland County's Drainage Model and Study. This data will be requested from Oakland County Water Resource Commission (OCWRC). Perform drainage calculations for the City of Berkley Combined Sewer System to develop design flows and resulting HGL elevations Calculated design flow for each sewer segment can be used to determine the design storm capacity of the existing system Perform calculations to consider effect of restricted catch basins Conclusion: Develop a recommended Combined Sewer Improvement Program based on study results.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated. Phase 1 Study initiated. 2018 Update: Phase 1 Study conclusion delivered to the City the end of 1st Qtr. 2018. 2023 Update: Initial Study Completed

Identify potential shelters and bring up to ADA and Special Needs compliance.	
Year Initiated	2017
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	Library Director
Supporting Agencies/ Organizations	American Red Cross, United Way, Salvation Army
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Extreme Heat, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Coordinate with the Berkley School district and NGO's to identify potential shelters in the city. Determine if these shelters are currently up to ADA and Special Needs compliance. If not develop requirements lists to bring the shelter to compliance. Work with facility owners to make the facilities compliant.
2023 Plan Update Status and Changes in Priority	Coordinating with Red Cross

Identification and Replacement of lead water lines and connections.	
Year Initiated	2017
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	Director of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years) 2035
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Identification of any lead service lines in the Berkley water system and to develop a plan for replacement to ensure safe drinking water for all of the residents.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Identification of lead service lines is currently ongoing. An estimated completion date for removal of all lead service lines is 2035

Identification and implementation of methods to slowdown or stop terrorist attack by vehicle at Berkley events such as the Woodward Dream Cruise, the Berkley Art Bash and the County Oakland Irish festival.	
Year Initiated	2017
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	Director of Public Works
Supporting Agencies/ Organizations	Director of Public Safety
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	To ensure the safety of residents and visitors at all of the Berkley events.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Determine an appropriate method of stopping vehicle attacks on personnel and property at local events and festivals.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: DPW vehicles used to block street at Public Events

Completed Mitigation Actions

Assist in the purchase of new fire equipment including a foam capable pump.	
Year Initiated	
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	Medium
Hazard(s) Mitigated	Tornadoes, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Upgrade current respiration equipment.	
Year Initiated	
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	Medium

Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Provide funding to hire and train a sufficient number of people to assist the public safety department.	
Year Initiated	2005
Applicable Jurisdiction	City of Berkley
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

5. Village of Beverly Hills

Community Profile and Description

The Village of Beverly Hills is a suburb of Detroit located in the Southfield Township. It is the most populous village in the state of Michigan. As of the 2020 U.S. Census, the population is 10,584. The Village of Beverly Hills has a total area of 4.02 square miles.

Hazards

Winter Weather Hazards:

- Winter weather poses a significant hazard, particularly on community roads like Southfield and Fourteen Mile Roads.
- These roads are frequented by trucks carrying hazardous materials, necessitating up-to-date hazmat equipment and continued training.
- Fog can contribute to severe accidents during winter conditions.

Extreme Cold and Heat Concerns:

- The village may be impacted by extreme cold, but there are insufficient facilities to serve as warming shelters.
- Extreme heat also poses challenges, as not enough cooling shelters are available.

Riverine Flooding:

- The area where the Rouge River intersects the village, primarily west of Greenfield Road and south of Village Drive, is historically prone to flooding.
- Other riverine flood concern areas include intersections with 13 Mile Road, Evergreen Road, and small culverts near Hillview.

Dam Failure:

- Mitigation is necessary for the high-hazard dam at Evergreen Road and Old Pond Court to prevent potential flooding in the area and downstream on the Rouge River.

Tornado and High Wind Hazards:

- The threat of tornadoes is a concern, with high winds potentially causing damage to trees, structures, and infrastructure.
- The village is particularly worried about power failures, water supply contamination, and structural damage resulting from tornadoes.

Power Outage Concerns:

- High winds leading to downed trees and branches are a major concern for power outages in the village.

Hazmat Accident Risks:

- The natural gas pipeline along Fourteen Mile Road presents a potential hazard for hazmat accidents.

Ice Storm Impacts:

- The village may be impacted by ice storms, affecting power and other utilities, including water mains.

Thunderstorm Risks:

- Thunderstorms have caused damage to structures, trees, and utilities in the past.

Active Shooter Preparedness:

- The possibility of an active shooter could occur at any public gathering, village police office building, or any of the nine schools.

Specific areas of concern for various hazards include:

- Natural gas pipeline along Greenfield Rd. (From 13 Mile to 14 Mile Rd).
- Natural gas pipeline above ground relief station on Saxon.
- Natural gas pipeline above-ground station on Lasher Rd.
- Electrical substation on Southfield Rd.
- Two water towers on 14 Mile Rd.
- Metering Pit on Beverly Rd. near Greenfield.
- Metering Pit on Greenfield Rd. near 13 Mile Rd.
- Rouge River, Erity Damn on Evergreen near Old Pond.
- Rouge River Damn near Rosevear.
- Rouge River Culverts; Hillview, Riverview, Georgetown, 13 Mile Rd, and Lahser Rd.
- 2 Bridges on Evergreen Rd. 1 on 13 Mile Rd.
- Douglas Evans underground water retention and treatment facility. 10,000 gallons of liquid chlorine stored underground.
- 500 gallons of liquid chlorine stored at 2 schools with swimming pools.
- Hazardous material is transported along 14 Mile, Southfield Rd, Lahser, and Greenfield. Designated trucking route.
- Above-ground sewer pipeline traveling over rouge river tributary near Hillside.
- Communication towers attached to water towers.
- Communication tower near Groves High School.
- Communication tower behind Public Safety Building.
- BP gas station on 13 Mile Rd. and Southfield Rd.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert.

	• Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide additional training and equipment to better prepare the public safety departments in responding to hazardous materials incidents.	
Year Initiated	2005
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide additional training and equipment to better prepare the public safety departments in responding to hazardous materials incidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Annual trainings. 2023 Update: Ongoing

Implement funding from fire grant to upgrade existing generators in the fire hall and police stations to provide power to entire buildings.	
Year Initiated	2012
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2

Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMPG
Benefits (Loss Avoided)	Continuity of operations
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Implement funding from fire grant to upgrade existing generators in the fire hall and police stations to provide power to entire buildings.
2023 Plan Update Status and Changes in Priority	Ongoing

Provide continuous training for hazmat emergencies.	
Year Initiated	2012
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Oil and Gas Well Accidents
Action/Implementation Plan and Project Description, if applicable	Provide continuous training for hazmat emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Mutual aid agreement with Oakland County. 2023 Update: Ongoing

Work to coordinate efforts with local utility companies to communicate the areas where tree clearing is necessary or planned and to repair downed power lines.	
Year Initiated	2012
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Work to coordinate efforts with local utility companies to communicate the areas where tree clearing is necessary or planned and to repair downed power lines.
2023 Plan Update Status and Changes in Priority	Ongoing

Mitigate the Erity Dam located near Evergreen Road and Old Pond Ct. The dam is currently being replaced in 2017. Modify culverts to increase water flow capacity.	
Year Initiated	2017
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	Birmingham, Oak Park, Berkley, Huntington Woods
Applicable Goal(s)	1, 2, 3, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Preserve life and mitigate casualties, and protect infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	High

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Mitigate the Erity Dam located near Evergreen Road and Old Pond Ct. The dam is currently being replaced in 2017. Modify culverts to increase water flow capacity.
2023 Plan Update Status and Changes in Priority	Ongoing

Increase the size of culverts where needed in the Village, including but not limited to Hillview, Riverview, and Georgetown.	
Year Initiated	2017
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Increase the size of culverts where needed in the Village, including but not limited to Hillview, Riverview, and Georgetown.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Schedule regular inspections of the City's sewer system.	
Year Initiated	2023
Applicable Jurisdiction	
Lead Agency / Organization / Position	Village of Beverly Hills
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Implement funding from fire grant to purchase a new ladder fire truck.	
Year Initiated	2012
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Implement funding from fire grant to purchase a new fire pumping engine.	
Year Initiated	2012
Applicable Jurisdiction	Village of Beverly Hills
Lead Agency / Organization / Position	Beverly Hills Public Safety
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Grants
Benefits (Loss Avoided)	Enhance capabilities

Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. In the process of purchasing two fire engines. 2023 Update: Completed

6. Village of Bingham Farms

Community Profile and Description

The Village of Bingham Farms was incorporated on October 4, 1955, named after a prominent family present in the village since 1880. All roads in the village remained unpaved until 1984 to discourage intensive development. Bingham Farms is located in Southfield Township. As of the 2020 U.S. Census, the population is 1,124. Bingham Farms has a total area of 1.21 square miles.

Hazards

Flooding Hazards:

- Flooding of the Rouge River tributaries is a concern at various locations in the village.
- The area most susceptible to this hazard is on the Franklin Branch of the Rouge River, north of Thirteen Mile Road and south of Woodlynne Road.

Hazmat and Traffic Accidents:

- Telegraph Road, with its large volume of truck traffic, poses a risk of traffic accidents and hazmat emergencies.

Ice Storms:

- Ice storms pose a significant threat, leading to extended power outages lasting several days.

Tornadoes and High Winds:

- Tornadoes are a significant threat to the village residents.
- High winds knocking over trees and power lines have become a major concern.

Hazmat Accident Risks:

- The presence of a 12” pipeline running along Thirteen Mile Road raises concerns about potential hazmat accidents.

Fire Truck Accessibility:

- The village addressed an issue with the existing ladder fire truck's inability to reach all points on the high school roof during fires.
- In 2014, a new truck equipped with a longer ladder (100' aerial) was purchased to resolve this problem.

Severe Weather Impact on Trees and Roads:

- Blizzards, heavy snow, or ice storms/sleet pose challenges due to dead trees and obstructed roads, damaging electrical infrastructure and hindering traffic during severe weather events.

Flood-related Hazards:

- The village is prone to flooding due to its jurisdiction containing a tributary to the Rouge River.
- Debris from upstream and flood events cause water over the road at 14 Mile, leading to residential flooding.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Bury Electrical wires that travel across Telegraph Road	
Year Initiated	2023
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	DTE
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduce transportation impact on major road during storms
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Bury Electrical wires that travel across Telegraph Road
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Hire an engineering firm to evaluate and correct the flooding concerns of the Village.	
Year Initiated	2005
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	Village of Bingham Farms
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Hire an engineering firm to evaluate and correct the flooding concerns of the Village.
2023 Plan Update Status and Changes in Priority	Ongoing

Acquire equipment to assist in debris removal following tornado and/or high wind storms.	
Year Initiated	2012
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	Village of Bingham Farms
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase capabilities to recover from disaster
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes

Action/Implementation Plan and Project Description, if applicable	Acquire equipment to assist in debris removal following tornado and/or high wind storms.
2023 Plan Update Status and Changes in Priority	Ongoing

Acquisition of equipment to assist in the removal of dead and live trees around power lines.	
Year Initiated	2012
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	Village of Bingham Farms
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase capabilities to recover from disaster
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) **(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)**	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Acquisition of equipment to assist in the removal of dead and live trees around power lines.
2023 Plan Update Status and Changes in Priority	Ongoing

Dead Tree Removal. Dead Ash and Oak trees scattered throughout the Village and create utility and road hazards during wind and storm events.	
Year Initiated	2017
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	Village of Bingham Farms
Supporting Agencies/ Organizations	Contracted entities
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	General Fund
Benefits (Loss Avoided)	Reduction of utility and road hazards
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown/ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Dead Tree Removal. Dead Ash and Oak trees scattered throughout the Village and create utility and road hazards during wind and storm events.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Acquire equipment to boost radio communication in all buildings (including schools) in the Village to assist public safety.	
Year Initiated	2012
Applicable Jurisdiction	Village of Bingham Farms
Lead Agency / Organization / Position	Village of Bingham Farms
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail

Action/Implementation Plan and Project Description, if applicable	Acquire equipment to boost radio communication in all buildings (including schools) in the Village to assist public safety.
2023 Plan Update Status and Changes in Priority	Completed

7. City of Birmingham

Community Profile and Description

The City of Birmingham is on the north side of Metro Detroit. The area comprising what is now the city of Birmingham was part of land ceded by Native American tribes to the United States government by the 1807 Treaty of Detroit. The City of Birmingham was re-incorporated from a village to a City in 1933. As of the 2020 U.S. Census, the population is 21,813. The City has a total area of 4.80 square miles.

Hazards

River/Urban Flooding:

- The potential for the Rouge River to flood and cause damage to businesses in the downtown area is a top hazard.
- Floodgates have been installed at many structures to successfully mitigate damages caused by flooding.

High Winds and Winter Storms:

- High winds and winter storms have become a major concern for the residents of Birmingham, posing risks to structures and power lines.

Hazardous Materials Transport:

- Woodward Avenue, a heavily traveled route through the city, has a history of numerous vehicular accidents.
- The traffic includes trucks carrying hazardous materials, and nearby train tracks also carry hazardous materials.
- A truck accident or train derailment resulting in a chemical spill presents significant risks to the city and its residents.

Hazmat Training for Public Service Employees:

- A need exists to provide hazmat training to all public service employees to better prepare them to respond to hazardous materials emergencies.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process

- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Birmingham
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide hazmat training to all members of the public safety departments.	
Year Initiated	2005
Applicable Jurisdiction	City of Birmingham
Lead Agency / Organization / Position	City of Birmingham Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide hazmat training to all members of the public safety departments.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Annually, all department employees are trained to an “Operations” level. Our department also participates in OAKWAY HazMat Team consisting of eight surrounding departments. Level of training ranges from “Operations”, “Technicians” to “Specialist”. 2023 Update: Ongoing

Establish Better Communication	
Year Initiated	2005
Applicable Jurisdiction	City of Birmingham
Lead Agency / Organization / Position	City of Birmingham Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2

Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Establish better communication between the City and the railroad companies to determine what is being transported through the City.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Our department puts on annual train emergency training each year. CN Railroad network comes through our City, to prepare for an incident we have updated contact personnel and contact information for CN Railroad in our area. We have requested Hazardous Materials commodity flow through our area. This information covers all hazardous materials transported through the community. 2023 Update: Ongoing

Completed Mitigation Actions

Install additional floodgates on older buildings located along the river.	
Year Initiated	
Applicable Jurisdiction	City of Birmingham
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Continue hazmat training for all public safety personnel.	
Year Initiated	2012
Applicable Jurisdiction	City of Birmingham
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Really an ongoing 2005 action. This one was "completed" to remove the duplication.
2023 Plan Update Status and Changes in Priority	

Removed Mitigation Actions

Mutual Aid for High Rise Fires	
Year Initiated	2017
Applicable Jurisdiction	City of Birmingham
Lead Agency / Organization / Position	City of Birmingham Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	We recently had a high-rise fire on the 14th/15th floors of an apartment complex. Our ladder truck was unable to get water streams to the fire floors. A mutual aid department arrived with their ladder truck and we were able to extinguish the fire.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	The City of Birmingham has very little undeveloped property to build either residential or commercial property. Due to this, what use to be one and two floor commercial buildings are now high rises and the potential for high rise fires has increased. With this in mind the City of Birmingham has engaged in mutual aid communities that in the event of a high-rise fire would send their ladder truck with personnel to help.
2023 Plan Update Status and Changes in Priority	REMOVE

8. Bloomfield Township

Community Profile and Description

The Charter Township of Bloomfield is home to 44,253 people according to the 2020 U.S Census. Its 26 square miles are distinguished by rolling hills, winding roads, and scenic lakes and streams. Located in Oakland County, Michigan, Bloomfield Township is within easy reach of the area's major thoroughfares and expressways. It provides a full range of public services, including its own police and full-time fire departments and road, water & sewer divisions.

Because 95% of the Township is residential there is a special emphasis on the needs of homeowners, but Bloomfield Township's business community is thriving and growing. Vibrant businesses including shops and restaurants can be found in the Township, particularly along the Telegraph and Woodward Avenue corridors.

Hazards

Mitigation Plans:

- Bloomfield Township has developed its Hazard Mitigation Plan to maintain eligibility for pre- and post-disaster FEMA grant funds.
- The township has two specific plans, a Flood Mitigation Project Plan dated July 2010, and a Hazard Mitigation Plan dated August 2011.

Flooding Concerns:

- Flooding is a particular concern for Bloomfield Township. Franklin and 14-mile road during heavy rains; Lahser and North Hickory experience flooding during heavy rains. Water recedes quickly on both locations. Club Drive between Square Lake Rd and Franklin Rd.
- Flooding is a result of drainage issues and lack of stormwater capacity and blockage from debris.

Active Shooter

- Places of worship continue to be a concern for the township.

Average Age of the Township

- Power outages affect the elderly & is a concern during wind and storm events.

Other

- Sun pipeline goes through the township.

- Railway goes through the center of the township.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Bloomfield Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include:

	• Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide funding to rebuild drains and eliminate recurring flooding problems in the Township, particularly in sections 13 and 14	
Year Initiated	2005
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Life safety, asset protection
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Provide funding to rebuild drains and eliminate recurring flooding problems in the Township, particularly in sections 13 and 14
2023 Plan Update Status and Changes in Priority	Ongoing - Further action is not a high-priority

Provide the members of the public safety departments with additional hazmat equipment and training	
Year Initiated	2005
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low

Potential Funding Source	HSGP
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Ongoing - Consolidated another action by adding training

Install additional outdoor warning sirens within the community	
Year Initiated	2012
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	No Gaps - Currently Covered

Follow the recommendations outlined in the Flood Mitigation Action Plan.	
Year Initiated	2012
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township Department of Public Works
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Life safety and asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Ongoing

Participate in mutual aid assistance with surrounding communities (including 9-1-1).	
Year Initiated	2012
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township Department of Public Works
Supporting Agencies/ Organizations	Bloomfield Township Fire Department, Bloomfield Township Police Department
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Ongoing

Encourage tree trimming and maintenance to prevent limb breakage and protect nearby utility lines.	
Year Initiated	2012
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	Bloomfield Township Department of Public Works
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Continue additional hazmat training.	
Year Initiated	2012
Applicable Jurisdiction	Bloomfield Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents:

	Transportation Incident, Oil and Gas Well Accidents
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	REMOVE - CONSOLIDATE this action with providing additional Hazmat Equipment Action

9. City of Bloomfield Hills

Community Profile and Description

The City of Bloomfield Hills is locate in Metro Detroit's northern suburbs. What is now Bloomfield Hills was a farming area until the turn of the 20th century when wealthy Detroit residents bought up the land. The settlement became a village in 1927, and in 1932 residents voted to become a city to avoid being incorporated into growing Birmingham. Bloomfield Hills is the location of the National Historic Landmark Cranbrook Educational Community and other historic sites listed on the national register of historic places. As of the 2020 U.S. Census, the population is 4,460. The total area of the City of Bloomfield Hills is 5.04 square miles.

Hazards

Floods:

- We have areas of our City that have flooded during high rain events multiple times. These include the Hunt Club Subdivision, Bloomfield Parkway/ Woodward Ave Intersections, Huntingwood Lane and Long Lake, Long Lake and Rathmore, and the river flowing from Opdyke at St Hugo Church all the way SW to Lasher and Quarton.

Traffic Accidents:

- Woodward Avenue and Long Lake Road, the most traveled streets in the city, are known for numerous traffic accidents, requiring traffic safety measures and road improvements.
- The City of Bloomfield Hills has both a major thoroughfare for Woodward Ave which splits passes through our entire City into the east and west halves. We also are the home of CN Railroad major tracks traveled by. Hazardous materials are transported in high quantities on both of these areas daily.

Hazmat Hazard:

- Concerns exist about hazardous materials traveling through the city via railroad, posing a potential hazmat hazard.
- Emergency response planning and hazmat training are essential to address such risks.

High Winds and Thunderstorms:

- High winds and thunderstorms have caused power outages and other wind-related damage.
- Measures should be taken to reinforce infrastructure and address the impact on older trees.

- Our City has an older population with many senior residents. Many of our homes are older construction and all of our electric grid is above ground. This makes The City of Bloomfield Hills more expectable to damage when these events occur.

Tornadoes:

- The City's electrical grid is all above ground. We have a large educational community with boarding students as well as two large senior living communities.

Severe Hail:

- Structural damages caused by severe hail are a concern, necessitating building inspections and improved building codes.
- Our City has an older population with many senior residents. Many of our homes are older construction and all of our electric grid is above ground. This makes The City of Bloomfield Hills more vulnerable to damage when these events occur.

Ice and Sleet Storms:

- Ice and sleet storms may impact above-ground power lines, requiring regular maintenance and contingency plans for power restoration.
- Our City has an older population with many senior residents. Many of our homes are older construction and all of our electric grid is above ground. We have two large Senior Living Communities a major state highway and many roads.

Winter Storms and Blizzards:

- Winter storms and blizzards may cause traffic disruptions and threaten assisted living facilities.
- Emergency response planning and coordination are crucial during such events.
- Our City has an older population with many senior residents. Many of our homes are older construction and all of our electric grid is above ground. We have two large Senior Living Communities a major state highway and many roads.

Communication System Failure:

- A potential communication system failure incident may impact police communication, emphasizing the need for redundant communication channels.

Fuel Station Impact:

- The single fuel station in the city may be at risk during an oil and gas well accident, requiring safety measures and preparedness plans.

Structural Fire Threat:

- The Cranbrook School poses the biggest structural fire threat, necessitating fire safety measures and emergency response planning.

Civil Disturbances:

- Student rallies may become civil disturbances requiring crowd management strategies and law enforcement coordination.

Terrorism Threat:

- Multiple presidential and staff visits annually may increase the terrorism threat requiring enhanced security measures and preparedness planning.

Public Health:

- Our older population makes any health emergency more critical.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Implement Flood Control Measures	
Year Initiated	2023
Applicable Jurisdiction	Bloomfield Hills
Lead Agency / Organization / Position	DPW
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	$5,000
Potential Funding Source	Local
Benefits (Loss Avoided)	Reduce Flooding by cleaning storm drains and outlets
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2023
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	DPW cleans storm drains, waterways and road grates to permit storm water to enter these outlets and drain into the appropriate areas efficiently to prevent water backups and flooding in the City of Bloomfield Hills.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Bloomfield Hills
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc.

	• Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue to Provide Training for Public Safety Officers	
Year Initiated	2012
Applicable Jurisdiction	City of Bloomfield Hills
Lead Agency / Organization / Position	Public Safety Department
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High ($150,000 annually)
Potential Funding Source	Annual FY budget, HSGP
Benefits (Loss Avoided)	Trained PSOs, reduction of liability
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing - Annual Need
Actual Completion Date	6/30/FY
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	Continue to provide training for public safety officers to assist in all emergency needs of the City.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing

Completed Mitigation Actions

Address flooding problems along Opdyke Road.	
Year Initiated	
Applicable Jurisdiction	City of Bloomfield Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Hire additional public safety officers to assist in all emergency needs of the City, especially building fires.	
Year Initiated	2005
Applicable Jurisdiction	City of Bloomfield Hills
Lead Agency / Organization / Position	New Command Structure
Supporting Agencies/ Organizations	Mutual Aid Improvements
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Annual budget
Benefits (Loss Avoided)	Maintaining minimum manpower
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	December 2017
Actual Completion Date	December 2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Fire apparatus improvement/accreditation
2023 Plan Update Status and Changes in Priority	Completed. Hired 16th PSO.

The City and County are working together to coordinate installation of a new cell tower to increase coverage of the OakWin Radio System.	
Year Initiated	2012
Applicable Jurisdiction	City of Bloomfield Hills
Lead Agency / Organization / Position	CLEMIS (OakWIN)
Supporting Agencies/ Organizations	AT&T
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	CLEMIS
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	November 2017
Actual Completion Date	November 2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Note: The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action.
2023 Plan Update Status and Changes in Priority	2017 Update: Completed

10. Brandon Township

Community Profile and Description

Brandon Township is located within the metro Flint, Michigan area. The Flint River headwaters are in the Brandon Township. The Township of Brandon was created in 1837, named in honor of the settlers of the Town of Brandon, Vermont, whose descendants had migrated to this area of Michigan. As of the 2020 U.S. Census, the population is 15,384. The total area of Brandon Township is 35.8 square miles.

Hazards

Tornado Threat to Manufactured Home Park:

- Tornadoes are a significant threat to the manufactured home park's residents located south of Seymour Lake Road between Dartmouth and Sashabaw Roads.
- Additional sirens serving this area are needed for improved warning and preparedness.

Traffic Accidents on M-15:

- M-15, a heavily traveled two-lane road, has a history of numerous traffic accidents.
- Traffic safety measures and road improvements are essential to address this concern.

Flooding of Paint Creek:

- Paint Creek flooding results in the closing of Poli Road between Lockwood and Sashabaw Roads.
- Flood mitigation measures should be considered to minimize the impact on the community.

Ice Storms and High Winds:

- Ice storms are a significant threat, with residents experiencing extended power outages.
- High winds knocking over trees and power lines are major concerns for the residents.

Switching Station Hazard:

- A switching station with battery backup on the corner of M-15 and Narrin Road poses a potential hazard that requires monitoring and preparedness.

Crude Oil Pipeline:

- A crude oil pipeline running just south of M-15 and Grange Hall Road poses a potential hazard, necessitating safety measures and monitoring.

Propane Supplier Tanks:

- The propane supplier's 2-30,000-gallon tanks could be hazardous to the community.
- Proper safety measures and regulations should be in place to mitigate potential risks.

Dam Failure:

- The dam at Lake Louise poses a significant threat, potentially flooding hundreds of homes downstream to the Village of Ortonville and the Flint Watershed.
- Emergency response planning and dam safety measures are crucial.

Flood Hazard from Kersley Creek:

- Kersley Creek flowing through the Village of Ortonville and to Flint Watershed presents a flood hazard, particularly during Spring when it historically reaches high levels.

Wildfire in State Park Property:

- The community's heavily wooded state park property is susceptible to wildfires, especially under extremely dry conditions.
- Fire prevention and preparedness measures are necessary to reduce wildfire risks.

Hazardous Materials Incidents on M-15:

- The M-15 corridor is an area that requires monitoring for hazardous materials incidents.
- Emergency response plans and hazmat training are essential for preparedness.

Invasive Species - Phragmites:

- Phragmites are a problem in the community and efforts should be made to address and control the invasive species.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.

- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

New Fire Wells for Water Supply Throughout Township	
Year Initiated	2023
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	Brandon Fire Department
Supporting Agencies/ Organizations	Brandon Township
Applicable Goal(s)	1, 2, 3, 4, 7
Estimated Cost & Analysis (Low, Medium, High)	$300,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Water supply for structure fires
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2024 / Summer
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Wildfires, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Structural Fire, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	New Fire Wells for Water Supply Throughout Township
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Brandon Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide additional tornado sirens.	
Year Initiated	2005
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	Brandon Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Provide additional tornado sirens.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Additional sirens have been installed. Need to check on total coverage map from Oakland County Homeland Security. 2023 Update: Ongoing

Phragmite Invasion Reduction	
Year Initiated	2017
Applicable Jurisdiction	Brandon Township, Village of Ortonville
Lead Agency / Organization / Position	Brandon Township
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Local funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduce the damage caused to roots blocking drainage tiles and culverts.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Invasive Species
Action/Implementation Plan and Project Description, if applicable	Reduction of invasive species, phragmites.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Provide confined space rescue equipment.	
Year Initiated	
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	Brandon Township
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Infrastructure Failure,
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Address flooding on Poli Road.	
Year Initiated	2005
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2016. OCRC has built up Poli Road - Road did not flood in Spring 2017.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2016. OCRC has built up Poli Road - Road did not flood in Spring 2017.

Install a fire suppression well in downtown Ortonville to help with possible fire in the downtown area.	
Year Initiated	2012
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown. Fire suppression well was added, providing 350 GPM well.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Unknown. Fire suppression well was added, providing 350 GPM well.

Implement the Brandon-Oxford-Addison narrow band grant to purchase narrow band radios for the respective townships by 2013.	
Year Initiated	2012
Applicable Jurisdiction	Brandon Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown. VHF Radio system has been completed.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Date unknown. VHF Radio system has been completed.

11. City of Clarkston

Community Profile and Description

The City of Clarkston was incorporated in 1884 as a Village. In 1992, Village residents voted to incorporate the Village as a city in order to preserve its boundaries and local government. As of the 2020 U.S. Census, the population is 928. The City of Clarkston is small, with the total area just over a half square mile (0.51 sq mi).

Hazards

Natural Hazards:

- Tornadoes, ice storms, and thunderstorms with high winds threaten the historical downtown area and residents.
- Power outages affect the population, especially the elderly and those relying on private wells for water supply.

Fire Hazards:

- Older buildings on Main Street lack modern fire preventive systems.
- In a fire in the downtown area, assistance from neighboring communities may be required.

Tornado Hazards:

- Tornadoes are a significant hazard of concern to the city.

Transportation Accidents on M-15:

- Transportation accidents on M-15 have become a major concern for Clarkston's residents.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Clarkston
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Create a Program to Provide Water, Oxygen and Medication to Senior Citizens	
Year Initiated	2005
Applicable Jurisdiction	City of Clarkston
Lead Agency / Organization / Position	City of Clarkston City Manager's Office
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	On Hold
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Create a program that would provide water, oxygen and medication to senior citizens in cases of power outages due to weather or infrastructure failures.
2023 Plan Update Status and Changes in Priority	2017 Update: On Hold 2023 Update: Ongoing

Generators	
Year Initiated	2017
Applicable Jurisdiction	City of Clarkston and Independence Township
Lead Agency / Organization / Position	Independence Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$30,000
Potential Funding Source	Local funds, BRIC, HMGP
Benefits (Loss Avoided)	By allowing the City offices to stay open to the public during a power outage, City Officials will be able to better coordinate response efforts, and improve critical communication with the public.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Purchase of a generator for city offices
2023 Plan Update Status and Changes in Priority	Ongoing

Overgrown Tree Reporting Campaign	
Year Initiated	2017
Applicable Jurisdiction	Independence Township and City of Clarkston
Lead Agency / Organization / Position	Independence Fire Department
Supporting Agencies/ Organizations	DTE Energy
Applicable Goal(s)	1, 2, 3, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	$1,000
Potential Funding Source	Local finds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	By identifying overgrown and dead trees close to DTE Energy's electrical infrastructure and passing this information along to them, we will reduce the number of power outages in our community during storm and wind events
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	The Independence Fire Department, would create and lead a program for reporting overgrown and dead trees

	near electrical power lines. This would include a public awareness campaign, including the creation and distribution pamphlets. It would also include press release(s) and website postings. A web based GIS application for the public to report the location and description of electrical hazard would be developed and promoted, as well. Ultimately this will lead to a safer community, with less power outages during thunderstorm and high wind events.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Coordinate programs with neighboring communities to improve mutual assistance in times of power outages and other emergencies.	
Year Initiated	
Applicable Jurisdiction	City of Clarkston
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	

2023 Plan Update Status and Changes in Priority	Completed

Coordinate programs with neighboring communities to improve mutual assistance in times of power outages and other emergencies.	
Year Initiated	
Applicable Jurisdiction	City of Clarkston
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

12. City of Clawson

Community Profile and Description

The City of Clawson's name is a misspelling of John Lawson's name, a local settler. It was incorporated in 1921 as a village and in 1940 as a city. The City of Clawson is part of the Detroit Metro area. As of the 2020 U.S. Census, the population is 11,389. The total area of the City of Clawson is 2.20 square miles.

Hazards

At-Risk Populations:

- The 15-story senior citizens complex poses specific risks in the event of structural fires, tornadoes, and high winds.
    - Preparedness and emergency response plans are necessary to address potential threats to the residents.
    - Fire Department exercises with them once a year.
- Nursing home next to the police station (two-story facility). They have a response plan.

Hazmat Incidents:

- Trucks carrying hazardous materials along Fourteen Mile Road create a potential hazmat hazard, endangering the lives of Clawson's citizens.
- Measures should be taken to ensure proper safety and response protocols.
- Added no left turn signs recently to mitigate travel through the city.

Airplane Accident Risk:

- A local elementary school is in the direct flight path of Oakland Troy Airport.
    - School is scheduled to be replaced with Condos in 2024.
- Although the likelihood of an airplane accident is remote, the potential consequences could be devastating.
- Emergency response plans and preparedness should be in place to address this potential risk.

Pipeline Rupture

- Additional emergency response, manpower, and training are needed to address potential hazards, including the risk of a pipeline rupture.

High Winds:

- High winds parallel to Fourteen Mile Road cause major property damage in that area, requiring mitigation measures.

Aging Infrastructure:

- Sewer and water main lines in the City are over 30 years old, putting them at risk for failure and infrastructure failure.
- The water main under the high school poses a potential risk, necessitating contingency plans for evacuation and continued education in case of failure.
    - All the schools are going through renovation over the next three years. High School water main has been removed as part of the renovation is no longer an issue.

Flood

- Elmsford Street: floods routinely. Homes/basement flooding.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Update Building Security in City Hall	
Year Initiated	2023
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	City of Clawson Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Police Department is in the City Hall.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Clawson
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and

	underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide additional hazmat equipment to be made available to area communities in situations where mutual aid is needed.	
Year Initiated	2005
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Local funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide additional hazmat equipment to be made available to area communities in situations where mutual aid is needed.
2023 Plan Update Status and Changes in Priority	Ongoing

Provide specific training, additional manpower and equipment to be used in the event of a plane crash in the vicinity of local elementary school.	
Year Initiated	2005
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	Police and Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Transportation Accidents: Air
Action/Implementation Plan and Project Description, if applicable	Provide specific training, additional manpower and equipment to be used in the event of a plane crash in the vicinity of local elementary school.
2023 Plan Update Status and Changes in Priority	Ongoing: The School will be demolished next year and will be replaced by condos in the coming years.

Review and update evacuation plan for the two-story Mission Point Health System and 15-story Senior Citizen Complex.	
Year Initiated	2017
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	Clawson Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Review and update evacuation plan for the two-story Mission Point Health System and 15-story Senior Citizen Complex.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Upgrade generators in the city hall and fire hall, the 2 named command posts for emergencies.	
Year Initiated	2012
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown. Upgraded generators to PD & FD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Upgrade generators in the city hall and fire hall, the 2 named command posts for emergencies.
2023 Plan Update Status and Changes in Priority	Completion date unknown. Upgraded generators to PD & FD

Removed Mitigation Actions

Hire additional manpower so that there is a sufficient level of preparedness to respond to major emergencies.	
Year Initiated	2005
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	City of Clawson
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	Low

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Financial limitation. 2023 Update: Remove this action

Include the department of public works in the OakWin Radio System.	
Year Initiated	2012
Applicable Jurisdiction	City of Clawson
Lead Agency / Organization / Position	City of Clawson, County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents:

	Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Remove

13. Commerce Township

Community Profile and Description

Commerce Township is a suburb of Detroit, and the Huron River runs mostly north-south through the township. As of the 2020 U.S. Census, the population is 43,058. The total land area of Commerce Township is 29.8 square miles.

Hazards

Tornado Incidents:

- A tornado touching down in the Township poses a significant threat to all citizens.
- Mobile home park residents located west of Wixom Road, between Loon Lake and Glengary Roads, are particularly vulnerable.

Floodplain and Increased Flooding:

- Several buildings are located in a floodplain area.
- There has been increased flooding of Hayes Creek recently, requiring flood mitigation measures.

HAZMAT Incidents:

- Three companies in the Township are identified as potential hazmat risks to the community.
- Preparedness and response plans should be in place to address potential hazmat emergencies.

Multi-Vehicle Accidents:

- The likelihood of multi-vehicle accidents on M-5, Union Lake Road, or Haggerty Road is identified as a hazard.
- Traffic safety measures and accident prevention strategies should be implemented.

Securing Police and Fire Stations:

- Securing police and fire stations with cameras and fencing is a priority to protect them from vandalism or theft.

Mobile Command Vehicles:

- The Township needs mobile command vehicles for emergencies, missing children, power outages, floods, tornadoes, etc.

Radio Dead Zones:

- Radio dead zones are present in some areas, including the 3 high schools, even after changing to the OakWin Radio System.
- Installation of bi-directional antennas is a top priority to improve communication reliability.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Commerce Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Advocate for Widening Union Lake and Haggerty Roads	
Year Initiated	2012
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	Commerce Township Planning Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure to enhance safety and response
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Advocate for widening Union Lake and Haggerty Roads to 5 lanes for improved public safety and emergency vehicle access.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Still a goal, but no current construction plans are in place. 2023 Update: This is ongoing and expect much progress in 2024.

Increase staffing of Fire Department	
Year Initiated	2017
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	Commerce Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$1,350,000
Potential Funding Source	Mileage
Benefits (Loss Avoided)	Increased efficiency and safety for Firefighting and emergency mitigation
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2021
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Commerce will add career firefighters every year until all stations are staffed with at least 2 firefighters 24/7
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Install additional tornado sirens and implement an educational program that increases the public's awareness of their vulnerability to tornadoes.	
Year Initiated	
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A

Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Supply the fire department with necessary hazmat equipment.	
Year Initiated	
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2005
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Acquire Equipment to Allow Radio Communication	
Year Initiated	2012
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	

Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Acquire equipment to allow radio communication in all buildings in the Township (including schools) to improve public safety.
2023 Plan Update Status and Changes in Priority	Completed, date unknown

Acquire equipment to allow radio communication in all buildings in the Township (including schools) to improve public safety.	
Year Initiated	2012
Applicable Jurisdiction	Commerce Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Completed

Purchase water rescue equipment	
Year Initiated	2017
Applicable Jurisdiction	
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	$50,000
Potential Funding Source	Mileage
Benefits (Loss Avoided)	Emergency response to water-related emergencies
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, High Hazard Dams, Transportation Accidents: Marine
Action/Implementation Plan and Project Description, if applicable	Purchase of rescue boat for all inland lakes
2023 Plan Update Status and Changes in Priority	This goal has been accomplished.

14. City of Farmington

Community Profile and Description

Farmington was the site of three Native American trails - the Orchard Lake Trail, the Grand River Trail, and the Shiawassee Trail. Farmington was founded in 1824 by Arthur Power. As of the 2020 U.S. Census, the population is 11,597. The total area of the City of Farmington is 2.66 square miles.

Hazards

Fire and Tornado Incidents:

- The possibility of a fire or tornado hitting high-rise senior citizen facilities creates specific concerns, particularly for the fire department.
- Mitigation measures and emergency response plans are needed to address these potential hazards.

HAZMAT Incidents:

- Two companies within the city present hazmat risks to the community.
- Specific training with other communities in large-scale emergencies is requested to enhance preparedness.
- Farmington has three (3) SARA Title III facilities within its jurisdiction. These facilities are near residential areas and schools. Because of their locations, an incident at one of these facilities would have severe impact on surrounding homes, businesses, and schools.

Flooding Incidents:

- The Valley View Condos, situated along a river in a low-lying area, are at risk of flooding.
- The Warner Farms subdivision also experiences flooding during frequent or heavy rainfall.
- Flood mitigation measures are required to address these flooding issues.
- The Rouge River runs through the City of Farmington. The Shiawassee Park and surrounding homes and condo complexes are within the rivers' floodplain. When the river floods, it displaces vehicles and residents.

Fog Incidents:

- Farmington has low laying water sources capable of producing fog in proper circumstances. Dense fog can make travel on M5 or Grand River dangerous.

Senior Living Facility:

- The senior high-rise facility with 153 apartments faces challenges during power outages.
- The building's generator only heats one common area and powers the elevators, leaving many residents nowhere to go.
- The complex has enlisted a generator company on standby to improve resilience during power outages.

Terrorism:

- Farmington is home to two public schools and one private school. There have been many acts of school violence, and there is no prediction on where assaults occur.

Cyber Security:

- Police departments and municipalities are targets for cybercrime from nefarious hackers.

Infrastructure Failure

- Within Farmington there are DTE Power substations. An incident at one of these substations could result in the loss of power. Although Farmington Public Safety Department has a generator, the loss of infrastructure services would impact the resident and our ability to serve them.
- There are two electric wastewater lift pumps that prevent contaminated water from spilling into the Rouge River. A failure of one of these pumps could result in contaminated water spilling into the river.
- The City also has a 3-million-gallon wastewater retention/pump building that prevents waste from backing up into homes during an outage.

Invasive Species

- The Rouge River runs through the Shiawassee Park and transports a number of native and invasive species of insects and foliage. The city is currently experiencing a possible infestation of Spongy Moths in the Rouge River basin.

Major Transportation Incidents

- M5 and Grand River Avenue are both major thoroughfares for private and commercial vehicles. An incident on either of these roads would impact travel. These trunklines also transport hazardous materials and incident on one of these roads could tax local emergency services.

Socio-Political Hazards

- Farmington has a prosperous downtown. This social gathering district is advantageous to those who want to make their voices heard. Farmington has experienced socio-political rallies and with these types of functions comes supporting and counter-supporting points of view. Mitigating these incidents can tax resources.

Structural Fire

- The downtown business district has row-stye construction businesses. These buildings share a common wall and fires within these districts can be difficult to contain. Many of these buildings are very old and have experienced renovations.

Weapons of Mass Destruction

- Farmington is near the City of Detroit, which could be a target for WMD attack. Due to its proximity, Farmington could experience the effects of a WMD not specifically intended for the City.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Farmington
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Storm Sewer Improvements	
Year Initiated	2017
Applicable Jurisdiction	City of Farmington
Lead Agency / Organization / Position	Farmington DPW
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Drought, Extreme Heat, Flooding, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Storm sewer improvements - reduce flooding, automatic transfer switch and standby generator at 9 Mile Booster stream bank. Stabilization/restoration bridge inspections.
2023 Plan Update Status and Changes in Priority	Ongoing

Additional New/Reserve Firefighters	
Year Initiated	2017
Applicable Jurisdiction	City of Farmington
Lead Agency / Organization / Position	Farmington DPS
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$7,000 per new firefighter
Potential Funding Source	Budgeted
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire
Action/Implementation Plan and Project Description, if applicable	Hiring of new additional reserve firefighters for fire suppression and large-scale incidents.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Provide regular hazmat training to members of the fire department.	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Provide additional training for responding to mass emergencies.	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Need for Bi-Directional Antennas for Dead Zones	
Year Initiated	2012
Applicable Jurisdiction	City of Farmington
Lead Agency / Organization / Position	

Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Radio dead zones are still present even after changing over to the OakWin Radio System. Most of the dead zones are in the 2 high schools and nursing homes. The need for bi-directional antennas is a top priority. Note: The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action.
2023 Plan Update Status and Changes in Priority	Completed

15. City of Farmington Hills

Community Profile and Description

Farmington Hills is the second largest city in Oakland County in the state of Michigan with a total area of 33.31 square miles. As of the 2020 U.S. Census, the population was 83,986. It is part of the upscale northwestern suburbs of Metropolitan Detroit, approximately 20 miles northeast of downtown Ann Arbor. It is a diverse community that embraces cultural diversity; Farmington Hills residents speak more than 80 different languages.

Farmington Hills consistently ranks as one of the safest cities in the United States, as well as in the state of Michigan. In 2010, the area ranked as the 30th safest city in America. Farmington Hills also ranks as the 36th highest-income place in the United States with a population of 50,000 or more and ranks as Americas 14th best city to live in by 24/7 Wall St.

Farmington Hills operates under the Council-Manager form of government, the most successful and fastest-growing form of government in U.S. municipalities today.

Farmington Hills is a world-class business center containing 3,500 businesses from start-ups to International Fortune 500 companies. It's centrally located near three major highways in South Oakland County, and shares a border with Wayne County. There are three international airports within a 35-minute drive.

Hazards

Flooding Incidents:

- The City has a history of flooding problems, with areas near Fourteen Mile and Halsted Roads and Grand River Avenue at Ten Mile Road being of greatest concern.
- Debris management and streambank erosion control are needed to address flood-related hazards, including 500 road and stream crossings.

Tornado and High Wind Incidents:

- Tornadoes and high winds present risks to the entire City, with manufactured homes particularly vulnerable to tornadoes.
- Debris mitigation for a 3-million-gallon elevated water tank is necessary to address high winds.

Severe Winter Storms: Snow and Ice Storms:

- Frequent power outages during winter storms are a problem in the community, especially along major highways including I-696, M-5, and I-275.
- Tree trimming and debris management are needed to increase visibility and improve emergency response.

Earthquake Incidents:

- Historical structures are vulnerable to earthquake incidents, and power outages may occur.

Water Infrastructure:

- The City added a 3-million-gallon water tower at 27245 Halsted Rd, operational since June 2014, and a 2.8-million-gallon storage tunnel under Middlebelt Road for excess sewage or water runoff during wet weather.

Hazmat Incidents:

- Numerous gas and oil pipelines running through the City pose a potential hazmat hazard.
- Several buildings containing hazardous materials within the City could be potential sites for hazmat incidents.
- Chemical companies like PMB, Town & Company, and The Hawk pose additional risks, as well as onsite fuel facilities.

Active Shooter Incidents:

- Vulnerable locations for active shooter incidents include the community center, municipal facilities, and religious institutions.

Wildfire and Invasive Species:

- Large, wooded areas like Heritage Park and historically designated infrastructure are vulnerable to wildfire.
- Invasive species impact parks and corridors, affecting natural plants.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Stabilize Culvert and Bridge End Sections	
Year Initiated	2023
Applicable Jurisdiction	Farmington Hills
Lead Agency / Organization / Position	Farmington Hills Department of Public Works
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Hazard Dams, Earthquake, Flooding, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Stabilize culvert and bridge end sections, head walls, wingwalls, etc. for scour, erosion, and potential flood damage
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Address Need for Back-Up Power for Critical Facilities	
Year Initiated	2023
Applicable Jurisdiction	Farmington Hills
Lead Agency / Organization / Position	Farmington Hills Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3, 4, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	High

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Address Need for Back-Up Power for Critical Facilities
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Facilities Hardening for Active Shooter	
Year Initiated	2023
Applicable Jurisdiction	Farmington Hills
Lead Agency / Organization / Position	Farmington Hills Police Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 3, 4, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Active Shooter/Active Assailant
Action/Implementation Plan and Project Description, if applicable	Facilities Hardening for Active Shooter
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Farmington Hills
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5

Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Address Flooding Problems Caused by Choke Points	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	City of Farmington Hills Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/GMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Address flooding problems caused by choke points in the Rouge River or the failure of the sewer system and flooding that results in road closures or residential/business damage.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The sewer system back up was addressed with a 3/4 of a mile x 8 ft. tunnel for sewage retention. This project was completed in 2017. The Minnow Pond at 14 and Halsted is slated to be completed during the next 5-year cycle. 2019 Update: Completed - The Minnow Pond at 14 and Halsted is slated to be completed during the next 5-year cycle. 2023 Update: Ongoing

Study the Feasibility of Installing Additional Entrances and Exits to/from I-696	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	City of Farmington Hills Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance infrastructure to promote safety and emergency vehicle access
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Study the feasibility of installing additional entrances and exits to/from I-696 to improve emergency vehicle access to accident sites.
2023 Plan Update Status and Changes in Priority	On Hold

Seek Funding to Provide Boosters to the OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	City of Farmington Hills Central Services, County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase communication capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek funding to provide boosters to the OakWin Radio System to eliminate or reduce dead spots inside and outside of buildings.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Ongoing / In process - Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county.

Emergency Water Main Tie Ins	
Year Initiated	2017

Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	City of Farmington Hills Department of Public Services
Supporting Agencies/ Organizations	GLWA
Applicable Goal(s)	1, 2, 3, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	$3 million or $1 million each
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Water loss to the community and region
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Early 2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Emergency water main tie ins to neighboring communities. One to Southfield, one to West Bloomfield, and one to Novi.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing

Completed Mitigation Actions

Upgrade or Replace Current Communication System	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes,

	Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Upgrade or replace the current communication equipment used by the public safety departments and community alert system.
2023 Plan Update Status and Changes in Priority	Complete

Provide Backup Power to Operate Traffic Signals and Life Stations	
Year Initiated	2005
Applicable Jurisdiction	City of Farmington Hills
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Wildfires, Infrastructure Failure,
Action/Implementation Plan and Project Description, if applicable	Provide backup power to operate traffic signals and lift stations at times of power outages. Reduce the potential hazards and property damage due to flooding, including traffic accidents, sanitary backups and loss of commerce caused by power outages.
2023 Plan Update Status and Changes in Priority	Completed

16. City of Ferndale

Community Profile and Description

Ferndale was incorporated into a village in 1918 and then incorporated into a city on March 7, 1927. Native Americans were early inhabitants of the area now known as the City of Ferndale. Ferndale is well known in the Detroit area for its LGBT population and progressive policies. As of the 2020 U.S. Census, the population is 19,190. The total area of the City of Ferndale is 3.88 square miles.

Hazards

HAZMAT Incidents:

- Potential for hazmat accidents involving trucks, trains, or local businesses exists.
- Woodward Avenue, Eight Mile Road, and I-696 are primary routes for large trucks carrying hazardous materials through the City.
- Train derailments with chemical spills risk neighborhoods along the tracks.

Rail Yard Hazards:

- A rail yard in the City has significant storage of hazardous materials, and a rail accident at Motor Yard CN rail is possible.

Local Business Risks:

- Multiple local businesses pose potential risks due to the nature of products stored at their facilities.
- The fire department may not be adequately equipped to respond to hazmat accidents at some sites.

Electrical Power Loss and Tornado Incidents:

- The loss of electrical power due to severe weather or infrastructure failure is a concern.
- The threat of tornadoes poses risks to the community.

Sewer and Stormwater System Concerns:

- Ferndale's sewer and stormwater systems cannot handle heavy rain, leading to flash flooding.

Water Infrastructure Risk:

- The water system is well maintained, but sections have very old mains.

Invasive Species:

- Rats and leptospirosis are invasive species of concern.

Airport and Helicopter Traffic:

- The City is under the flight path for metro/city airports, with contact helicopter traffic present.

Thunderstorms, Hail, and Lightning:

- Our community has about 12k trees of varying height and diameter in ROW. They are especially vulnerable to the increasing storms that generate high winds and heavy precipitation. When limbs and trees fall, they damage private property.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Ferndale
Lead Agency/ Organization	Fire Department
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Tree Inspection and Maintenance	
Year Initiated	2016 (Action was identified and added during the 2023 update)
Applicable Jurisdiction	City of Ferndale
Lead Agency/ Organization	Department of Public Works
Supporting Agencies/ Organizations	City of Ferndale
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low, $65,000
Potential Funding Source	Local Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Lower insurance claims, safety issues and down utility lines.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	• High Winds/Severe Winds • Ice and/or Sleet Storms • Thunderstorms (Lightning)

Action/Implementation Plan and Project Description	Use arborists to identify and inspect trees belonging to the City, maintain records and use the data to prioritize a work plan for addressing the backlog of tree maintenance.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Ongoing Mitigation Actions

Conduct Ongoing Training for Public Safety Personnel	
Year Initiated	2012
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	FD/Hazmat PD/Civil Disturbance
Supporting Agencies/ Organizations	City Hall
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	City General Fund
Benefits (Loss Avoided)	Medium ($10,000 to $100,000)
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Continual
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway, Transportation Accidents: Rail, Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Conduct ongoing training for public safety personnel to be prepared for hazmat incidents or civil disturbances in the community.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Always ongoing. 2023 Update: Ongoing

Generator for DPW/DPS	
Year Initiated	2017
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Continuity of operations
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Generator for the DPW/DPS to keep the gas pumps, mechanics, sign shop, communications, phones, radios.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Water pump stations have backup power, which were installed in 2016-17. Need to obtain generators for other facilities/assets that do not have secondary power.

Narrow Banded Radio	
Year Initiated	2017
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	DPW
Supporting Agencies/ Organizations	Fire Rescue/Emergency Services
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	City General Fund
Benefits (Loss Avoided)	Immediate communication with DPW in the field
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Narrow banded radio for DPW/DPS
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing: Police and Fire are transitioning to the new Oakland County radio system. DPW uses a Verizon-based radio system. Ongoing action is to connect and enable DPW to communicate with Fire and Police.

Completed Mitigation Actions

Equip Fire Department with Bio-Chemical Suit	
Year Initiated	2005
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies:

	Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Store an Adequate Supply of Bottled Water	
Year Initiated	2005
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Store an adequate supply of bottled water to be distributed to citizens, particularly the elderly, when the water supply and electricity are lost due to a power outage from ice or windstorms.
2023 Plan Update Status and Changes in Priority	Completed

Obtain Backup Generators for Police Headquarters and City Hall	
Year Initiated	2012
Applicable Jurisdiction	City of Ferndale
Lead Agency / Organization / Position	City of Ferndale
Supporting Agencies/ Organizations	DPW/FD/PD
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	City general fund
Benefits (Loss Avoided)	Loss of 911 PSAP averted
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Generator installed, maintains city hall, police dispatch, and whole department. Allows for local EOC (not set up yet). Generator just completed. 2023 Update: Completed

17. Village of Franklin

Community Profile and Description

The community was founded in 1825 and named after Benjamin Franklin in 1831. Franklin was incorporated into a Village in 1953. The community is known for large, estate-style homes situated on ravines, as well as its vintage downtown and a nearby cider mill. As of the 2020 U.S. Census, the population is 3,139. The total area of the Village of Franklin is 2.66 square miles.

Hazards

Natural Hazards:

- The City has experienced significant damage from tornadoes and high winds, leading to the need for debris removal.
- Ice storms pose a significant threat, resulting in extended power outages, fallen trees, and power lines.
- Flooding on Fourteen Mile and Franklin Roads is a concern.

Fire Safety:

- The lack of fire hydrants in the downtown district is a major concern in the event of a major fire.

Pipeline Rupture:

- The potential rupture in the 12-inch pipeline along Fourteen Mile Road and Inkster is a local concern.

Infrastructure Vulnerabilities:

- The community's water supply relies on individual private wells, and wastewater disposal depends on grinder pump systems; these are both at risk during electrical power failures.

At-Risk Populations:

- The elderly population in Ferndale is large and may require assistance during an evacuation.

Snow and Ice-Related Hazards:

- Dead and untrimmed trees threaten electrical utilities and road blockages during severe snow and ice incidents.

Flood-Related Hazards:

- The community's tributary to the Rouge River can cause flooding to roadways and residential areas during severe rain events.

HAZMAT Incidents:

- The proximity of a gas station to the fire department and a river road presents risks for potential HAZMAT incidents.

Transportation Incidents:

- Transportation incidents on Community Road can disrupt traffic flow.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Remove Debris from Rogue River Tributary within Village Jurisdiction	
Year Initiated	2023
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	> $10,000
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Prevention of Flooding impacts
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Remove Debris from Rogue River Tributary within Village Jurisdiction
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Remove Dead Trees and Trim Adjoint to Roadways	
Year Initiated	2023
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	> $100,000
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Transportation Impacts
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Remove dead trees and trim existing adjoint to roadways to divert transportation impacts during severe weather impacts
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Franklin
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for	High

each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Acquire Equipment to Assist with Debris Removal	
Year Initiated	2012
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase capabilities to recover from disaster
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Acquire equipment to assist in debris removal following tornado and/or high windstorms.

2023 Plan Update Status and Changes in Priority	Ongoing

Acquire Equipment to Assist in Dead and Live Tree Removal	
Year Initiated	2012
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase capabilities to recover from disaster
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Acquire equipment to assist in dead and live tree removal around power lines.
2023 Plan Update Status and Changes in Priority	Ongoing

Dead Tree Removal	
Year Initiated	2017
Applicable Jurisdiction	Village of Franklin
Lead Agency/ Organization / Position	Franklin Police
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 5 Improve and support public and private organizational response capabilities. Prevention and reduction of damage to public and private property and infrastructure.
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Severe Winter Storms, Infrastructure Failure, Transportation Accidents: Highway
Action/Implementation Plan and Project Description	Large trees that will fall and cause power line issues. These dead trees need to be cleared from power lines.
2023 Plan Update Status and Changes in Priority	Ongoing

Seek Funding for Purchasing Generator	
Year Initiated	2012
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Seek funding for purchase of a generator for use/installation in local church or school shelter.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Provide Hazmat Detection Equipment	
Year Initiated	2005
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide hazmat detection equipment to the police and fire departments.
2023 Plan Update Status and Changes in Priority	Completed

Upgrade Existing, or Purchase New Equipment	
Year Initiated	2005
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Unknown, but complete
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Upgrade existing, or purchase new, equipment that will provide better communication within the departments and between communities.

2023 Plan Update Status and Changes in Priority	Completed

Acquire Equipment to Boost Radio Communication	
Year Initiated	2012
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Village of Franklin
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Acquire equipment to boost radio communication in all buildings.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Partially completed with new booster and FD hall. 2023 Update: Completed

Generator	
Year Initiated	2017
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	Franklin Police Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 6

Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek funding for purchase and installation of a new generator for the Village of Franklin offices. Currently, the Village offices do not have generator power should the power go out, which will negatively affect village services.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Completed

Removed Mitigation Actions

Maintain and Emergency Supply of Water	
Year Initiated	2005
Applicable Jurisdiction	Village of Franklin
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed (date unknown)
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Maintain an emergency supply of water that can be distributed to those residents who lose electric power and are unable to use their wells.
2023 Plan Update Status and Changes in Priority	Removed

18. Groveland Township

Community Profile and Description

Groveland Township was established in 1835. As of the 2020 U.S. Census, the population is 5,912. The total area of Groveland Township is 36.1 square miles. There are two unincorporated communities with the Township, Austin Corners and Groveland Corners.

Hazards

Tornado and High-Wind Incidents:

- The entire community faces a significant threat from tornadoes and high-wind incidents.
- Residents of the manufactured home park off Dixie Highway and Oak Hill Road are particularly vulnerable.

Flooding:

- The Township has numerous flood-prone areas, leading to frequent road closings.
- McGinnis, Perryville, Jossman, and Tripp Roads are among the most affected by floods.

Inaccessible Locations:

- With over 4,800 acres of grasses and shrubland, many remote locations in the Township are difficult for emergency vehicles to access.

HAZMAT Incidents:

- Hazmat incidents involving trucks traveling on I-75, M-15, and Dixie Highway are a potential concern.

Special Events:

- The annual Renaissance Festival held along Dixie Highway poses the potential for civil disturbances or other emergencies.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end.

During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.

- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Groveland Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and

	underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Ongoing Training to Assure Highest Quality Response	
Year Initiated	2012
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	Groveland Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide ongoing training to assure the highest quality response to Township residents.
2023 Plan Update Status and Changes in Priority	Ongoing. We have reviewed our situation and have concluded we have trained in enough situations the staff can react to all but the most extreme conditions. In that case, we know we can call on mutual aid.

Camp Tamarack Park Evacuation Plan	
Year Initiated	2017
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	Groveland Township Fire Department

Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	Very limited
Potential Funding Source	Local budget
Benefits (Loss Avoided)	Resident protection from severe weather by having an evacuation plan and predetermined shelters in place.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Develop an evacuation plan for the Camp Tamarack Park. Meet with Camp leadership to determine needs and how plan would be utilized, develop transportation plan to move campers and verify shelter(s) locations and ability to meet needs.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing - Camp Tamarack has added additional security and plans to shelter in place unless absolutely necessary

Completed Mitigation Actions

Provide adequate equipment and training necessary to deal with hazmat accidents, particularly on I-75, M-15 and Dixie Highway.	
Year Initiated	2005
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	

Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Provide Funding to Purchase a Brush Truck	
Year Initiated	2005
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Wildfires
Action/Implementation Plan and Project Description, if applicable	Provide funding to purchase a brush truck to assist in fighting fires in back country areas that are not easily accessible to current emergency equipment.
2023 Plan Update Status and Changes in Priority	Completed

Install at Least 1 Additional Tornado Siren	
Year Initiated	2005
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Removed Mitigation Actions

Raise and improve roads that are susceptible to flooding.	
Year Initiated	2005
Applicable Jurisdiction	Groveland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed

19. City of Hazel Park

Community Profile and Description

The City of Hazel Park was incorporated in 1941. The City's motto is "the friendly city." As of the 2020 U.S. Census, the population is 14,983. The total area of the City of Hazel Park is 2.82 square miles.

Hazards

HAZMAT Incidents:

- The presence of companies storing hazardous materials and trucks carrying such materials through the city requires additional equipment and training to respond to potential hazmat accidents.

Fire Hazards:

- Hazel Park has two older structures that are significant fire hazards, and the lack of high-angle rescue equipment could complicate firefighting efforts.

Traffic Accidents:

- The S-curve on I-75 through the city and increased traffic flow raise concerns about traffic accidents.

Power Outages:

- Thunderstorms and high winds can cause power outages in the city.

Overhead Utility Lines:

- The Fire Department's emergency vehicle ramp has utility lines overhead, necessitating the replacement of these lines with underground utilities.

Thunderstorms, Lightning, and Hail:

- Thunderstorms can lead to trees falling on power lines and potential power failures.

Flood-related Hazards:

- Flash flooding on I-75 between 9 Mile and I-696 during heavy rain events poses an issue, especially as the city relies on an old drainage system.

Active Shooter Incidents:

- The Amazon package center in the Commerce Center and the LG facility have experienced shooting incidents, raising concerns about active shooter incidents.

HAZMAT Incidents:

- Two separate lithium battery manufacturers, Akasol and LG, at the Commerce Center, pose large-scale HAZMAT risks. The K.C. Jones Plating facility in a residential area also facilitates hot salt plating.

Major Transportation Incidents:

- The 8-Mile overpass bridge at I-75 is structurally challenged, and incidents like semi-tractor spills and the 9-mile Bridge fire and collapse in 2011 have occurred.
    - Immediate attention is required for these transportation issues.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Bury power lines / trim trees	
Year Initiated	2023
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	DTE
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms
Action/Implementation Plan and Project Description, if applicable	Move Power lines to below ground / trim trees in areas underground is not feasible
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Mitigate Lithium Battery Incidents	
Year Initiated	2023
Applicable Jurisdiction	City of Hazel Park / Hazel Park Fire Department
Lead Agency / Organization / Position	Hazel Park Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	HSGP
Benefits (Loss Avoided)	Life and Building Safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	ASAP
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Lithium Battery incidents, train and equip firefighters to safely extinguish and mitigate lithium battery incidents, Transportation Accidents: Highway
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Hazel Park
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Fire Department with Additional Training and Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	City of Hazel Park Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide the fire department with additional training and rescue equipment to deal with hazmat accidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Financial Constraints. 2023 Update: Ongoing

Move overhead wires above Fire Department to underground	
Year Initiated	2017
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	City of Hazel Park Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Remove overhead wires and replace with underground system
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

The City of Hazel Park will continue to implement the same mitigation strategies identified in 2005.	
Year Initiated	2012
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	

Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Structural Fires
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	RECOMMENDED FOR REMOVAL

Equip Fire Department with High Angle Rescue Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	City of Hazel Park Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Structural Fires
Action/Implementation Plan and Project Description, if applicable	Equip the fire department with high angle rescue equipment to assist in the fighting of building fires.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Financial Constraints. 2023 Update: REMOVE

Hire Additional Fire Inspectors	
Year Initiated	2005
Applicable Jurisdiction	City of Hazel Park
Lead Agency / Organization / Position	City of Hazel Park Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)

Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Financial Constraints. 2023 Update: REMOVE

20. Highland Township

Community Profile and Description

Highland Township is a suburb of Detroit and was founded in 1835 by pioneer families. As of the 2020 U.S. Census, the population is 19,172. The total area of Highland Township is 35.8 square miles and nearly one quarter of the land in Highland Township is owned by the State of Michigan as part of the Highland Recreation Area. There are six unincorporated communities in Highland Township: Clyde, East Highland, Hickory Ridge, Highland, Seven Harbors and West Highland.

Hazards

Power Outage Risk:

- The rural area with over 2,600 acres of forest land is vulnerable to power outages caused by falling trees and limbs during ice or windstorms, leading to hardships for residents and local businesses.

Tornado Incidents:

- Manufactured home communities, including Highland Hills, Highland Greens, and Hickory Ridge, are at greatest risk in the event of a tornado, requiring specific attention to their safety.

Commercial Truck Traffic:

- M-59 (Highland Rd.) is the main thoroughfare and access to US-23, resulting in a high volume of commercial truck traffic, including hazardous materials.

Train Derailment Hazard:

- The risk of a train derailment could result in a hazardous material spill in the area.

Environmental Contamination:

- With numerous lakes, streams, ponds, water retention areas, and wetlands covering over two square miles, there is a potential risk of environmental contamination.

Water Supply System:

- Around 15-20% of the Township is covered by a water supply system (wet or dry hydrants), but access to many lakes in previously developed areas is limited or impossible, requiring careful planning for water access during emergencies.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Highland Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits.

	• Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Increase Manpower Available	
Year Initiated	2005
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	Highland Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	Increase manpower available to respond in the event of an emergency in the Township.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. We currently staff (2) personnel on duty 24/7 90% of the time, with a minimum of at least (1) person, part time staff. Staff is increased utilizing Paid on Call personnel. All Fire Department coverage staff is Fire Fighter I&II, and EMT-B or higher. 2023 Update: Ongoing

CERT Training	
Year Initiated	2012
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	Highland Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5, 7
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	CERT (Citizen Emergency Response Team) training/recruitment to assist in the event of a local or regional emergency.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. While it has been discussed repeatedly, there has been no progress on the development of a CERT program. 2023 Update: Ongoing

Oakland County IMT	
Year Initiated	2017
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	Highland Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	Fire Chief to join the Oakland County Incident Management Team.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated

	2023 Update: Ongoing, always looking to add qualified candidates.

Completed Mitigation Actions

Create Emergency Back-up Communication System	
Year Initiated	2005
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	Increase communication capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure, Structural Fires
Action/Implementation Plan and Project Description, if applicable	Create an emergency back-up communication system to be used during ice and windstorms and the resulting power outages.
2023 Plan Update Status and Changes in Priority	Completed

Removed Mitigation Actions

Install 1 Additional Tornado Siren	
Year Initiated	2005
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	Low

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Structural Fires
Action/Implementation Plan and Project Description, if applicable	Install 1 additional tornado siren in the northeast section of the Township.
2023 Plan Update Status and Changes in Priority	2017 Update: On Hold. Unknown status due to a change in FD administration, and lack of documents or information regarding any changes. 2023 Update: REMOVE

Hazard Assessment Position	
Year Initiated	2017
Applicable Jurisdiction	Highland Township
Lead Agency / Organization / Position	Highland Township Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increase preparedness and planning capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Hire a new position specifically tasked with hazard assessment.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Remove

21. Holly Township

Community Profile and Description

Our area is rural & zoned residential (52%), Ag/Recreation/Park (40%) and Gov./Industrial/Commercial (8%). We have large agricultural buildings such as barns, feed storage, Ag fuel/chemical storage and large indoor riding arenas with stables. Only 12% of our area is protected by hydrants. Other occupancies are Camp Grounds that serve 2500 campers daily, a MI State Park with overnight camping, two beach areas, several recreational lakes and picnic activity areas with miles of hiking trails, 2 schools, 2 low income trailer parks with 650 housing units, 15 nursing /assisted living homes, several daycares, an entertainment venue with daily attendance in excess of 25,000, and the large, busy and expanding 1000 acre Veterans Administration National Cemetery that conducts up to 30 services and burials a day. Residential housing is growing. In 2021 housing developments have added an additional 150 residences with over 250 projected for 2022. The new homes added in 2022 and continuing in 2023 are an expansion of a mobile home park targeting seniors and low-income residents. A planned convalescent home with 91 beds is in development for and residential development of 300 new living units for 2023-2025.

Hazards

Tornado Incidents:

- Tornadoes are a significant threat to all residents, with special concern for those in the Holly Hills manufactured home park.
- Township officials desire additional warning sirens to improve alerting capabilities during tornado events.

Flooding and Wetlands:

- With over 4,300 acres of wetlands, flooding can be a problem in the Township. Road Commission efforts and seeking grants for road elevation have helped mitigate flooding in certain areas, but more actions are needed.

Renaissance Festival Concerns:

- The annual Renaissance Festival attracts a large crowd, making it potentially susceptible to civil disturbances or mass casualty events. The lack of an evacuation plan and the close proximity of old buildings pose fire risks.

Natural Gas Pipelines and High-Voltage Wires:

- The presence of 36" and 18" natural gas pipelines and pumping stations raises concerns.

- Efforts to get residents on natural gas are ongoing to standardize heating sources. High-voltage wires pose a hazard, and efforts to bury lines are underway.

Road Conditions and Flooding:

- Improving road quality and maintenance is a priority, especially in areas susceptible to overland flooding.

Communication Tower and Culvert Concerns:

- The communication tower could be a potential target for disruption. Aging and inadequate culverts are major concerns, and a washout around a culvert previously resulted in a train derailment.

Hazmat Accidents:

- Grange Hall Road, designated as a truck route, presents potential hazmat accidents, particularly in transit between I-75 and US-23.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Holly Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Public Safety Department and Township Officials with Training	
Year Initiated	2005
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	North Oakland County Fire
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Provide the public safety department and Township officials with training regarding a potential mass casualty event.
2023 Plan Update Status and Changes in Priority	Ongoing at public fire board meetings, presence at Township Board and planning commission meetings.

Provide Funding to Pave Falk and Rood Roads	
Year Initiated	2012
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Holly Township and Road Commission of Oakland County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide funding to pave Falk and Rood Roads for improved emergency services access in the event that a train derailment would block major road(s) entering Holly Township. Rood Road - increase ingress and egress for the High School.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. They are pursuing funding for these roads. 2023 Update: Ongoing. They are pursuing funding for these roads.

Obtain Funding to Improve Grange Hall Road, Holly Road and Other Roads	
Year Initiated	2012
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Holly Township, Road Commission for Oakland County
Supporting Agencies/ Organizations	N/A

Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Obtain funding to improve Grange Hall Road, Holly Road and other roads in Holly Township.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. North Holly Road is complete, but other roads are ongoing. Setup a gravel road plan to add gravel (300,000 pounds) to roads in the NW quadrant. First time in 20 years that this is being done. 2023 Update: Obtain funding to replace culvert on Kurtz road that has had its weight limit reduced. Now unsafe to drive emergency vehicles adding 3 mile and 7 minutes to response time to Western Township residents.

Seek to Increase Communication with Other Units of Government	
Year Initiated	2012
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Township Supervisor
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek to increase communication with other units of government during an emergency response situation. Improve communications with surrounding counties, townships, cities or villages for fire and police departments. Develop a means of communicating with Genesee County which does not use the OakWin Radio System.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Oakland County has transitioned to a new radio system, which is now integrated into the Michigan Public Safety Communications System, and will benefit the entire county.

Implement Fire Mitigation Efforts for the Renaissance Festival	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	North Oakland County Fire
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation, Seek ways to require property owner to fund improvements.
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fires

Action/Implementation Plan and Project Description, if applicable	Fire mitigation for the Renaissance Festival because buildings are close together and old, and there is increased attendance.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing. Improve water supply to meet Needed Fire Flow, i.e., water supply on Dixie Hwy or internal well. Second access to the south parking lot.

Bury Powerlines	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Township Supervisor
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Bury power lines north of Grange Hall Road
2023 Plan Update Status and Changes in Priority	Ongoing

Elevate Roads Affected by Repetitive Flooding	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Road Commission for Oakland County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	Some completed, North Holly and Fish Lake Rds., others are targeted
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Elevate road on North Holly Road. Elevate the road and add a bypass pipe to allow water to flow.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing

Reduce Speed Limit on North Holly Road	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Holly Township, Road Commission for Oakland County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Reduce speed limit on North Holly Road between Lahring and Quick Roads.
2023 Plan Update Status and Changes in Priority	Ongoing

Develop Evacuation Plan for Mobile Home Parks (Holly Hills)	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	North Oakland County Fire
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Develop Evacuation Plan for Mobile Home Parks (Holly Hills)
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: In the works, waiting for the second exit to be paved and the remainder of new housing units to be installed.

Develop Evacuation Plan for Renaissance Festival	
Year Initiated	2017
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	North Oakland County Fire
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	The annual Renaissance Festival may attract as many as 35,000 people. Although the festival is usually without incident, civil disturbance or a mass casualty event are a possibility. There is limited ingress and egress, and no evacuation plan.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Draft and partial plan in place but weak, the operator of Festive has been notified it must be strengthened and updated prior to the 2024 season.

Completed Mitigation Actions

Raise and Improve Sections of Township	
Year Initiated	2005
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Raise and improve sections of Township roads that are susceptible to flooding.
2023 Plan Update Status and Changes in Priority	Completed

Implement Additional Hazmat Training	
Year Initiated	2005
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	

Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2010 - Countywide Hazmat Team created
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Implement additional hazmat training for members of the fire department.
2023 Plan Update Status and Changes in Priority	2010 - Countywide Hazmat Team created

Install Additional Tornado Siren	
Year Initiated	2005
Applicable Jurisdiction	Holly Township
Lead Agency / Organization / Position	Holly Township
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	Life Safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed – no additional sirens are needed at this time.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed – no additional sirens are needed at this time.

22. Village Of Holly

Community Profile and Description

The Village of Holly is home to the Annual Holly Dickens Festival and to the Michigan Renaissance Festival. As of the 2020 U.S. Census, the population is 5,997. The Village of Holly has a total area of 3.04 square miles. The Village is located almost entirely within Holly Township, with a very small portion extending into Rose Township. The Village of Holly is one of the earliest railroad junctions in the State of Michigan and the department's response area is a major thoroughfare for both the Canadian National Railroad and CSX Railroad with tracks that traverse the entire response district. Many rail cars transport commercial, agricultural, and chemical products including hazardous waste, flammable liquids and/or caustic materials destined for several automotive and manufacturing plants in the metro Detroit area. Materials transported on these rail cars directly support the Chemical, Critical Manufacturing, and Defense Industrial Base sectors as identified by the Department of Homeland Security. Additionally, within the 3.04 square miles jurisdiction protected are two (2) SARA Title III hazardous material sites as well as multiple industrial plating and machinery companies utilizing numerous chemicals such as chlorine gas and various industrial acids. There are four (4) occupied structures taller than 3 stories that are target hazards. Critical infrastructure protected also includes a wastewater management facility, a public water main system (including hydrants), three (3) groundwater tanks, two (2) elementary schools, one (1) middle school, and (1) high school as well as the Holly Area Schools administrative offices and school transportation department. The Village also hosts several large (150,000 Sq Ft.) manufacturing facilities.

Hazards

Railroad Hazards:

- Rail is the primary hazard for the Village of Holly
- The presence of two railroad lines, CSX Railroad and the Lake State Railroad, pose a risk of train derailments, especially involving chemical spills. This could have devastating effects on the Village of Holly. Due to the small geographic footprint of the village, a railroad incident will impact the entire village.

Weather-Related Hazards:

- Damage from high winds, tornadoes, and thunderstorms remains a concern for the Village, particularly considering the presence of high-wire power lines that can exacerbate the impact of severe weather events.

Manufactured Home Parks and Community Center:

- The Village has three manufactured home parks, and one has an exit point only within the Village.

- The Karl Rictor Community Center could serve as a potential shelter for residents in emergencies.

HAZMAT Incidents:

- A local utility company utilizes many batteries on-site for backup purposes.
    - There is a potential risk of a hazmat incident in the event of a fire at this location.
- Wastewater Treatment Plant stores hazardous materials/chemicals onsite.

High Hazard Dams:

- Mill Pond Dam evaluated yearly. Located on the south end of the village. Minimal impacts if there were an inundation.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Study, design, and implement Mill Pond Dam Replacement or Removal: and Impact Analysis	
Year Initiated	2023
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	Local Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	TBD
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long-term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flood, High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	Public sentiment is mixed on replacing or removing.
2023 Plan Update Status and Changes in Priority	New

Add Cameras to Town Traffic System	
Year Initiated	2023
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Department of Public Works
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Life safety, protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Transportation
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	New

Develop a Transportation Plan for New Nursing Home Facility	
Year Initiated	2023
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Earthquake, Extreme Heat, Flooding, Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Opening a new nursing home soon with 71 beds. Develop a transportation plan for the new facility in the event the Village would need to evacuate the facility.
2023 Plan Update Status and Changes in Priority	New

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Holly
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Increased Community Awareness	
Year Initiated	2012
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide increased community awareness of the risk of a train vs. motor vehicle accident on the railroad tracks in the Village.
2023 Plan Update Status and Changes in Priority	Ongoing

Develop Evacuation Plans for Mobile Home Parks	
Year Initiated	2017
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Evacuation Plan for Mobile Home Parks (Holly Village and Hawaiian Gardens)
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing. The location where they will shelter will be modified in two years.

Agreement with School System for Shelter Usage	
Year Initiated	2017
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	Very limited
Potential Funding Source	Local budget
Benefits (Loss Avoided)	Protect residents by having an evacuation plan and predetermined shelters in place, most common hazard would likely be weather related
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	Medium

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Develop an evacuation plan with the School system to utilize pre-approved school buildings for shelter if needed. Meet with School Superintendent, Village Manager, Mobile Home Park Managers, and all potential stakeholders to develop a plan similar to Grovelands.
2023 Plan Update Status and Changes in Priority	Ongoing

Fire Station Generator	
Year Initiated	2019
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	Village of Holly Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($30,000)
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	To save lives and property by being able to keep the fire station and its tools, equipment and apparatus able to respond.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years) - 2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure,

	Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	There is no generator at the fire station. Being able to have backup power in the event of an outage will allow the fire department to keep critical equipment and resources powered up and ready for response. In addition, personnel will be able to stay on-site during outages.
2023 Plan Update Status and Changes in Priority	Ongoing - the generator has been purchased. Currently waiting for it to be installed

Completed Mitigation Actions

Provide Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Provide additional tornado sirens to serve all areas of the Village.
2023 Plan Update Status and Changes in Priority	Completed

Implement a Procedure for Mutual Assistance	
Year Initiated	2005
Applicable Jurisdiction	Village of Holly
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	

Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Implement a procedure for mutual assistance from surrounding communities to respond in case of mass emergencies. We do not have sufficient resources to respond to a mass emergency, such as a train derailment, tornado or major building fire.
2023 Plan Update Status and Changes in Priority	

23. City of Huntington Woods

Community Profile and Description

The City of Huntington Woods is a suburb of Detroit. The City is known as the "City of Homes," as it consists mostly of residences. Huntington Woods was incorporated as a Village in 1926 and a City in 1932. As of the 2020 U.S. Census, the population is 6,388. The total area of the City of Huntington Woods is 1.47 square miles.

Hazards

Severe Weather Hazards:

- Thunderstorms with high winds can cause large-scale damage and power outages due to the high number of large trees and older homes in the community.
- A tornado touching down in the City poses a significant risk, especially to a local elementary school.
- High winds knocking over trees and power lines have become a major concern for residents, with past incidents causing significant damage in August 2011.

HAZMAT Incidents and Emergency Evacuations:

- The Detroit Zoo, located in the city's southeast corner, stores certain hazardous materials necessary for its operations.
    - An emergency requiring immediate evacuation of the zoo may occur.

Traffic Accidents:

- Woodard Avenue is a potential hotspot for traffic accidents, particularly during the Woodward Dream Cruise in August.

Winter Weather Hazards:

- Blizzards, heavy snow, and ice storms/sleet can create roadway hazards due to old, soft-growth trees falling.
- Extreme cold events could adversely impact the large elderly population in the community.
- Obtaining additional generators for the recreation center, which also serves as a warming center, is suggested.

Extreme Heat:

- Emergency generators are needed for all public buildings to serve as cooling centers for at-risk populations during extreme heat events.

Tree Hazards:

- A large amount of Silver Maple and softwood trees of substantial size pose risks during high wind events.
    - Mitigation efforts are required to remove the most hazardous trees.

Invasive Species:

- Japanese Knotweed is prominent and problematic in the area, requiring an eradication plan or strategy.

Major Transportation Incidents:

- A significant number of hazardous materials road-related incidents have occurred.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Recreation Center Generator for Warming / Emergency Center	
Year Initiated	2023
Applicable Jurisdiction	Huntington Woods
Lead Agency / Organization / Position	Huntington Woods Public Safety Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	$100,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Place for people to be safe
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Flooding, Severe Summer Storms, Severe Winter Storms, Tornadoes

Action/Implementation Plan and Project Description, if applicable	Recreation Center Generator for Warming / Emergency Center
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Removal of Scottwood Street Trees	
Year Initiated	2023
Applicable Jurisdiction	Huntington Woods
Lead Agency / Organization / Position	Huntington Woods Public Works Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	$240,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Removal of Scottwood Street Trees that fail during storms, improving roadways and power infrastructure
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Huntington Woods
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Generator for Recreation Center Building	
Year Initiated	2017
Applicable Jurisdiction	City of Huntington Woods
Lead Agency / Organization / Position	City of Huntington Woods Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	The building will be used as a heating and cooling shelter for the community in the event of a power outage. This building will also be designated as the local EOC.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for	High

each mitigation action during the update process)	
Hazard(s) Mitigated	Extreme Heat, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Procure generator to power 25,000 sq. ft. Recreation Center building. The City is currently taking bids on a generator to power our 25,000-sq. ft. Recreation Center building. The building will be used as a heating and cooling shelter for our community in the event of a power outage. This building will also be designated as our local EOC.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Not Completed / Partially Completed

Completed Mitigation Actions

Provide Training Specifically for Evacuation of Detroit Zoo	
Year Initiated	2005
Applicable Jurisdiction	City of Huntington Woods
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Supply Public Safety Departments with Decontamination Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Huntington Woods
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Supply the public safety departments with the necessary decontamination equipment to be used in hazmat accidents.
2023 Plan Update Status and Changes in Priority	Completed

Continue Educational Material Regarding Tornadoes	
Year Initiated	2012
Applicable Jurisdiction	City of Huntington Woods
Lead Agency / Organization / Position	City of Huntington Woods5
Supporting Agencies/ Organizations	
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. Community education on high winds and tornadoes is complete. A City web page was created with educational material. The City also provided State and County pamphlets to residents regarding severe weather safety.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Continue to provide the community with educational material regarding the dangers of tornadoes.
2023 Plan Update Status and Changes in Priority	Completed

Coordinate with County for Improvement of OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	City of Huntington Woods
Lead Agency / Organization / Position	City of Huntington Woods

Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Coordinate with the County for improvements in the OakWin Radio System to eliminate or reduce dead zones.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Completed in 2023

24. Independence Township

Community Profile and Description

Independence Township was named by one of its earliest settlers, Joseph Van Sycle, who came to the area in 1834 from Independence Township, New Jersey. As of the 2020 U.S. Census, the population is 36,686. The total area of Independence Township is 36.3 square miles. The township is home to Pine Knob Ski Resort and Pine Knob Music Theater.

Hazards

Power Outages and Vulnerable Residents:

- Power outages adversely affect the entire community, with the elderly and those dependent on private wells being the most vulnerable.
- Representatives of Independence Township expressed the need for a system to assist affected individuals during power outages, especially residents of a senior citizen assisted living facility.

Pine Knob Music Theatre:

- The Pine Knob Music Theatre attracts crowds of 15,000 people during concerts.
- Although most concert evenings have few problems, the large number of attendees poses the potential for civil disturbances.
- Township representatives addressed the need for a training program with neighboring public safety departments to handle civil disturbances at the Music Theatre.

Tornado Risks:

- A tornado could have devastating impacts on the entire Township.
- Particular at-risk areas include the manufactured home park on Mann Road at I-75 and senior citizen facilities.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Independence Township
Lead Agency/ Organization	Fire Chief
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Program to Provide Needed Supplies in Times of Power Outages	
Year Initiated	2005
Applicable Jurisdiction	Independence Township
Lead Agency / Organization / Position	Independence Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Create a program that would provide needed supplies to senior citizens in times of power outages.
2023 Plan Update Status and Changes in Priority	2017 Update: On Hold 2023 Update: Ongoing

Implement Additional Training to Address Potential Civil Disturbances	
Year Initiated	2005
Applicable Jurisdiction	Independence Township
Lead Agency / Organization / Position	Independence Township
Supporting Agencies/ Organizations	Oakland County Sherrif's Office
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest)

Action/Implementation Plan and Project Description, if applicable	Implement additional training to address potential civil disturbances at the Pine Knob Music Theatre.
2023 Plan Update Status and Changes in Priority	Ongoing

Overgrown Tree Reporting Campaign	
Year Initiated	2017
Applicable Jurisdiction	Independence Township and City of Clarkston
Lead Agency / Organization / Position	Independence Fire Department
Supporting Agencies/ Organizations	DTE Energy
Applicable Goal(s)	1, 2, 3, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	$1,000
Potential Funding Source	Local funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	By identifying overgrown and dead trees close to DTE Energy's electrical infrastructure and passing this information along to them, we will reduce the number of power outages in our community during storm and wind events
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	The Independence Fire Department would create and lead a program for reporting overgrown and dead trees near electrical power lines. This would include a public awareness campaign, including the creation and distribution of pamphlets. It would also include press release(s) and website postings. A web-based GIS application for the public to report the location and description of electrical hazards would be developed and promoted, as well. Ultimately this will lead to a safer community, with fewer power outages during thunderstorms and high wind events.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Coordinate Program with Neighboring Communities	
Year Initiated	2005
Applicable Jurisdiction	Independence Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Coordinate programs with neighboring communities to improve mutual assistance in times of mass emergencies.
2023 Plan Update Status and Changes in Priority	Complete

Continue to Advocate for 100% Outdoor Warning Siren Coverage	
Year Initiated	2012
Applicable Jurisdiction	Independence Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	
Benefits (Loss Avoided)	

Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Continue to advocate for 100% outdoor warning siren coverage for Oakland County.
2023 Plan Update Status and Changes in Priority	Completed

Generators	
Year Initiated	2017
Applicable Jurisdiction	City of Clarkston and Independence Township
Lead Agency / Organization / Position	Independence Township Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$30,000
Potential Funding Source	Grants or local funds
Benefits (Loss Avoided)	By allowing the City offices to stay open to the public during a power outage, City Officials will be able to better coordinate response efforts, and improve critical communication with the public.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/

	Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Purchase of a generator for city offices
2023 Plan Update Status and Changes in Priority	COMPLETE - Township Office now has a Generator

25. City of Keego Harbor

Community Profile and Description

The City of Keego Harbor was originated as a real estate investment and planned resort. It is located along the Cass Lake. As of the 2020 U.S. Census, the population is 2,764. The total area of the City of Keego Harbor is 0.54 square miles.

Hazards

Flooding Risks:

- Many streets in Keego Harbor are located in designated floodplain areas, making them vulnerable to flooding during heavy rainstorms.
- Local sewers tend to back up, exacerbating flood risks.

Aging Infrastructure and Tornado Risks:

- Keego Harbor has many small cottages that are still in existence from its past as a vacation community.
- Due to their age and construction, these older homes may not provide sufficient shelter for residents during tornadoes or high winds.
- We have the Keego Harbor Mobile Home Park at 3170 Orchard Lake Road.
- We also have the Magnolia by the Lakes Senior Living Center where the mobility and extraction of many of the residents in an emergency is questionable.
- We have 2 Storm Water Pump stations that move our excess water to Sylvan/Cass Lake. Loss of a pump station would endanger numerous residences with flooding. We have the Beechmont Pump Station and the Schmidt Pump Station.

New Town Hall Building as a Potential Shelter:

- A new town hall building was constructed to replace the old structure, which was susceptible to flooding and other calamities.
- The new facility could serve as a shelter with a large meeting room.

Traffic Hazards:

- Heavy traffic volumes on Orchard Lake and Cass Lake Roads pose the potential for vehicle accidents, raising concern for local officials.

High Winds:

- We have the Keego Harbor Mobile Home Park at 3170 Orchard Lake Road. Also numerous mature trees throughout the city vulnerable to storm damage (winds, ice, sleet) that will take down power lines.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Keego Harbor
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland

	County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Seek Funding for Water Rescue Training	
Year Initiated	2012
Applicable Jurisdiction	City of Keego Harbor
Lead Agency / Organization / Position	City of Keego Harbor Fire Department, City of Keego Harbor Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Marine
Action/Implementation Plan and Project Description, if applicable	Seek funding for water rescue training (summer/winter) on Keego Harbor lakes.
2023 Plan Update Status and Changes in Priority	No longer needed. Turned over the marine and water rescue to the Oakland County Sheriff's Department, which provides those services now. Will provide a support role, as needed

Bury Power Lines	
Year Initiated	2017
Applicable Jurisdiction	Keego Harbor
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A

Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Utility construction budget
Benefits (Loss Avoided)	Ongoing utility service
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	This is already being done for many construction projects.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Assist in Funding Construction of Community Center	
Year Initiated	2012
Applicable Jurisdiction	City of Keego Harbor
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Earthquake, Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Assist in funding the construction of a community center that could serve as an emergency shelter.
2023 Plan Update Status and Changes in Priority	Completed

Supply Police Station with Emergency Generator	
Year Initiated	2005
Applicable Jurisdiction	City of Keego Harbor
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	

Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Address Area Flooding Concerns	
Year Initiated	2005
Applicable Jurisdiction	City of Keego Harbor
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Seek Funding for Additional Repeaters for OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	City of Keego Harbor
Lead Agency / Organization / Position	City of Keego Harbor, County
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek funding for additional repeaters for the OakWin Radio System to boost signal in certain areas.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Completed. Oakland County has a new radio system and repeaters are no longer needed. Anticipating to receive radios in November. Every community in the County is going to the new system.

26. City of Lake Angelus

Community Profile and Description

The City of Angelus was incorporated in 1984 and is Michigan's smallest incorporated city. Lake Angelus consistently ranks as the 5th city in Michigan with the highest per capita income. According to the 2020 U.S. Census, the population is 287. The total area of the City of Angelus is 1.64 square miles.

Hazards

Tornado Incidents:

- Lake Angelus faces a significant risk of damage caused by tornadoes due to the high number of larger trees and older homes in the area.

Fire Hazards:

- The high tree density and construction material used in many older homes pose a concern for large-scale fires.

Ice Storms:

- Residents in Lake Angelus are at risk during ice storms due to the presence of larger, older trees in the community, which can cause damage to property and power lines.

Hazmat Incident Risk:

- The City is responsible for one-half mile of Baldwin Road near Great Lakes Crossing Outlets, where there is a potential for a hazardous material (hazmat) incident.

Fuel Storage Tanks:

- The City previously identified two 300-gallon fuel storage tanks as a primary concern, but these tanks have been emptied and filled with sand, reducing the immediate hazard.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end.

During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.

- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Lake Angelus
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and

	underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Assess City's Preparedness to Respond to Hazardous Material Emergency	
Year Initiated	2005
Applicable Jurisdiction	City of Lake Angelus
Lead Agency / Organization / Position	City of Lake Angelus Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Assess City's Preparedness to Respond to Hazardous Material Emergency
2023 Plan Update Status and Changes in Priority	Ongoing

Advocate for County-Wide Road Improvements	
Year Initiated	2012
Applicable Jurisdiction	City of Lake Angelus
Lead Agency / Organization / Position	City of Lake Angelus, County
Supporting Agencies/ Organizations	Public Works
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway

Action/Implementation Plan and Project Description, if applicable	Advocate for County-wide road improvements, especially to high-traffic roads.
2023 Plan Update Status and Changes in Priority	

Update City Hall to ADA Requirements	
Year Initiated	2017
Applicable Jurisdiction	City of Lake Angelus
Lead Agency / Organization / Position	Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased safety for residents during extreme heat and cold events, increased access to City services for residents.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Severe Winter Storm
Action/Implementation Plan and Project Description, if applicable	Update City Hall to comply with ADA requirements so it can be used as a heating and/or cooling center.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Fuel Tanks	
Year Initiated	2017
Applicable Jurisdiction	City of Lake Angelus
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2017. The fuel tanks have been emptied and filled with sand.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site

Action/Implementation Plan and Project Description, if applicable	Reduce risk posed by the two 300-gallon fuel tanks in the City.
2023 Plan Update Status and Changes in Priority	2017. The fuel tanks have been emptied and filled with sand.

27. Village of Lake Orion

Community Profile and Description

The Village of Lake Orion is located in the outskirts of Metro Detroit and was established in 1859. As of the 2020 U.S. Census, the population is 2,876. The total area of the Village of Orion is 1.30 square miles.

Hazards

Natural Hazards:

- The community is concerned about various natural hazards, including tornadoes, thunderstorms, and winter weather hazards.
- Ice storms have significantly impacted the Village of Lake Orion, posing risks to property, power lines, and transportation, especially on M-24, the main route through the community.

Dam Failure Incidents:

- Village representatives are particularly concerned about the infrastructure failure of the dam for Lake Orion, which controls the flow of water under M-24.
- A breach in the dam could result in significant flooding, impacting residents and businesses located south of the lake.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Lake Orion
Lead Agency/ Organization	

Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue Village's Awareness and Preparations for Potential of Tornado	
Year Initiated	2005
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	Village of Lake Orion Police Department, Village of Lake Orion Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5

Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Continue Village's Awareness and Preparations for Potential of Tornado
2023 Plan Update Status and Changes in Priority	2017 Update: Will continue to monitor weather systems and communications networks and will continue to provide public education on warnings as well as locations of emergency shelters. Assist with mass casualty damage assessments and evacuations as needed. Ongoing

Prepare a Plan Addressing Damage to, or Failure of, the Lake Orion Dam	
Year Initiated	2012
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	Village of Lake Orion
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase response capabilities; Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Plan is complete, monitoring is ongoing.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	Prepare a Plan Addressing Damage to, or Failure of, the Lake Orion Dam

2023 Plan Update Status and Changes in Priority	2017 Update: As mentioned in the New Mitigation Actions plan, the Lake Orion - Paint Creek dam was built by MDOT in 1987. In August of 2017, we had a breech in the spillway causing water to bypass the dam into Paint Creek. In 2017 a new $700,000.00 dam was built. The Village of Lake Orion maintains a separate "Dam Emergency Action Plan" that was triggered by the break caused by sudden erosion under the M-24 Bridge, which is part of the dam spillway. The Action Plan has been updated with new contact information and worked perfectly during this incident. MDOT is responsible for maintenance and structural integrity, and the village of Lake Orion is responsible for operating and monitoring the dam. 2023 Update: Ongoing

Paint Creek Bank Stabilization	
Year Initiated	2017
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	Village of Lake Orion, DEQ
Supporting Agencies/ Organizations	Lake Orion Police Department
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$200,000.00
Potential Funding Source	SAW Grant, Village of Lake Orion
Benefits (Loss Avoided)	Prevent the destabilization of the creek bank and surrounding areas.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Working with the DEQ to obtain funding to shore up or stabilize the banks of the Paint Creek that run through the village of Lake Orion.
2023 Plan Update Status and Changes in Priority	Ongoing

Major Upgrade to Village Water Main	
Year Initiated	2017
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	VLO Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$8,000,000.00
Potential Funding Source	DWRF Bonds and local funds

Benefits (Loss Avoided)	Upgrade water system and to meet State fire suppression standards for hydrants.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2021
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	The Village is underway in replacing 8 miles of water main, or 40,000 lineal feet of water main. The upgrade when complete will result in full compliance with State Fire Suppression standards for pressure at fire hydrants throughout the community.
2023 Plan Update Status and Changes in Priority	Phase 1 and 2 are complete. Phase 3 and 4 are ongoing

Completed Mitigation Actions

Research Feasibility of Back-up Water Supply System	
Year Initiated	2005
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete. A study of potential backup systems identified the Village of Oxford as an option. Investigation determined this was not a viable option due to cost of running a backup connection and including right of way issues that would not make this feasible. No other back up system has been identified. The Village does have 2 separate water entry points from the Detroit water system.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Research the feasibility of a back-up water supply system that can be utilized in times of emergencies, especially when pressure is diminished in the Detroit Water and Sewerage Department.
2023 Plan Update Status and Changes in Priority	Complete. A study of potential backup systems identified the Village of Oxford as an option. Investigation determined this was not a viable option due to cost of running a backup connection and including right of way issues that would not make this feasible. No other back up system has been identified. The Village does have 2 separate water entry points from the Detroit water system.

Lake Orion-Paint Creek Dam Replacement	
Year Initiated	2017
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	MDOT
Supporting Agencies/ Organizations	Lake Orion Police Department
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$700,000.00
Potential Funding Source	MDOT and Village of Lake Orion
Benefits (Loss Avoided)	Prevent major flooding to the Paint Creek and Clinton River Waterway area
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	Completed in September 2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	The Village of Lake Orion maintains a separate "Dam Emergency Action Plan" which was triggered by a break in the dam spillway discovered by a DNR inspection on

	August 11, 2017. The dam was built by MDOT in 1987. VLO Dam Action plan was implemented and emergency repairs were in place by August 19, 2017, with a new dam constructed by September 23, 2017.
2023 Plan Update Status and Changes in Priority	Completed in September 2017

Upgrade Police Communications: OCSO Police Dispatched	
Year Initiated	2016
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	Lake Orion Police Department - OCSO Communication Section
Supporting Agencies/ Organizations	Oakland County Sheriff's Office
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	$30,000.00
Potential Funding Source	Local funds
Benefits (Loss Avoided)	Improved communications network
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	2016
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Switched over from local 911 center to OCSO dispatch center. Improved radio communication between neighboring agencies and Orion Township Fire Department. Saves the Village from having to upgrade 911 systems to meet state of Michigan requirements.
2023 Plan Update Status and Changes in Priority	2016

Member of Oakland County OakTac Emergency Response Consortium	
Year Initiated	2016
Applicable Jurisdiction	Village of Lake Orion
Lead Agency / Organization / Position	Lake Orion Police Department
Supporting Agencies/ Organizations	OakTac Consortium
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$1,000.00 annual
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Inclusion in Emergency Response group for major incidents and events. Upgrade active shooter training
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Lake Orion Police Department is now a member of the OakTac Emergency Response Team. OakTac will respond to any mass police incident in Oakland County and will provide staffing, communications and equipment. Includes LOPD officers into the regional Active Shooter response protocols.
2023 Plan Update Status and Changes in Priority	Complete

28. City of Lathrup Village

Community Profile and Description

The City of Lathrup Village was incorporated in 1953 as the first incorporated community in Southfield Township. As of the 2020 U.S. Census, the population is 4,088. The total area of the City of Lathrup Village is 1.50 square miles.

Hazards

Tornado and Weather Emergencies:

- The threat of tornadoes and other weather emergencies is a concern to the residents of Lathrup Village.
- While tornado warning sirens appear adequate, the lack of a public emergency shelter was identified as a concern.

Flooding and Sewer Backups:

- Heavy rains can lead to flooding and sewer backups in the City.
- Areas significantly affected by flooding include the streets of Eleven Mile and Red River.

Hazmat Accident Concern:

- Lathrup Village is concerned about the potential for a hazardous materials (hazmat) accident due to a natural gas pipeline running through the City. I-696 and Southfield Road run through the City causing additional concerns for major transportation and transportation-related HAZMAT concerns.

Severe Winter Weather Hazards:

- Winter weather, especially affecting roads like Southfield Road, 11 Mile, and 12 Mile, is a top hazard in the City.
- These roads are regularly used by large trucks carrying hazardous materials, necessitating updated training for emergency response and handling such incidents during annual training sessions.

Power Outages:

- Power outages caused by trees and branches downed by high winds are a major concern for Lathrup Village.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Lathrup Village
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits.

	• Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Additional Shelters for Citizens	
Year Initiated	2005
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	City of Lathrup Village Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000) - High (greater than $100,000) depending on the route (using a previously constructed shelter vs. constructing a new shelter)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years) - Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide additional shelters for citizens to use in emergency situations.

2023 Plan Update Status and Changes in Priority	Ongoing, need to identify space to build or designate a shelter

Address Changes Needed in Areas that Experience Flooding	
Year Initiated	2005
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	City of Lathrup Village Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Address changes needed in areas that experience flooding from sewer back-ups, particularly near Eleven Mile Road and Red River Street.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Improvements have been made and will continue to be made to the pumps in the water tanks. The City is constantly improving and replacing items in the infrastructure. 2023 Update: Ongoing, Improvements have been made and will continue to be made to the pumps in the water tanks. The City is constantly improving and replacing items in the infrastructure.

Provide Funding to Train Public Safety Personnel	
Year Initiated	2012
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	City of Lathrup Village Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Oil and Gas Well Accidents
Action/Implementation Plan and Project Description, if applicable	Provide funding to train public safety personnel in the event of a hazmat accident involving the pipeline.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Working to get appropriate people to the appropriate trainings. 2023 Update: Ongoing

Tree Trimming	
Year Initiated	2017
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	City of Lathrup Village Public Services Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased safety for city residents and visitors, reduction of infrastructure and property damage due to downed trees.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	The City continues to trim trees that pose a threat to life safety and/or property. There are a number of old, large trees that may be damaged during a high wind or snow event.
2023 Plan Update Status and Changes in Priority	Ongoing. Recent storms have exacerbated local budgets for this purpose.

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Issue a Loudspeaker to be Used for Crowd Control	
Year Initiated	2005
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	No longer needed
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	No longer needed

Address Changes Needed in Areas of Flooding due to Sewer Back-ups	
Year Initiated	2012
Applicable Jurisdiction	City of Lathrup Village
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. This is a duplicate from the 2005 mitigation action item.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed. This is a duplicate from the 2005 mitigation action item.

29. Village of Leonard

Community Profile and Description

The Village of Leonard is in Addison Township. The Village was named for Leonard Rowland and was incorporated in 1889. As of the 2020 U.S. Census, the population is 377. The total area of the Village of Leonard is 0.96 square miles.

Hazards

Emergency Response Assistance:

- Being located away from more populated areas, the Village may face challenges in receiving timely assistance during emergency situations, as seen during a recent ice storm.
- The delay in opening roads after the ice storm highlights the need for special attention to vulnerable residents, particularly the elderly and those requiring immediate medical attention.

Fire Risk and Prevention:

- The 100-year-old grist mill being considered for historical designation poses a high fire risk due to its age and construction materials.
- The building's absence of fire prevention equipment, such as sprinklers, needs to be addressed to mitigate the fire hazard.

Traffic Accidents:

- Forest and Elmwood Streets are areas of concern in the Village of Leonard due to traffic accidents, necessitating traffic safety measures and road improvements.

Events and Crowds:

- The Strawberry Festival, attracting a large crowd every year, has the potential for civil disturbance or mass casualties during hazardous situations.
- Proper crowd management strategies and emergency preparedness plans should be implemented for such events.

Stormwater Management and Flooding:

- The lack of a sewer system and storm drains in the Village makes it vulnerable to heavy rainfall and snowmelt, leading to stormwater runoff and flooding issues.
- The proximity to the Clinton River Watershed and swampy areas with inadequate drainage requires stormwater management measures to mitigate flooding risks.

Hazardous Materials:

- Copper Standard, an industry in the Village, possesses hazardous materials on-site related to the plastic injection industry.
- Proper storage and handling of hazardous materials must be ensured to reduce potential risks.

Aging Infrastructure and Electrical Power:

- The Village's very old electrical power infrastructure poses concerns for reliability and safety.
- Regular maintenance and modernization of the electrical infrastructure are necessary to mitigate potential hazards.

Oil and Gas Pipeline:

- The presence of an oil and gas pipeline on the south border of the Village requires proper monitoring and preparedness measures to address potential hazards.

Fire Risks in Old Buildings:

- Historic buildings like Roland Hall, Leonard Mill, and Leonard Barber Shop with apartments upstairs are at risk of arson and fires.
- Fire safety measures and prevention strategies should be implemented for these structures.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Leonard
Lead Agency/ Organization	

Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Old Mill Renovation Project	
Year Initiated	2017
Applicable Jurisdiction	Village of Leonard
Lead Agency / Organization / Position	Village of Leonard Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$1,000,000

Potential Funding Source	Local funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduced arson risk, rodent reduction for disease spread, public safety
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Invasive Species, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire,
Action/Implementation Plan and Project Description, if applicable	Old Mill Renovation Project
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated. This project is in the third year and some funds have been received. The old dilapidated parts of the mill have been removed. The main part of the mill is secured. The grounds cleaned. 2023 Update: Ongoing

Completed Mitigation Actions

Provide Funding to Assist in Clean-Up of Community	
Year Initiated	2005
Applicable Jurisdiction	Village of Leonard
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Provide funding to assist in the clean-up of the community following ice and windstorms.
2023 Plan Update Status and Changes in Priority	Completed

Find/Allocate Funding to Provide Sewers and Storm Drains	
Year Initiated	2012
Applicable Jurisdiction	
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Find/allocate funding to provide sewers and storm drains for the Village of Leonard.
2023 Plan Update Status and Changes in Priority	Completed

Provide Funding for Communication Boosters for OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	Village of Leonard
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies:

	Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Note: The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action.
2023 Plan Update Status and Changes in Priority	Completed

Removed Mitigation Actions

Equip Grist Mill with Fire Prevention Equipment	
Year Initiated	2012
Applicable Jurisdiction	Village of Leonard
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed
Equip Grist Mill with Fire Prevention Equipment	
Year Initiated	2012
Applicable Jurisdiction	Village of Leonard
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed

30. Lyon Township

Community Profile and Description

Lyon Township was founded on March 7, 1834, as a general law township. The Township Board of Trustees approved a resolution on January 15, 1980, to make Lyon Township a charter township. As of the 2020 U.S. Census, the population is 23,271. The total area of Lyon Township is 32.0 square miles. There are two unincorporated communities within the Township: New Hudson and Kensington. The township's major industry is in the Grand River corridor from Milford Road to Napier, employing approximately 3,000 people.

Hazards

Tornado Incidents:

- Tornadoes pose a significant danger to all residents in Lyon Township.
- Manufactured home park residents are particularly vulnerable to injuries and property damage from tornadoes.
- Manufactured home parks located off Eight Mile Road, east of Griswold, and Grand River Avenue between Kent Lake Road and Martindale Road are at heightened risk.
- The Township representatives expressed the need for additional outdoor warning sirens to improve tornado warnings and preparedness.

Traffic Safety:

- Lyon Township is concerned about potential multi-vehicle accidents on I-96 near Milford Road.
- Proper traffic safety measures and road improvements should be implemented to reduce the risk of accidents in the area.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Design and Construction of Harden Storm Shelter within New Fire Station #3	
Year Initiated	2023
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	Lyon Township Board of Trustees
Supporting Agencies/ Organizations	Fire Dept.
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Life Safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2029/30
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Oil and Gas Well Accidents, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Design and Construction of Harden Storm Shelter within New Fire Station #3
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Flood Control / Mitigation	
Year Initiated	2023
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	Lyon Township Department of Public Works
Supporting Agencies/ Organizations	Lyon Township
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Protection of life/property
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	TBD
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Severe Summer Storms, Severe Winter Storms
Action/Implementation Plan and Project Description, if applicable	Conducting Flood mitigation/control activities to prevent or minimize flooding during these

	extreme weather events includes but not limited to.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Lyon Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Install Additional Outdoor Warning Sirens	
Year Initiated	2005
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	Lyon Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	This mitigation action originated in 2005 and was continued in 2012. The Township continually monitors areas within its jurisdiction to ensure all are covered by warning sirens. The Township is currently paying special attention to the expanding areas of their jurisdiction and seeks to ensure the Residential mobile home park located off Eight Mile Road, east of Griswold is also covered.
2023 Plan Update Status and Changes in Priority	Ongoing - trailer park covered now. However, recent subdivision developments had been built in uncovered areas.

Seek Funding to Find Suitable Emergency Shelter for Residents	
Year Initiated	2012
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	Lyon Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000) - High (greater than $100,000) (depending on if an existing structure is used or a new one is constructed)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities; Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek Funding to Find Suitable Emergency Shelter for Residents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Looking to identify potential locations, but all previous efforts have been ad hoc. 2023 Update: Ongoing

Family Reunification Plan	
Year Initiated	2017
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	Lyon Township Fire Department
Supporting Agencies/ Organizations	School District, Police, EMS, Oakland County
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	Staff Time
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Efficient family reunification following a hazard
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	This plan would first be in coordination with the school district and would focus on utilizing their school buses and potentially utilizing their facilities.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Install additional tornado sirens for the mobile home park.	
Year Initiated	2005
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	Removed - this action was replaced in 2012
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed - this action was replaced in 2012

Seek funding to coordinate a County-wide emergency shelter system for public safety to know where to send people in every city, town, village or township.	
Year Initiated	2012
Applicable Jurisdiction	Lyon Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	

Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Earthquake, Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Removed - This project was removed from Lyon Township. If it is to be continued, it should be at the County level.

31. City of Madison Heights

Community Profile and Description

The City of Madison Heights is a suburb of Detroit. Originally part of Royal Oak Township, Madison Heights incorporated as a city by popular vote on January 17, 1955, and chartered on December 6 that same year, becoming the tenth city government in southern Oakland County. As of the 2020 U.S. Census, the population is 28,468. The total area of the City of Madison Heights is 7.09 square miles.

Hazards

Building Fires:

- Madison Heights is concerned about building fires, particularly in its 5 high-rise senior citizens' apartment complexes.
- The height of these buildings and the physical limitations of some residents make them more vulnerable to fire hazards.
- The city representatives emphasized the need to train fire department personnel to respond effectively to emergencies in high-rise buildings.

Traffic Safety:

- Madison Heights faces significant traffic accidents, especially on major highways like I-75 and I-696.
- Multi-vehicle accidents on these highways are particularly critical, requiring attention to improve traffic safety.

Tornadoes and High Winds:

- Tornadoes were identified as a significant hazard in Madison Heights.
- High winds have become a major concern, knocking over trees and power lines, causing damage and power outages.

HAZMAT Incidents:

- The presence of hazardous materials in eight industrial businesses within the city poses a potential hazmat emergency risk.
- Regular inspections and preparedness measures are necessary to address this hazard effectively.

Severe Winter Weather Events:

- The city is vulnerable to power outages during blizzards, heavy snow, ice storms, and sleet events.

- In extreme cold, power outages and the need for a warming center are significant concerns.

Economic and Social Challenges:

- Changes to state and federal aid programs have affected many residents' eligibility for assistance, potentially leading to increased criminal activity.

Tree Trimming and Power Outages:

- The older community in Madison Heights experiences power outages after high wind events due to trees causing disruptions.
- Tree trimming needs to be increased and improved to mitigate this hazard.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Increase Building and Fire Inspection on Highs Hazard Facilities	
Year Initiated	2023
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire
Supporting Agencies/ Organizations	Building Department
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Protection of life and property
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	Increase Building and Fire Inspection on Highs Hazard Facilities

2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Increase Training for Police and Fire to Handle Active Assailant Incidents	
Year Initiated	2023
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Police
Supporting Agencies/ Organizations	Fire
Applicable Goal(s)	3, 4
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2024
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest), Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Increase Training for Police and Fire to Handle Active Assailant Incidents
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Madison Heights
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for	High

each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Tree Pruning	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Public Works, Fire Department, Utilities
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	City Annual Budget, Utilities Budget
Benefits (Loss Avoided)	Increase public safety, reduction of transportation interference, reduction of utility damage
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019 for plan, then ongoing tree maintenance
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Work with local utilities to establish an aggressive tree pruning schedule to protect utility lines during inclement weather.
2023 Plan Update Status and Changes in Priority	Ongoing

Cyber Crimes Training	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	IT, Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3, 5
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased awareness, increased cyber security
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Cybercrime awareness training for all City employees to combat the threat to personal information and to protect a breach to the City's IT infrastructure.
2023 Plan Update Status and Changes in Priority	Ongoing

Increase Public Notification System Subscribers	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	All
Applicable Goal(s)	1, 5
Estimated Cost & Analysis (Low, Medium, High)	Staff time, possible advertising costs
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased community knowledge about hazard events
Benefits Analysis (Low, Medium, High)	Medium/High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium/High

Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Increase the number of resident subscribers to the City's public notification system which has been implemented to keep residents informed of severe weather alerts, criminal activity, traffic notifications, and missing person alert.
2023 Plan Update Status and Changes in Priority	Ongoing

Replace Lead Service Water Lines	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Public Works, Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Removal of lead from environment
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2021, onward
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Replace all privately owned lead service water lines.
2023 Plan Update Status and Changes in Priority	Ongoing

Generators at all City facilities	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Under Investigation, BRIC/HMGP
Benefits (Loss Avoided)	Continued service during power loss

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Generator support at all critical City facilities during an electrical system failure.
2023 Plan Update Status and Changes in Priority	Ongoing

Catastrophic Sewer Interceptor Failure Plan	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	Prevention and reduction of damage to public and private property and infrastructure.
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Implement a strategic work plan to prepare and plan for a catastrophic Sewer Interceptor failure.
2023 Plan Update Status and Changes in Priority	Ongoing

Storm water Asset Management Plan	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	Public Works
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Explore outside sources of funding to support implementation

Benefits (Loss Avoided)	Reduction of storm water flood concerns
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Prepare a storm water asset management plan.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Study Feasibility of Providing Funding for Acquisition of Mass Casualty Trailer	
Year Initiated	2005
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, Date Unknown. The fire department was unable to secure funding for this project. The City of Madison Heights has a mutual aid agreement with neighboring communities to assist in mass-casualty incidents.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Study the feasibility of providing funding for the acquisition of a mass-casualty trailer that can be used to assist in instances of multi-vehicle accidents.
2023 Plan Update Status and Changes in Priority	Complete, Date Unknown. The fire department was unable to secure funding for this project. The City of Madison Heights has a mutual aid agreement with neighboring communities to assist in mass-casualty incidents.

Seek a Grant for S.C.B.A. (Self-Contained Breathing Apparatus)	
Year Initiated	2023
Applicable Jurisdiction	
Lead Agency / Organization / Position	

Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$165,600
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	In 2014, the Madison Heights Fire Department was awarded a $165,600, Assistance to Firefighters Grant to replace its outdated Self-Contained Breathing Apparatus.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Seek a grant for S.C.B.A. (Self-Contained Breathing Apparatus) to replace existing outdated equipment.
2023 Plan Update Status and Changes in Priority	In 2014, the Madison Heights Fire Department was awarded a $165,600, Assistance to Firefighters Grant to replace its outdated Self-Contained Breathing Apparatus.

Pursue a Regional Grant to Acquire Video Conferencing	
Year Initiated	2012
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$358,000
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	In 2012, The Madison Heights Fire Department was unsuccessful in its attempt to secure Assistance to Firefighters Grant funding for $358,000, for the purchase of video conferencing system for 14 surrounding communities.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	Low

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Pursue a regional grant to acquire video conferencing to 14 surrounding fire departments.
2023 Plan Update Status and Changes in Priority	In 2012, The Madison Heights Fire Department was unsuccessful in its attempt to secure Assistance to Firefighters Grant funding for $358,000, for the purchase of video conferencing system for 14 surrounding communities.

Provide Additional Training for Dealing with Emergencies in High-Rise Buildings	
Year Initiated	2005
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	City of Madison Heights
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Additional high-rise training has been provided to fire staff. New and revised high-rise emergency Standard Operating Procedures were implemented. 2023 Update: COMPLETE

Replace All Firefighters' Personal Protective Equipment	
Year Initiated	2012
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Investigate funding sources to replace all of the firefighters' personal protective equipment. Current equipment is outdated and worn out.
2023 Plan Update Status and Changes in Priority	2017 Update: The City has approved funds to purchase new gear for staff that meets NFPA standards. The Department has established an eight-year replacement schedule for all frontline personal protective equipment. 2023 Update: COMPLETE

Fire Suppression System	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	IT infrastructure protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire

Action/Implementation Plan and Project Description, if applicable	Study the feasibility of a fire suppression system in all city facilities in effort to maintain critical infrastructure in the event of a fire, especially in City Hall's IT room.
2023 Plan Update Status and Changes in Priority	COMPLETE

Internet Protocol Fire Station Alerting System	
Year Initiated	2017
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Decreased response time, improved communication
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Implement an internet protocol fire station alerting system and mapping system to decrease response times to emergency calls and improve the communications between the Public Safety Answering Point and the City's two fire stations.
2023 Plan Update Status and Changes in Priority	COMPLETE

Removed Mitigation Actions

Investigate Funding to Provide a Single Point Dispatch System	
Year Initiated	2012
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. Funding was not secured to provide a single point dispatch system for surrounding area police and fire department. This system is no longer under consideration.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Investigate funding to provide a single point dispatch system for surrounding area police and fire departments for better communication between municipalities.
2023 Plan Update Status and Changes in Priority	Removed. Funding was not secured to provide a single point dispatch system for surrounding area police and fire department. This system is no longer under consideration.

Seek Funding to Provide 1 Common Alerting Station System	
Year Initiated	2012
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	

Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. Funding was not secured to provide one alerting station system for surrounding communities. The Fire Department is not pursuing the one common alerting system at this time.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed. Funding was not secured to provide one alerting station system for surrounding communities. The Fire Department is not pursuing the one common alerting system at this time.

Provide Increased Training for the Incident Management Team	
Year Initiated	2012
Applicable Jurisdiction	City of Madison Heights
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	As of December 2017, the Madison Heights Fire Department currently doesn't have any active members on the Oakland County IMT. The Fire Department would support any member willing to join the County's IMT.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide increased training for the Incident Management Team (IMT) to provide consistent and comprehensive support for long term, large scale and/or complex emergencies.
2023 Plan Update Status and Changes in Priority	As of December 2017, the Madison Heights Fire Department currently doesn't have any active members on the Oakland County IMT. The Fire Department would support any member willing to join the County's IMT.

32. Milford Township

Community Profile and Description

Milford Township was established in 1832. As of the 2020 U.S. Census, the population is 17,090. The total area of Milford Township is 35.2 square miles.

Hazards

Tornado Incidents:

- The community is concerned about tornadoes, especially the Childs Lake Mobile Home Park residents, who are at greater risk.
- The lack of sufficient outdoor warning sirens increases the community's vulnerability to tornadoes.

Train Derailment and HAZMAT Incidents:

- Milford Township identified the potential for a train derailment involving hazardous materials as a significant concern.
- The community is susceptible to hazardous materials in the event of a railroad accident with railcars containing dangerous substances.

Dam Failure and Flood-related Hazards:

- Three dams in the community, two of which could cause a significant impact on life and property upon failure, are a concern.
- Homes and businesses along the river risk flooding during extreme rain events.

Wildfires and Invasive Species:

- State forests and large parks are susceptible to wildfires during extreme drought conditions.
- The community has large strands of Phragmites and Japanese Knotweed, requiring mitigation.

Oil and Gas Well Incidents:

- Milford Township is concerned about incidents involving an oil well at Camp Dearborn, a gas well at GM Road and Hickory Ridge Trail, and seven natural gas transmission lines at Milford Junction.

Structural Fire Incidents:

- A battery recycling facility on Pontiac Trail is vulnerable to fire hazards.

- Fire sprinklers do not protect most village buildings and structures, posing a potential risk.

Extreme Heat/Cold and Public Health Emergencies:

- The at-risk population in the community can be adversely impacted by extreme heat or cold conditions.
- Their community has five senior living facilities, raising concerns about potential public health emergencies.

High Winds Events:

- Manufactured homes are at an increased risk from high winds, with a history of downed trees and power lines.

Active Shooter Incidents:

- The Milford Memories Festival and three schools in the community are areas of concern for potential active shooter incidents.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Improve Lake Level Control Structure	
Year Initiated	2023
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Township Supervisor
Supporting Agencies/ Organizations	Moore Lake HOA
Applicable Goal(s)	3, 6
Estimated Cost & Analysis (Low, Medium, High)	$400,000
Potential Funding Source	FEMA, TWP General Fund - Moore Lake HOA
Benefits (Loss Avoided)	If Structure fails - wipes out downtown businesses
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	Improve Lake Level Control Structure, Southend of Moore Lake
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Severe Weather Sirens	
Year Initiated	2023
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Milford Township Administration
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	1, 3, 5
Estimated Cost & Analysis (Low, Medium, High)	$100,000
Potential Funding Source	FEMA, BRIC, HMGP
Benefits (Loss Avoided)	Astronomical
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Severe Weather Sirens
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Update - Refurbish Moore Dam	
Year Initiated	2023
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Milford Township Administration
Supporting Agencies/ Organizations	Oakland County - FEMA
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	Federal - State - Local
Benefits (Loss Avoided)	Devastation of Milford Village
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long-term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Hazard Dams, Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Update - refurbish Moore Dam
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Additional Tornado Warning Devices	
Year Initiated	2023
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Milford Township Administration
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	FEMA - State - County - Local, BRIC/HMGP
Benefits (Loss Avoided)	Loss of Potential Life
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Tornadoes
Action/Implementation Plan and Project Description, if applicable	Additional Tornado Warning Devices
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Milford Township

Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue to Advocate for Additional Outdoor Warning Sirens	
Year Initiated	2012
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Milford Township Administration
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	1

Estimated Cost & Analysis (Low, Medium, High)	Approximately 1 siren per year
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Continue to advocate for additional outdoor warning sirens so all residents of the Township can be warned of a weather emergency. The Township works with the County to identify where the next siren should be placed.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Approximately 4 sirens have been installed over the past 6 years. 2023 Update: Ongoing

Flooding on Coogan Drive	
Year Initiated	2017
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	Milford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Address Flooding on Coogan Drive. Coogan Drive, along the Huron River is located in a potential flood zone. Dams have been installed on the Huron River

	to control this flood potential, however extensive rainfall could be an issue for those residents.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Redesign Culverts in Areas of Frequent Flooding Along Huron River	
Year Initiated	2005
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Install Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Milford Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

33. Village of Milford

Community Profile and Description

The Village of Milford began in 1832 with the building of a sawmill. In 1939, Henry Ford built a carburetor plant, which was demolished in 2002. As of the 2020 U.S. Census Population and Housing Unit Estimates, the population is 6,520. The total area of the Village of Milford is 2.52 square miles.

Hazards

Civil Disturbances:

- Although rare, the potential for civil disturbances exists during events like the Milford Memories Festival and the Christmas and Memorial Day Parades, which attract large crowds.

Train Derailment and Hazmat Incidents:

- The presence of railroad tracks running through the Village poses a risk of a train derailment, potentially involving hazardous materials, leading to devastating consequences.

Tornadoes:

- The potential damage caused by tornadoes is a concern for the community.

DTE Facility and Milford Junction:

- The DTE facility on Duck Lake Road and Milford Junction interconnect Township pose potential hazards.

Blizzards and Extreme Cold Weather:

- Blizzards and extended cold conditions can impact the Village.

Nursing Homes and Long-Term Power Outages:

- Several large nursing homes in the area are a concern during prolonged power outages.

Emergency Shelter Location:

- The Village needs to identify a suitable location for an emergency shelter.

Hubble Pond Dam:

- The Hubble Pond Dam poses a risk if it fails.

Flooding Risk:

- The Huron River east of Main Street presents a flooding risk.

New Water Treatment Plant:

- The construction of a new water treatment plant in 2018 will reduce the risk of water system failure incidents.

Invasive Species Threat:

- Phragmites and Oak Wilt along the Huron River pose an invasive species threat.

Structural Fire Risk:

- There is a high risk of structural fires in the downtown area due to older buildings without sprinkler systems.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Identify and Equip for Operations	
Year Initiated	2023
Applicable Jurisdiction	Village of Milford
Lead Agency / Organization / Position	Village of Milford Administration
Supporting Agencies/ Organizations	Milford TWP, Community Organizations
Applicable Goal(s)	1, 2, 4, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Loss of Life
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2026
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Identify and Equip for Operations temporary shelters within the community for extreme heat and cold events with extended power loss.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Milford
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media.

	• Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Ongoing Training to Prepare for Train Derailment	
Year Initiated	2005
Applicable Jurisdiction	Village of Milford
Lead Agency / Organization / Position	Milford Police
Supporting Agencies/ Organizations	Milford Police
Applicable Goal(s)	Improve and support public and private organizational response capabilities.
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide ongoing training to prepare for a train derailment that may involve hazardous materials.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Continue to Advocate for Training Regarding Transportation of Hazardous Material	
Year Initiated	2012
Applicable Jurisdiction	Village of Milford
Lead Agency / Organization / Position	CSX
Supporting Agencies/ Organizations	Milford Police and Fire Departments

Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed – this was an extension of the 2005 action.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue to advocate for training regarding the transportation of hazardous materials and the response to any spill or hazmat incident.
2023 Plan Update Status and Changes in Priority	Removed – this was an extension of the 2005 action.

Sprinkler Systems	
Year Initiated	2017
Applicable Jurisdiction	Village of Milford
Lead Agency / Organization / Position	Milford Fire
Supporting Agencies/ Organizations	Milford Police
Applicable Goal(s)	1, 2, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	Add sprinklers in buildings without, notably older buildings in the downtown area, for increased fire suppression capability.
2023 Plan Update Status and Changes in Priority	REMOVE

34. City of Northville

Community Profile and Description

The City of Northville is located in and divided by Oakland and Wayne Counties. It is a suburb of Metropolitan Detroit. Northville was first settled in 1825 and was incorporated as a village in 1867. In 1955, Northville was incorporated as a City. As of the 2020 U.S. Census, the population is 3,326. The total area of the City of Northville is 2.07 square miles.

Hazards

Structural Fire in Downtown Area:

- The City is concerned about the potential of a structural fire in the downtown area due to the advanced age of many buildings.
- The interconnected nature of some buildings further increases the vulnerability to structural fires.

Train Derailment / HAZMAT Incident:

- The threat of a train derailment is a hazard the City faces.
- If a derailment involves hazardous materials, it could lead to serious consequences and pose a risk to the community.

Extreme Heat

- The City of Northville has an aging population that is more susceptible to extreme heat. There are currently no designated cooling centers within the city. Citizens are directed outside of the city for cooling centers.

Thunderstorms, Lightning, and Hail

- The City of Northville has an aging population. The city's current infrastructure is old and is susceptible to downed trees/limbs and electrical wires. Power outages are common during major storms.

High Winds

- The City of Northville has an aging population. The city's current infrastructure is old and is susceptible to downed trees/limbs and electrical wires. Power outages are common during major storms.

Blizzards, Ice Storms, and Extreme Cold

- The City of Northville has an aging population. The city's current infrastructure is old and is susceptible to downed trees/limbs and electrical wires. Power outages are common during major storms

Tornadoes

- The City of Northville has an aging population. The city's current infrastructure is old and is susceptible to downed trees/limbs and electrical wires. Power outages are common during major storms.

Public Health Emergencies

- The City of Northville has an aging population. This population would be more at risk to public health emergencies such as Covid-19.

Fog

- Fog can develop at any time especially in the morning hours. Fog could affect visibility on city roads including 8 Mile. 8 Mile Road is a highly traveled road.

Infrastructure Failure

- The City of Northville's water tower is located in Oakland County. If the tower fails, it could affect the water supply to Northville residents.

Structural Fire

- The City of Northville is an older community with many historical homes. These homes could pose a greater fire risk.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Northville
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Review lot coverage ordinance to reduce runoff	
Year Initiated	2024
Applicable Jurisdiction	City of Northville
Lead Agency/ Organization	City of Northville Administration
Supporting Agencies/ Organizations	City of Northville
Applicable Goal(s)	7
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	NA
Benefits (Loss Avoided)	Reduce runoff from private homes and lots
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flood: Urban/Flash Flooding
Action/Implementation Plan and Project Description	The City of Northville will be reviewing planning and zoning requirements related to the amount of impervious surface that is allowed on residential lots. The intent is to reduce runoff from residential area.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Promote and increase Nixel registration	
Year Initiated	2023
Applicable Jurisdiction	City of Northville
Lead Agency/ Organization	City of Northville Fire Department
Supporting Agencies/ Organizations	City of Northville
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	Low ($500)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Improve communication with residents during emergencies
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2024
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description	Promote and increase Nixel registration and evaluate options to increase frequency of announcements. Produce and distribute educational and marketing materials encouraging Nixel and social media participation.

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Adding a School Resource Officer to Northville Public Schools	
Year Initiated	2023
Applicable Jurisdiction	City of Northville
Lead Agency/ Organization/Position	
Supporting Agencies/ Organizations	City of Northville Administration
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium, $135,000 per year
Potential Funding Source	Grants and Local Funds
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term - 2024
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Active Shooter / Active Assailant
Action/Implementation Plan and Project Description	The City of Northville has entered into an MOU with Northville Schools to provide a School Resource Officer in City of Northville Schools for the next three years. Interviews for possible candidates have taken place. Union approval for the position is pending. An SRO should be in-place in November of 2023.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Ongoing Mitigation Actions

Design a Flood Control System	
Year Initiated	2005
Applicable Jurisdiction	City of Northville
Lead Agency / Organization / Position	City of Northville Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Design a flood control system to prevent flooding in the Eight Mile and Novi Road Area. Flooding causes unsafe conditions, especially at the Tree Top Apartments
2023 Plan Update Status and Changes in Priority	Ongoing

Conduct Ongoing Training and Coordination with Mutual Aid Partners	
Year Initiated	2012
Applicable Jurisdiction	City of Northville
Lead Agency / Organization / Position	City of Northville Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Conduct ongoing training and coordination with mutual aid partners in fire and hazmat response.
2023 Plan Update Status and Changes in Priority	Ongoing

Mitigate Storm Water Runoff	
Year Initiated	2017
Applicable Jurisdiction	City of Northville
Lead Agency / Organization / Position	City of Northville Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP

Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Mitigate Storm Water Runoff
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Implement Additional Hazmat Training	
Year Initiated	2005
Applicable Jurisdiction	City of Northville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

Update Tornado Warning System	
Year Initiated	2005
Applicable Jurisdiction	City of Northville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

35. City of Novi

Community Profile and Description

Novi was originally a township organized in 1832 from Farmington Township. Novi was incorporated as a City in 1969. Novi is one of the fastest growing cities in Michigan. The population from 2000 to 2010 increased by 16.5 %. As of the 2020 U.S. Census, the population is 66,243. The total area of the City of Novi is 31.28 square miles.

The City of Novi is also tied to Novi Township. The Township contracts with the city to provide many services and is vulnerable to the same hazards.

Hazards

HAZMAT Incidents and Train Derailments:

- Concern about potential accidents involving the release of hazardous materials, especially in the event of a train derailment on the railroad running north to south.
- Major thoroughfares like I-696, I-96, M-5, and I-275 could be affected, posing risks to interstate commerce and the environment.

Tornado Incidents:

- Areas most vulnerable to tornadoes in the community are manufactured home communities, covering 313 acres of land in Novi.
- Specific locations of concern include Grand River Avenue and Seeley Road, Thirteen Mile Road, east of Novi Road, Haggerty Road between Twelve Mile Road and I-696, and Napier Road south of Grand River Avenue.

Thunderstorms:

- Thunderstorms and resulting power outages are of concern to the City.

Structural Fires:

- The potential of a structural fire at one of the senior citizen facilities in the City is a particular concern due to the residents' limited mobility, health conditions, and age.

Road Construction and Gas Line Ruptures:

- Road construction can lead to accidents, traffic congestion, and difficulties for emergency personnel.
- Frequent gas line ruptures at construction sites are also of concern and require mitigation measures.

Improving Radio Coverage:

- The City aims to eliminate radio dead zones and provide continuous coverage of the OakWin Radio System in all buildings to enhance communication during emergencies.

Terrorism/WMD and Soft Targets:

- Novi has numerous "soft targets" where people congregate in large numbers, making them vulnerable to terrorism and sabotage attacks.
- Locations of concern include hospitals, schools, sporting venues, hotels, movie theaters, restaurants, places of worship, shopping centers, transportation routes, and government buildings.
- Saudi Aramco has been cited as a concern, due to being a research center for energy.
- Additional mass-crowd-gathering soft targets could include the Suburban Showcase Collection, the State Fair and political events.
- Major shopping centers in Novi, such as Twelve Oaks Mall, West Oaks I and II, Novi Town Center, Main Street, and Twelve Mile Road Crossing at Fountain Walk, need security and emergency preparedness attention.

Communications System Resilience:

- Communications failures during natural or technological disasters, particularly high windstorms, can significantly impact the community and its communication system.

Infrastructure Failure:

- The City of Novi is concerned about potential infrastructure failures, including the 36-inch water main under I-96, which could have catastrophic consequences.
- Traffic accidents, especially on major highways like I-96, M-5, I-275, and Novi Road, pose hazards and require attention.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Install Redundant Water Line	
Year Initiated	2023
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	City of Novi Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$3M
Potential Funding Source	Water Sewer Fund Novi
Benefits (Loss Avoided)	Avoid water loss to 70% of community
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	unknown (6 year CIP)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Install Redundant 36" Water Line under 1-96 to replace vulnerable pre-stressed concrete cylinder pipe water main
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Integrate a New Emergency Operations Center	
Year Initiated	2023
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	Novi Public Safety
Supporting Agencies/ Organizations	Police/Fire
Applicable Goal(s)	1, 2, 3, 4, 6
Estimated Cost & Analysis (Low, Medium, High)	5 million
Potential Funding Source	Internal (local/county) funds

Benefits (Loss Avoided)	Continuity of Government / support in the event of unique incident
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2028
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Integrate a New Emergency Operations Center
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Novi
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Additional Hazmat Training and Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	Fire Department
Supporting Agencies/ Organizations	Emergency Management
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$20,000
Potential Funding Source	Yearly operational cost
Benefits (Loss Avoided)	Loss of life and injuries
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	November 2018 (ongoing)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide additional hazmat training and equipment for the public safety departments.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Hazmat training for Police and Fire Departments (awareness and operational training level). 2023 Update: Ongoing

Additional Training to Address Potential Civil Disturbance/Terrorist Target	
Year Initiated	2012
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	$15,000
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Loss of life & injuries
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	December 2018 (ongoing)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest), Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Additional training to address the potential civil disturbance/terrorist target at the Twelve Oaks Shopping Center.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Emergency response to high-profile events (active shooter, etc.) 2023 Update: Ongoing

Install and improve generators for certain public buildings	
Year Initiated	2017
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	City of Novi Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	$70,000
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Warming center, power back-up
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	March, 2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Install and improve generators for certain public businesses (senior citizens, older adult facilities)
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Increase Public Awareness of the Dangers of Tornadoes	
Year Initiated	2005
Applicable Jurisdiction	City of Novi
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	5
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed

36. Novi Township

Community Profile and Description

Novi Township was organized in 1832 from Farmington Township. Only a small portion of the original Township of Novi remains unincorporated. The majority of the township incorporated first as the Village of Novi in 1958 and later into the City of Novi in 1969. As of the 2020 U.S. Census, the population was 160. The total area of Novi Township is 0.1 square miles.

The Township contracts with the City of Novi for many services. For the purposes of this plan, the Township and the City will share the same hazards and new mitigation action items.

Hazards

Community Structure:

- Novi Township is a small community with three roads, all located within a single subdivision plat.

Extreme Heat and Severe Winter Weather:

- Extreme heat and severe winter hazards are significant concerns for the residents of Novi Township. These hazards may include cold temperatures, heavy snowfall, ice storms, and related impacts on roads and infrastructure.

Road Replacement and Culvert Updates:

- Novi Township has addressed road-related hazards by replacing roads of concern. Except for one cul-de-sac, all roads in the community have been replaced.
- During the road replacement, culverts were updated to improve drainage and mitigate potential flood-related hazards.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.

- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Novi Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Funding to Replace the Rest of the Roads in the Township	
Year Initiated	2012
Applicable Jurisdiction	Novi Township
Lead Agency / Organization / Position	Novi Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	The roads have been slowly replaced over the years. Culverts have been updated as needed as well.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Only one remaining cul-de-sac. Ongoing

Provide Assistance in Funding Necessary Repairs in the Township's Roads	
Year Initiated	2005
Applicable Jurisdiction	Novi Township
Lead Agency / Organization / Position	Novi Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway

Action/Implementation Plan and Project Description, if applicable	Provide Assistance in Funding Necessary Repairs in the Township's Roads
2023 Plan Update Status and Changes in Priority	Ongoing

Fire Services	
Year Initiated	2017
Applicable Jurisdiction	Novi Township
Lead Agency / Organization / Position	Novi Township Administration
Supporting Agencies/ Organizations	City of Novi
Applicable Goal(s)	1, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Annual budget
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	None, continual
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue to contract with the City of Novi for fire protection services.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Provide Additional Funding for Maintaining Township Roads	
Year Initiated	2012
Applicable Jurisdiction	Novi Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. This was just a continuation of the 2005 action.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

37. City of Oak Park

Community Profile and Description

The City of Oak Park was first settled by European Americans in 1840. The Village of Oak Park incorporated as a city on October 29, 1945, following the end of World War II. As of the 2020 U.S. Census, the population is 29,560. The total area of the City of Oak Park is 5.16 square miles.

Hazards

Winter Storm Hazards:

- Two high-rise elderly care buildings historically lose power during severe winter storms.
- Currently, there is a limited backup power system for these buildings, requiring potential improvements to ensure uninterrupted power supply during severe weather events.

Earthquake Incidents:

- The older age of most buildings in the area raises concerns about additional damage that could result from an earthquake.
- Mitigation efforts should focus on assessing and strengthening the structural integrity of buildings to enhance their resilience against seismic activities.

Outdated PowerGrid Infrastructure:

- The city's power lines and electrical grid are described as very outdated, making them susceptible to damage during storms or high wind events.
- The vulnerability of the power infrastructure leads to widespread power outages and fire incidents from downed power lines, necessitating urgent upgrades and maintenance.

Active Shooter Incidents, Terrorism, and WMD Incidents:

- The City of Oak Park expresses concern about potential incidents involving active shooters, terrorism, or weapons of mass destruction, particularly targeting religious populations.
- Preparedness and response plans should be developed and implemented to address the specific threats associated with such incidents.

Other Hazards:

- The city faces structure fires, thunderstorms, and tornadoes.

- Multi-story residential apartment buildings, including a senior citizen high-rise, are particularly at risk during these occurrences, requiring adequate measures for their safety.

Transportation-Related Hazards:

- Oak Park experiences hazards related to transportation due to the high traffic volume on trunk lines such as I-696 and Eight Mile Road.
- Mitigation efforts should include strategies to reduce potential accidents and enhance safety on these heavily traveled routes.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Improve Preparedness for Jewish Community from Attacks	
Year Initiated	2023
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	OP Public Safety
Supporting Agencies/ Organizations	Southfield, other depts and Oak Park
Applicable Goal(s)	1, 4, 5, 7
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life-safety
Benefits Analysis (Low, Medium, High)	Medium-High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium-High
Hazard(s) Mitigated	Active Shooter/Active Assailant, Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Improve Preparedness for Jewish Community from Attacks
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Improve Power Infrastructure to Reduce Fire Hazard	
Year Initiated	2023
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	DTE, OP
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Very Expensive
Potential Funding Source	General Funds
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium-High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium-High
Hazard(s) Mitigated	Earthquake, Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Improve Power Infrastructure to Reduce Fire Hazard
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Oak Park
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

The jurisdiction did not have previous mitigation actions.

Completed Mitigation Actions

Regional Study of Water Tankers	
Year Initiated	2005
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Provide a regional supply of water tankers to be shared with neighboring communities when there is no water or when water pressure is low due to power failures and/or failures of the Detroit Water and Sewerage Department.

2023 Plan Update Status and Changes in Priority	Completed

Replace Older Backup Generators	
Year Initiated	2005
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Replace the older backup generators at the City's public safety department.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Provide Backup Electrical Power for Community Center	
Year Initiated	2005
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Provide backup electrical power for the community center to provide shelter during

	power failures and other emergency sheltering needs.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Provide New Aerial Ladder for Firefighting	
Year Initiated	2005
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	Provide a new aerial ladder for firefighting due to the age of existing equipment and the acquisition of new properties containing multi-story residences.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Construction of New Public Safety/City Hall Building	
Year Initiated	2012
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. The new building is complete and currently being occupied by the Public Safety

	Department. The generator is installed and operating properly.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Infrastructure Failure, Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	The City of Oak Park is starting construction of a new public safety/city hall building. Currently they share the building with the 45-B District Court. Upon completion, they will move to their own building and many of their security issues will be decreased due to the traffic of the court offices. The new building will also have automatic/dedicated generator backup for continuity of services during a power outage.
2023 Plan Update Status and Changes in Priority	Complete, date unknown. The new building is complete and currently being occupied by the Public Safety Department. The generator is installed and operating properly.

Community Center Renovation	
Year Initiated	2012
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. The renovations in the Community Center are complete.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	The City's community center is also due for renovation that will improve the services available to Oak Park residents during power outages or times of extreme temperatures.
2023 Plan Update Status and Changes in Priority	Complete, date unknown. The renovations in the Community Center are complete.

LED Street Light Installation	
Year Initiated	2023
Applicable Jurisdiction	City of Oak Park
Lead Agency / Organization / Position	DTE, Department of Public Works, Assistant City Manager
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	$625,000
Potential Funding Source	City Fund
Benefits (Loss Avoided)	Increased road safety, decreased road accidents
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	End of 2017, early 2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	The City is currently replacing all street lights to LED lighting. This project looks to increase safety and reduce accidents along the roadways.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated. As of December 2017, funds have been secured and the project is underway. 2023 Update: COMPLETED

38. Oakland Township

Community Profile and Description

Oakland Township has the distinction of being one of Michigan's oldest townships. It was first named by the Land Ordinance of 1785. It was one of the original 25 townships in the Territory of Michigan when counties were further divided into townships in 1827. As of the 2020 U.S. Census, the population is 20,067. The total area is 36.8 square miles.

Hazards

Thunderstorms, High Winds, and Heavy Rain Incidents:

- The threat of thunderstorms accompanied by high winds and heavy rains is a significant concern for the residents of Oakland Township.
- The primary risks include trees or branches falling on power lines, leading to power outages, and blocking Township roads, impeding traffic and emergency response.

Flooding Incidents:

- Flooding due to heavy rains is a recurring problem in Oakland Township.
- Roads vulnerable to flooding include Canyon, Gallagher, Collins, and Orion Roads, necessitating measures to address and manage floodwater effectively.

HAZMAT Incidents:

- The potential for a hazardous material emergency exists in the Township, raising concerns about the safety of residents and responders.
- Specific training and proper equipment are crucial to effectively respond to all hazmat emergencies, prompting the need for robust hazmat preparedness programs.

Natural Gas Pipelines and Chemicals Stored by Farmers:

- The presence of natural gas pipelines and chemicals stored by farmers poses potential hazards in Oakland Township.
- Ensuring proper monitoring, maintenance, and safety measures are in place to mitigate the risks associated with these facilities and materials is vital.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process

- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Oakland Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Needed Assistance in Preventing Flooding	
Year Initiated	2005
Applicable Jurisdiction	Oakland Township
Lead Agency / Organization / Position	Road Commission
Supporting Agencies/ Organizations	
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities to flooding
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Riverine Flooding
Action/Implementation Plan and Project Description, if applicable	Provide needed assistance in preventing flooding of area roads flood during heavy rain.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Potential for this issue remains, but has not been a recent threat. 2023 Update: Ongoing

Seek and Provide Training for Hazmat Incidents	
Year Initiated	2005
Applicable Jurisdiction	Oakland Township
Lead Agency / Organization / Position	Oakland Township Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Petroleum and Natural Gas Pipeline Accidents
Action/Implementation Plan and Project Description, if applicable	Seek and Provide Training for Hazmat Incidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Annual training 2023 Update: Ongoing

Tactical Training	
Year Initiated	2017
Applicable Jurisdiction	Oakland Township
Lead Agency / Organization / Position	Oakland Township Fire
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	1,3,4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Protection of life (both civilian and responders), safety of critical assets.
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Annual training effort
Actual Completion Date	Ongoing
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Criminal Acts: Mass Shootings/Active Assailant, Terrorism and Sabotage
Action/Implementation Plan and Project Description, if applicable	Tactical training to respond to active shooter situations within the Township, especially at a school or daycare.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

Removed Mitigation Actions

Implement Additional Hazmat Training	
Year Initiated	2012
Applicable Jurisdiction	Oakland Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	

Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	Completed. The 2012 plan created a new mitigation action for this continuing action. For clarity, this action was "removed."
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Completed. The 2012 plan created a new mitigation action for this continuing action. For clarity, this action was "removed."

39. City of Orchard Lake

Community Profile and Description

The City of Orchard Lake Village is a small, exclusive suburb of Detroit. Prior to 1928, the community now known as the City of Orchard Lake Village was part of West Bloomfield Township. The residents of the community voted (92 in favor, 5 against) on March 19, 1928, to incorporate as Orchard Lake Village. As of the 2020 U.S. Census, the population is 2,238. The total area of the City of Orchard Lake Village is 4.12 square miles. About 43 percent of the City of Orchard Lake Village is occupied by lakes and ponds. The City surrounds its namesake, Orchard Lake, but also includes a portion of Upper Straits Lake and borders, along its northern limits, the waters of Cass Lake.

Hazards

HAZMAT Incidents:

- The City of Orchard Lake faces the potential for hazardous material emergencies, primarily due to trucks carrying hazardous materials through the community.
- The roads most frequently traveled by these vehicles are Orchard Lake Road, Pontiac Trail, and Commerce Road, requiring enhanced safety measures and response plans.
- Orchard Lake Road is a major thoroughfare through the city under the jurisdiction of the Road Commission of Oakland County. Large trucks access this road through the city.

Fuel Storage at Local Facilities:

- Fuel storage at local facilities is another hazard in Orchard Lake, particularly concerning due to its proximity to a school.
- Measures to ensure proper storage, monitoring, and safety protocols are necessary to mitigate potential risks.

Response to Major Emergencies:

- Orchard Lake representatives express concerns about the city's response to major emergencies, especially related to hazmat incidents.
- Adequate hazmat training and sufficient manpower are critical to effectively handle emergencies and protect the community.

Thunderstorms and Power Outages:

- Thunderstorms pose a major concern to the citizens of Orchard Lake due to their potential to cause power outages.

- Preparedness measures to handle power disruptions and ensure timely restoration are essential for the city's resilience.
- Large amount of trees, old growth, vulnerable to lightning strikes.

High Winds

- Large amount of trees, old growth, vulnerable to wind damage.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Orchard Lake
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Tree Removal and Tree Trimming	
Year Initiated	2017
Applicable Jurisdiction	City of Orchard Lake
Lead Agency / Organization / Position	Oakland County Road Commission
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	$50,000
Potential Funding Source	Taxpayer
Benefits (Loss Avoided)	Safe Travel
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Tree Removal and Tree Trimming of old growth trees along Pontiac Trail and Commerce Road.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Provide Joint Hazmat Training	
Year Initiated	2005
Applicable Jurisdiction	City of Orchard Lake

Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide joint hazmat training with police and fire departments and neighboring police departments.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Provide Additional Manpower for Emergencies	
Year Initiated	2005
Applicable Jurisdiction	City of Orchard Lake
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies:

	Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide additional manpower for emergencies as needed per mutual aid agreements.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Removed Mitigation Actions

Provide for Emergency Electrical Power for Certain Flood Pumps	
Year Initiated	2005
Applicable Jurisdiction	City of Orchard Lake
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Removed, date unknown

Pursue Improvements to the OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	City of Orchard Lake
Lead Agency / Organization / Position	City of Orchard Lake, County
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Pursue improvements to the OakWin Radio System such as portable repeaters to be used for fire emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: REMOVED

Seek Training Opportunities to Address Water Rescues	
Year Initiated	2012
Applicable Jurisdiction	City of Orchard Lake
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	West Bloomfield provides Fire Rescue services, so this mitigation action is no longer necessary for the City of Orchard Lake.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Marine

Action/Implementation Plan and Project Description, if applicable	Seek training opportunities to address the deficiencies with regard to water rescues on the City's lakes.
2023 Plan Update Status and Changes in Priority	West Bloomfield provides Fire Rescue services, so this mitigation action is no longer necessary for the City of Orchard Lake.

40. Orion Township

Community Profile and Description

Orion Township was established in March of 1835. The official motto of the township and village is "Where living is a vacation". As of the 2020 U.S. Census, the population is 38,206. The total area of Orion Township is 35.9 square miles. The Township has three unincorporated communities: Eames, Lake Orion Heights and Gingellville.

Hazards

Structural and Natural Fires:

- Orion Township faces potential dangers from both structural and natural fires, necessitating effective fire prevention and response strategies.

Tornadoes:

- The occurrence of a tornado could have devastating effects on people and property in Orion Township.
- Residents living in the mobile home park off Brown Road, west of Lapeer Road, are at the greatest risk during tornado events.

Winter Weather Hazards:

- Winter weather, especially ice storms, poses risks to the community, with M-24 being a heavily traveled road prone to accidents during such weather conditions.

Natural Gas Pipeline Hazards:

- The presence of a natural gas pipeline running through a small portion of the Township poses a potential hazard for hazmat incidents.

Dam Failure and Flood-Related Hazards:

- Concerns exist about the potential failure of the Lake Orion Dam and Duck Lake Dam, as well as flooding at specific locations like Buckhorn Lake, Lake Orion Dam (Paint Creek), and Duck Lake Dam (Clarkston Rd.).

Subsidence (Sinkhole) Incidents:

- Orion Township is at risk of subsidence due to the interconnection of many lakes in the area, requiring monitoring and mitigation measures.

HAZMAT Incidents:

- The General Motors Plant is a concern for potential future HAZMAT incidents, necessitating preparedness and response plans.

Infrastructure Failure Incidents:

- Concerns about the ITC Transmission Lines and the single GIWA water feed transmission main call for proper maintenance and contingency planning.

Oil and Gas Well Incidents:

- A large consumer gas main running through the community presents a potential hazard, requiring safety protocols and monitoring.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Indian Lake Rd. Bridge	
Year Initiated	2023
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	Orion Township Planning and Zoning, Public Services
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flood
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	New

Public Education in Orion Living Magazine	
Year Initiated	2023
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	Orion Parks, Orion Library, Chamber, DDA
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	$25,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	TBD
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Public Education in Orion Living Magazine
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Direct Bury Power Lines	
Year Initiated	2023
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	Utilities
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Fees
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	New

Secondary Connection to GIWA for NOCWA	
Year Initiated	2023
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	Supervisor's Office
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Life safety, resiliency
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Extreme Heat, Public Health Emergencies: Pandemic/Epidemic, Structural Fire
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Orion Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue educating people on hazardous weather conditions so they can be prepared for bad weather.	
Year Initiated	2012
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	Orion Township Fire Rescue Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	5,6
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	High Winds/Severe Winds, Tornadoes, Winter Storm and Blizzards
Action/Implementation Plan and Project Description, if applicable	Continue educating people on hazardous weather conditions so they can be prepared for bad weather.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

First Responder Training	
Year Initiated	2017
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	Orion Township Fire Rescue Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Staff time, possible travel and/or instructor costs, material costs
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased first responder capability, increased public safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Orion Township is actively seeking additional training opportunities to increase the capabilities of their first responders. Specific trainings the Township is interested in include: Active Shooter Gas Line Safety

2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Research the feasibility of a backup water supply system	
Year Initiated	2005
Applicable Jurisdiction	Orion Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Research the feasibility of a backup water supply system that can be utilized in times of emergencies, especially when pressure is diminished in the Detroit Water and Sewerage Department.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

41. Village of Ortonville

Community Profile and Description

The Village of Ortonville lies on the northern edge of Metro Detroit. The Village was founded in 1848 by Amos Orton and incorporated as a village in 1902. As of the 2020 U.S. Census, the population is 1,376. The total area of the Village of Ortonville is 0.98 square miles.

Hazards

Tornado Incidents:

- Local representatives express concerns about insufficient warning systems and resources to respond to tornado emergencies effectively.

Structural Fire Incidents:

- The advanced age of many buildings in the downtown area makes the Village vulnerable to potential devastating fires.

Vehicle Accidents on M-15:

- M-15, the major road in the community, experiences numerous vehicle accidents, posing risks to motorists and pedestrians.

Ice Storms and High Wind Events:

- Ice storms are a significant threat, causing prolonged power outages for residents.
- High winds are also a major concern, leading to fallen trees and power lines, exacerbating the impact of storms.

Frontier (Verizon) Switching Station:

- The Frontier (Verizon) switching station at M-15 and Narrin Road corner presents a possible hazard, especially concerning battery backup systems.

Crude Oil Pipeline:

- A crude oil pipeline running south of M-15 and Grange Hall Road is a potential hazard to the community.

Propane Supplier Tanks:

- The presence of two 30,000-gallon propane tanks at a supplier poses a risk to the community.

Dam Failure:

- Concerns exist about the potential failure of the Lake Louise dam, which covers Kersley to Flint Watershed, posing a flood-related hazard.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

New Fire Wells for Water Supply Throughout Village	
Year Initiated	2023
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	Brandon Fire Department
Supporting Agencies/ Organizations	Village of Ortonville
Applicable Goal(s)	1, 2, 3, 4, 7
Estimated Cost & Analysis (Low, Medium, High)	$200,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Water supply for structure fires
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2024 Summer
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Wildfires, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Structural Fire, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Especially for an old mill that is a historical building
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Ortonville
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Phragmite Invasion Reduction	
Year Initiated	2017
Applicable Jurisdiction	Brandon Township, Village of Ortonville
Lead Agency / Organization / Position	Brandon Township, Village of Ortonville
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Grants / local funds
Benefits (Loss Avoided)	Reduce the damage caused to roots blocking drainage tiles and culverts.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flood (Urban/Flash Flooding), Invasive Species
Action/Implementation Plan and Project Description, if applicable	Reduction of invasive species, phragmites.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Provide confined space rescue equipment.	
Year Initiated	2005
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Subsidence, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Transportation Accidents: Highway

Action/Implementation Plan and Project Description, if applicable	There is a need for equipment to properly respond to vehicle accidents and other hazards.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Address flooding that causes road closures on Poli Road.	
Year Initiated	2005
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	

Plan to Install Fire Suppression Well	
Year Initiated	2012
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	Plan to install a fire suppression well in downtown Ortonville to help with a possible fire in the downtown area.
2023 Plan Update Status and Changes in Priority	Complete, date unknown

Provide Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	Village of Ortonville
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing from 2012 plan. Additional siren installed in Village/TWP limits. Also, Stations #1 and #2 sirens have been updated with new radio receivers. Would like to update siren with new design. 2023 Update: Completed

Removed Mitigation Actions

Install Additional Outdoor Warning Sirens	
Year Initiated	2012
Applicable Jurisdiction	Village of Ortonville
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. This action was ongoing from 2005.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes

Action/Implementation Plan and Project Description, if applicable	Install additional outdoor warning sirens for full coverage in the Village.
2023 Plan Update Status and Changes in Priority	Removed. This action was ongoing from 2005.

42. Oxford Township

Community Profile and Description

Prior to the 1820s, what is now Oxford Township was known to be a hunting ground of the Nepessing Tribe of the Chippewa Indians, who inhabited large areas of what became Oakland, Lapeer and St. Clair counties. Oxford Township was not officially created until after Michigan became a state in 1837. As of the 2020 U.S. Census, the population is 22,419. The total area of Oxford Township is 35.2 square miles. The Township has three unincorporated communities within its boundaries: Oakwood, Thomas and Waterstone.

Hazards

Tornado Preparedness:

- Tornadoes are a primary hazard of concern for Oxford Township.
- Manufactured home residential areas are particularly vulnerable to tornado damage, covering over two hundred acres of Township land.

Power Outage Risks for Senior Living Facilities:

- The two senior living facilities in the Township rely on generator-based power and are at risk during extended power outages.

Traffic Accidents and HAZMAT Incidents:

- M-24, a heavily traveled road in the Township, poses risks of traffic accidents, especially involving trucks transporting hazardous materials.
- Local industrial facilities and hazardous materials on M-24 create the potential for hazardous material emergencies.

Energy Pipeline Hazards:

- The energy pipeline running through the Township has required repairs at multiple locations, raising concerns about potential hazards to the community.
- Malfunctions in the pipeline could significantly damage the environment and residents.

Winter Storm Hazards:

- Blizzards, heavy storms, and ice storms/sleet can cause blowing and drifting in rural areas, leaving residents snowed in for extended periods.

Extreme Cold Events:

- Two large, manufactured home parks face freezing pipes and plumbing challenges during extreme cold weather.

High Winds and Tornadoes:

- Two large, manufactured home parks risk additional damage during high winds or tornado events.

Subsidence (Sinkhole) Incidents:

- Multiple gravel pits and housing developments built on reclaimed gravel pits create a risk of subsidence incidents.

Active Shooter Incidents:

- A mass shooting occurred at Oxford High School in November 2021, highlighting the need for preparedness against active shooter incidents.

Oil and Gas Well Incidents:

- The presence of a large pipeline (Enbridge) across the township increases the risk of oil and gas well incidents.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Conduct a community survey on the potential hazards for Sink holes	
Year Initiated	2023
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	Supervisor
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside funding sources
Benefits (Loss Avoided)	Life safety, asset protection
Benefits Analysis (Low, Medium, High)	Medium

Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Subsidence
Action/Implementation Plan and Project Description, if applicable	Conduct a community survey on the potential hazards for Sink holes based on the soil makeup and the number of gravel pits
2023 Plan Update Status and Changes in Priority	New

Conduct a Study for Impact of Radon on Community Systems	
Year Initiated	2023
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	Supervisor
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside funding
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description, if applicable	Conduct a study to better understand the impact of Radon on community systems, including water systems in residential areas
2023 Plan Update Status and Changes in Priority	New

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Oxford Township
Lead Agency/ Organization	Fire
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low

Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Fund Specialized Training and Provide Equipment for Hazmat Incidents	
Year Initiated	2005
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	Oxford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Petroleum and Natural Gas Pipeline Accidents
Action/Implementation Plan and Project Description, if applicable	Fund Specialized Training and Provide Equipment for Hazmat Incidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Additional Equipment to Assist in Truck Accidents	
Year Initiated	2005
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	Oxford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide Additional Equipment to Assist in Truck Accidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Continue to Work/Communicate with Pipeline Representatives	
Year Initiated	2012
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	Oxford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Internal (Local/County) Funds
Benefits (Loss Avoided)	Increase coordination and cooperation
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Petroleum and Natural Gas Pipeline Accidents
Action/Implementation Plan and Project Description, if applicable	Continue to work/communicate with the pipeline representatives to assure safe conditions along the pipeline within the Township. Fund Specialized Training and Provide Equipment for Hazmat Incidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Install Standby Generator at Oxford Library	
Year Initiated	2017
Applicable Jurisdiction	Oxford Township, Village of Oxford
Lead Agency / Organization / Position	Oxford Township, Village of Oxford Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000); $75,000
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Cold, Extreme Heat, High Winds/Severe Winds, Ice and/or Sleet Storms, Thunderstorms (Lightning), Tornadoes, Winter Storm and Blizzards, Infrastructure Failure: Electrical System Failure Incident
Action/Implementation Plan and Project Description, if applicable	Install standby generator at Oxford Library so the building can function as a shelter in the event of power outage caused by ice, wind, storm, or tornado. By having the standby generator, the library could function as a shelter. Our community is growing, and the need is there for a larger shelter.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Install Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Oxford Township
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Complete, date unknown

43. Village of Oxford

Community Profile and Description

The Village of Oxford was incorporated in 1876 by the County Board of Supervisors and re-incorporated in 1891. As of the 2020 U.S. Census, the population is 3,492. The total area of the Village of Oxford is 1.47 square miles.

Hazards

Traffic Accident Risks:

- M-24 is a heavily traveled road running north and south through the Village.
- The large number of trucks using this route increases the potential for traffic accidents.

HAZMAT Incidents:

- Many trucks traveling on M-24 transport hazardous materials, posing additional risks to the community.
- The presence of hazardous materials on this route raises concerns about potential hazardous material emergencies.

Industrial Facilities:

- Local industrial facilities in the Village could be potential sources of hazardous materials.
- Proper hazard mitigation plans should be in place to respond to emergencies in these facilities.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Oxford
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Fund Specialized Training and Provide Equipment for Hazmat Incidents	
Year Initiated	2005
Applicable Jurisdiction	Village of Oxford
Lead Agency / Organization / Position	Oxford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Petroleum and Natural Gas Pipeline Accidents
Action/Implementation Plan and Project Description, if applicable	Fund Specialized Training and Provide Equipment for Hazmat Incidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Additional Equipment for Truck Accidents	
Year Initiated	2005
Applicable Jurisdiction	Village of Oxford
Lead Agency / Organization / Position	Oxford Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway

Action/Implementation Plan and Project Description, if applicable	Provide Additional Equipment for Truck Accidents
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Install Standby Generator at Oxford Library	
Year Initiated	2017
Applicable Jurisdiction	Oxford Township, Village of Oxford
Lead Agency / Organization / Position	Oxford Township, Village of Oxford Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000); $75,000
Potential Funding Source	BRIC/HMGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2020
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Cold, Extreme Heat, High Winds/Severe Winds, Ice and/or Sleet Storms, Thunderstorms (Lightning), Tornadoes, Winter Storm and Blizzards, Infrastructure Failure: Electrical System Failure Incident
Action/Implementation Plan and Project Description, if applicable	Install standby generator at Oxford Library so the building can function as a shelter in the event of power outage caused by ice, wind, storm, or tornado. By having the standby generator, the library could function as a shelter. Our community is growing, and the need is there for a larger shelter. Fund Specialized Training and Provide Equipment for Hazmat Incidents The library is located in the Charter Township of Oxford of which the Village of Oxford is in the township. The proximity of the library to the Village (100 feet) makes this a project that the entire community would benefit from.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Install Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Village of Oxford
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	

Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	
2023 Plan Update Status and Changes in Priority	Complete, date unknown

44. City of Pleasant Ridge

Community Profile and Description

Pleasant Ridge began with the subdivision of the Mayday farm by Burt Taylor in 1906. It was incorporated as a village in 1919 and as a city in 1928. As of the 2020 U.S. Census, the population is 2,627. The total area of the City of Pleasant Ridge is 0.57 square miles.

Hazards

Electrical Disruptions:

- The City is vulnerable to electrical disruptions due to infrastructure system failures or severe weather.
- Power outages have severely impacted the community, and the response time from the local utility company has been unsatisfactory.

Active Shooter Incidents:

- There is an elementary school located within the City, and the Pleasant Ridge police have undergone training for active shooter incidents to be prepared in case of such an event at the school.

Infrastructure System Failures:

- The City is at risk of electrical, sewer, and stormwater infrastructure system failures.
- The electrical distribution system is on overhead wires along rear property lines, leading to frequent outages during severe weather events due to downed lines. Burying power lines could be an optimal solution.
- The combined sewer system is part of the GWK drainage district serving 12 SE Oakland County Communities.
    - The system becomes overwhelmed during flashier and frequent large storms, causing basement backups.

Traffic-Related Hazards:

- The City is at risk for traffic-related hazards, bisected by Woodward Avenue and borders I-696.

High Winds

- Our City contains many mature trees. During high wind events trees can topple, potentially falling on houses or property, and blocking streets. Downed trees or tree limbs can also cause power outages due to our overhead electrical distribution system.

Hazardous Materials

- The CN Railroad passes along the east edge of the City, with the train tracks being located within 150 feet of residential structures. A train derailment could cause significant public safety impacts if hazardous waste is spilled into the community.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires

Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Additional Manpower and Equipment for Vehicular Accidents	
Year Initiated	2005
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	City Manager
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide additional manpower and equipment to deal with vehicular accidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Emergency Funding for Water for Citizens	
Year Initiated	2005
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	City Manager

Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	High Winds/Severe Winds, Tornadoes, Infrastructure Failure: Electrical System Failure Incident, Infrastructure Failure: Water System Failure Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide emergency funding to provide water to citizens in cases of power outages.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing. In the process of installing a backup generator in the community center. This center will serve as a shelter during emergencies which will enable the city to provide water and other resources.

Provide Ongoing Training for Public Safety	
Year Initiated	2012
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	City Manager
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	All Hazards
Action/Implementation Plan and Project Description, if applicable	Provide ongoing training for public safety to provide a safe community.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Storm water Infiltration	
Year Initiated	2017
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	Oakland County Drain Commissioner - GWK District
Supporting Agencies/ Organizations	12 GWK communities
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Deploy green infrastructure improvements to infiltrate storm water in place before it enters the combined sewer system.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Completed Mitigation Actions

Provide Dedicated/Automatic Switch-over Generator	
Year Initiated	2012
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	City of Pleasant Ridge
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Completed
Actual Completion Date	Completed
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide a dedicated/automatic switch-over generator for the city hall and additional generators for the community center.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Completed

Removed Mitigation Actions

Provide Additional Manpower, Training, and Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Pleasant Ridge
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Provide additional manpower, training and equipment to be properly prepared for a civil disturbance.
2023 Plan Update Status and Changes in Priority	

45. City of Pontiac

Community Profile and Description

Pontiac is the County Seat for Oakland County. The first settlers arrived in what is now the City of Pontiac in 1818. Two years later there were enough people there to form a village named after the famous Indian Chief who had made his headquarters in the area only a few years before. Pontiac was Michigan's first inland settlement. The village was officially recognized by the state legislature in 1837 and it incorporated as a city in 1861. As of the 2020 U.S. Census, the population is 61,606. The total area of Pontiac is 20.28 square miles.

Pontiac has a tremendous amount of manufacturing, heavy industrial, retail, and residential. There is a downtown area spanning 2 square miles. Three hospitals are located in Pontiac, two of which are fully active.

Hazards

Tornadoes and Winter Weather Hazards:

- Tornadoes and winter weather hazards are significant concerns for the residents of Pontiac.
- Pontiac has a large population of seniors and low-income residents that may be vulnerable to extreme heat and cold due to their inability to pay heating/cooling bills and have inadequate housing insulation.

Hazmat Incidents and Traffic Accidents:

- Hazmat incidents and traffic accidents are also areas of concern in the city.

Fire Services:

- The Waterford Regional Fire Department provides fire services in Pontiac.

Train Delays:

- A major concern is the frequent delays in responding to emergency situations due to trains blocking streets.
- The lack of a solution to this problem is a genuine concern for the community.
- The presence of a rail yard within the city increases the potential for hazardous materials incidents or terrorist attacks.

Crime and Inmate Release:

- The high frequency of crime is a significant issue in Pontiac, like in many large cities.

- The practice of assigning inmates released from the Oakland County Jail to halfway houses and facilities in Pontiac, instead of returning them to their own communities, concerns city representatives.

Active Shooter / Active Assailant

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Pontiac
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires

Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Designated Special Hazmat Route	
Year Initiated	2012
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	City of Pontiac Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000) $100,000
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Continue efforts to clean up and manage woody debris in the Clinton River. Annual Review.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The OCSO does enforce the hazmat trucking restriction in the downtown district. 2023 Update: Ongoing

Seek Funding to Provide County-Wide Wireless Internet Security Cameras	
Year Initiated	2012
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	City of Pontiac Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase safety
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Criminal Acts: Arson, Criminal Acts: Mass Shootings/Active Assailant, Criminal Acts: Vandalism
Action/Implementation Plan and Project Description, if applicable	Seek funding to provide County-wide wireless internet security cameras to be placed in high crime areas for police and fire departments.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Rehabilitate or Demolish Vacant, Dangerous, or Condemned Buildings	
Year Initiated	2017
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	City of Pontiac Community Development Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Winds/Severe Winds, Tornadoes, Winter Storm and Blizzards

Action/Implementation Plan and Project Description, if applicable	Vacant, dangerous, and condemned buildings need funding for rehab or demolition, to protect residents and neighboring property.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Create a Plan to Eliminate Traffic Tie-ups at Railroad Crossings	
Year Initiated	2005
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. Lawrence street issue is complete. Lawrence is now split at the tracks, by a large concrete wall.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Create a plan to eliminate traffic tie-ups at railroad crossings to provide unimpeded emergency vehicle access (particularly at the Johnson, Lawrence, and Sanford Street railroad crossings).
2023 Plan Update Status and Changes in Priority	Complete, date unknown. Lawrence street issue is complete. Lawrence is now split at the tracks, by a large concrete wall.

Removed Mitigation Actions

Transfer Individuals Recently Released from Jail Back to Own Communities	
Year Initiated	2005
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	City of Pontiac
Supporting Agencies/ Organizations	
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Active Shooter/Active Assailant, Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Transfer individuals recently released from jail back to their own communities rather than placing them in a facility in Pontiac.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: REMOVE

Increase Public Safety	
Year Initiated	2017
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	City of Pontiac, Waterford Township Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	Low

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Funding is needed to increase public safety levels for the City. With renewed growth of industrial, manufacturing, retail, office space, and health care facilities, the South Blvd Fire Station #10 will need to be reopened with staffing and re-equipped.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: REMOVE

Additional Fire Prevention Officers	
Year Initiated	2017
Applicable Jurisdiction	City of Pontiac
Lead Agency / Organization / Position	Waterford Township Fire Department
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies:

	Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	With the continued growth of the City as noted in an earlier comment the need for Fire Prevention and Inspection is increasing. Funding is needed to provide additional Fire Prevention Officers.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: REMOVE

46. City of Rochester

Community Profile and Description

The City of Rochester is on the north side of the Detroit Metropolitan area. The City of Rochester was settled in 1817 and the village became the City of Rochester in 1967, breaking away from Avon Township. As of the 2020 U.S. Census, the population is 13,035. The total area in the City of Rochester is 3.83 square miles.

Hazards

Tornado and Structural Fire Risks:

- The downtown historical area is vulnerable to tornadoes and structural fires due to the age of the structures.

Structural Fire Incidents:

- There is a specific vulnerability to fires at the local senior citizen residential complex.

Flooding:

- Flooding of the Clinton River exists in the city's southern portion, particularly along South Street, posing a risk to light industrial areas.

High Wind Events:

- High winds have become a major concern, knocking over trees and power lines, causing significant damage in the past.

Electrical System Failure:

- There is a high risk of an electrical system failure incident due to poor power quality from the local service provider.

Aging Infrastructure:

- Aging infrastructure poses hazards such as sewer system failure, stormwater system failure, and transportation infrastructure system failure.
- Failure of potable water is a concern, as it is single-connecting for 2.8 square miles of the city.

Ice Storms and Severe Winter Weather:

- Ice storms pose hazards for traveling, particularly affecting senior citizens.

- Winter storms and blizzards can pose moderate to severe risks to historic buildings depending on the storm's severity.

Traffic Hazards:

- Increased traffic on Rochester Road poses potential hazards due to hazardous material transportation and the risk of multi-car accidents.
- There is a moderate risk of transportation accidents in the historic downtown area.

Extreme Weather Effects:

- Drought may lead to excessive use of the municipal water system.
- The increasingly aging population may be at greater risk during extreme cold and heat events.
- Hail is not usually a risk, depending on the size of the hail.

Other Risks:

- There is a low risk of arson, and blight is under control.
- Mass shootings/active assailants, terrorism, and sabotage pose moderate to high risks due to numerous large public events and crowds.
- There is an invasive species risk related to phragmites.

Flood-Related Hazards:

- Specific streets like Second, Third, and Fourth Streets from Main to Letica and Water are subject to flooding based on historical patterns.

HAZMAT Incidents:

- There is a transmission pipeline for Enbridge carrying a variety of flammable liquids.
- 12 companies around the city carry or possess hazardous materials.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Construct Potable Water Storage Tank	
Year Initiated	2023
Applicable Jurisdiction	Rochester
Lead Agency/ Organization / Position	Fire / DPW
Supporting Agencies/ Organizations	Finance
Applicable Goal(s)	1, 2, 4
Estimated Cost & Analysis (Low, Medium, High)	$750,000
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Potable water for community
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	6/1/2024
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description	Construct a 500,000-gallon potable Water Storage tank due to a single supply line for potable water. Recent failure highlights this single connection shortfall
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Improve storm drains to prevent flooding	
Year Initiated	2023
Applicable Jurisdiction	Rochester
Lead Agency/ Organization / Position	Fire / DPW
Supporting Agencies/ Organizations	Finance
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$650K
Potential Funding Source	NFIP
Benefits (Loss Avoided)	$3,000K
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	9/1/2024
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Improve storm drains to prevent flooding in intersection similar to Selong and Water, Thira and Watel and Selong and Letica due to extreme weather caused by global changes

2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Study, Design and Implement Streambank Erosion Control Mitigation	
Year Initiated	2023
Applicable Jurisdiction	Rochester
Lead Agency/ Organization / Position	Emergency Management and DPW
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$500,000
Potential Funding Source	BRIC, HMGP, FMA
Benefits (Loss Avoided)	Mitigate flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Extreme weather incidents have resulted in streambank erosion and high-water in rivers. Baskets are being undermined, eating into the bank causing streambank erosion issues. Mitigation alternatives, such as replacing gravel ballards, sheet pilings, and elevation, etc. need to be studied and implemented.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Study, Design and Implement Mitigation Alternatives to Address Stormwater Backflow	
Year Initiated	2023
Applicable Jurisdiction	Rochester
Lead Agency/ Organization / Position	Emergency Management and DPW
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$800,000
Potential Funding Source	BRIC, HMGP, FMA
Benefits (Loss Avoided)	Mitigate flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Stormwater drainage lacks capacity and drainage piping needs to be replaced and elevated to minimize backflow. In some areas, 12-inch piping needs to be replaced with 30-inch piping. The specific areas of concern include, but are not limited to: Clinton River and Paint Creek.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Mitigate Streambank Erosion	
Year Initiated	2023
Applicable Jurisdiction	City of Rochester
Lead Agency/ Organization / Position	Emergency Management and DPW
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Mitigate streambank erosion; need a study; add gravel ballards - not working; Baskets are being undermined, eating into the bank Add sheet pilings River bend has lowered
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Rochester
Lead Agency/ Organization	Emergency Management
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5

Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue Efforts to Clean up and Manage Woody Debris	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester
Lead Agency / Organization / Position	DPW
Supporting Agencies/ Organizations	Clinton River Watershed Council
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000) $100,000
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding ($1,000,000.00)

Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	Ongoing
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Continue efforts to clean up and manage woody debris in the Clinton River. Annual Review.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Improve security and maintenance at water systems.	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester
Lead Agency / Organization / Position	DPW
Supporting Agencies/ Organizations	Police
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (Greater than $100,000) $400,000
Potential Funding Source	City Budget, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure ($5,000,000)
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	6/2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Improve monitoring and security of municipal water works
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Community Communication System	
Year Initiated	2017
Applicable Jurisdiction	City of Rochester
Lead Agency / Organization / Position	Police/Fire/DPW
Supporting Agencies/ Organizations	City of Rochester
Applicable Goal(s)	1, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	$4,000 per year

Potential Funding Source	City budget
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	1/1/2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Community Communication System
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Plan and implement improvements to prevent erosion along the soft shoulder of the Clinton River.	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester
Lead Agency/ Organization / Position	DPW
Supporting Agencies/ Organizations	Planning
Applicable Goal(s)	Prevention and reduction of damage to public and private property and infrastructure.
Estimated Cost & Analysis (Low, Medium, High)	$750,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	$1,500,000
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	April, 2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Plan and implement improvements to prevent erosion along the soft shoulder of the Clinton River.
2023 Plan Update Status and Changes in Priority	Completed in 2017

Removed Mitigation Actions

Continue current levels of cooperation from Oakland County	
Year Initiated	2005
Applicable Jurisdiction	City of Rochester
Lead Agency/ Organization / Position	Rochester Fire
Supporting Agencies/ Organizations	Police & DPW
Applicable Goal(s)	Improve and support public and private organizational response capabilities.
Estimated Cost & Analysis (Low, Medium, High)	$5,000
Potential Funding Source	City Budget
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	Ongoing Cooperation
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Cold, Extreme Heat, Fog, Hail, High Winds/Severe Winds, Ice and/or Sleet Storms, Riverine Flooding, Shoreline Flooding & Erosion Subsidence, Thunderstorms (Lightning), Tornadoes, Urban Flooding, Wildfire, Winter Storm and Blizzards, Criminal Acts: Arson, Criminal Acts: Mass Shootings/Active Assailant, Criminal Acts: Vandalism, Dam Failure, Gas/Oil Shortages or Supply Disruption, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure: Communication System Failure, Incident Infrastructure Failure: Electrical System Failure, Incident Infrastructure Failure: Sewer System Failure, Incident Infrastructure Failure: Storm Water System Failure Incident, Infrastructure Failure: Transportation (Bridges, Roads, Overpasses), Infrastructure System Failure Incident, Infrastructure Failure: Water System Failure Incident, Invasive Species, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Petroleum and Natural Gas Pipeline Accidents, Scrap Tire Fire, Structural Fire, Transportation Accidents: Air ,Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation

	Accidents: Rail, Civil Disturbances, Terrorism and Sabotage, Weapons of Mass Destruction, Pandemic/Epidemic
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Removed 2023

47. City of Rochester Hills

Community Profile and Description

The City of Rochester Hills is located on the northern outskirts of Metropolitan Detroit. Prior to European settlement, the area now known as Rochester Hills was inhabited by Native Americans, namely the Potawatomi. The first European settler was James Graham who arrived in 1817. Rochester was incorporated as a village within the township in 1869. In 1966, village residents voted to become the City of Rochester, effective in February 1967. As of the 2020 U.S. Census, the population is 76,300. The total area of the City of Rochester Hills is 32.91 square miles.

Hazards

Flooding:

- Areas most vulnerable to flooding include Paint Creek near Dutton Road and Livernois, Stoney Creek near East Tienken Road, and the Clinton River north of Hamlin Road.
- Factors contributing to flooding include water originating from other communities and private bridges blocked by debris, causing subsequent flooding.
- Riverine and shoreline flooding are concerns at specific locations.

Emergencies at Senior Citizen Facilities:

- Fires or tornadoes at senior citizen facilities present significant risks, with 17 facilities in the community and 3 more scheduled to open.
- Lack of a specific plan for transporting residents to a safe area is an area of concern.

Extreme Cold and Heat:

- Multi-family residential and senior living complexes are threatened by extreme cold and heat due to building infrastructure failure.

Tornadoes and High Winds:

- Tornadoes and high winds have caused damage in the past, impacting trees, power lines, and manufactured home communities.
- Highly populated residential areas may also be at risk during tornado events.

Electrical Grid Failures:

- Electrical grid failures are a major concern due to the larger number of senior citizens living there.

Infrastructure Failure:

- M-59 poses a potential hazard due to high traffic volume and transportation of hazardous materials.
- Efforts to replace major bridges have reduced the risk of transportation infrastructure failure.

Other Weather-Related Hazards:

- Fog, hail, ice storms, sleet storms, thunderstorms, lightning, and blizzards may impact various areas and structures.

Air Incidents:

- Being in the flight path for Oakland County Airport, Rochester Hills, may be impacted by air incidents.

Public Health Emergencies:

- Large senior population and low-income housing buildings are vulnerable to extreme cold/heat and public health emergencies.
- Presence of senior living complexes and universities may also pose a threat during a pandemic/epidemic.

Active Shooter Incidents:

- Two universities and numerous schools make the community susceptible to active shooter incidents.

HAZMAT Incidents:

- The Sunoco Pipeline and an inspection pump facility present the potential for HAZMAT emergencies.

Invasive Species:

- The city is actively involved in Phragmite mitigation in green spaces.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.

- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Update the City's Emergency Operations Plan and Hazard Mitigation Plan	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Fire
Supporting Agencies/ Organizations	All Departments
Applicable Goal(s)	1, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025?
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	HIGH
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Planning and Preparedness: Update the City's Emergency Operations Plan and Hazard Mitigation Plan to better understand the hazards/threats of the city
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Management of the Clinton River	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Parks and Natural Resources
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3

Estimated Cost & Analysis (Low, Medium, High)	$305,000
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description	Streambank Management, Woody Debris Management and Removal
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Coexisting With Wildlife	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Parks and Natural Resources
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5, 7
Estimated Cost & Analysis (Low, Medium, High)	$26,500
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description	Provide education and mitigation to the public to reduce the number of deer/vehicle accidents.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Tree Management	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Parks and Natural Resources
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$202,500/annually
Potential Funding Source	General Funds
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Invasive Species
Action/Implementation Plan and Project Description	Update the tree inventory on city-owned property. Need to maintain to update records on condition of critical trees along pathways and in parks.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Phragmite Mitigation Program	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Parks and Natural Resources
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	$270,000 per year
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Asset protection
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Invasive Species
Action/Implementation Plan and Project Description	Treat on city-owned property. Phragmites can cause issues with drainage, infrastructure, public safety and natural habitats.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

SCADA Upgrades/Improvements	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	DPS
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 3
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	General Funds
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Subsidence, Infrastructure Failure
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Adams Road Study	
Year Initiated	2023
Applicable Jurisdiction	Rochester Hills
Lead Agency/ Organization / Position	Planning and Economic Development
Supporting Agencies/ Organizations	Oakland County Road Commission
Applicable Goal(s)	2, 3, 4, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Life safety
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Winter Storms, Infrastructure Failure
Action/Implementation Plan and Project Description	Overview of impacts of improvements to Adams Road between Hamlin and Walton.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Rochester Hills
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide Transportation for Citizens in Emergencies	
Year Initiated	2005
Applicable Jurisdiction	City of Rochester Hills
Lead Agency / Organization / Position	City of Rochester Hills Fire Department, Oakland County Sheriff's Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide transportation for citizens, especially seniors, in cases of emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Collaboration with Rochester Schools. 2023 Update: Ongoing.

Address Problem of Clinton River Flooding	
Year Initiated	2005
Applicable Jurisdiction	City of Rochester Hills
Lead Agency / Organization / Position	City of Rochester Hills Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Severe Summer Storms
Action/Implementation Plan and Project Description, if applicable	Address the problem of Clinton River flooding from storm water runoff and dam/lake level control structure releases upstream.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Seek funding to complete bank erosion repair of Clinton River.	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester Hills
Lead Agency / Organization / Position	City of Rochester Hills Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Seek funding to complete bank erosion repair of Clinton River.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Work along the Clinton River took place this summer, but will be a continuous process. 2023 Update: Ongoing - State made improvements in 2020

Seek Funding to Remove Woody Debris	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester Hills
Lead Agency / Organization / Position	City of Rochester Hills Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Seek funding to remove woody debris removal of the Clinton River and Paint Creek.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Subcontractors clean woody debris from the Clinton River on an as needed basis. 2023 Update: Ongoing. Subcontractors clean woody debris from the Clinton River on an as needed basis.

Emergency Warning Notification System	
Year Initiated	2017
Applicable Jurisdiction	City of Rochester Hills
Lead Agency / Organization / Position	Rochester Hills Fire Department
Supporting Agencies/ Organizations	Rochester Hills MIS
Applicable Goal(s)	1, 4, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC/HMGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Develop an effective emergency warning notification system to make residents aware of a community emergency.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing - currently utilizing social media.

Completed Mitigation Actions

Prohibit Building of Private Bridges	
Year Initiated	2005
Applicable Jurisdiction	City of Rochester Hills
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Halted. Don't believe this mitigation action is active.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Riverine Flooding
Action/Implementation Plan and Project Description	Prohibit the building of private bridges that may back up small streams and result in flooding, particularly on Paint Creek, the Clinton River and Stoney Creek.
2023 Plan Update Status and Changes in Priority	Completed

Removed Mitigation Actions

Seek funding to address flooding on Livernois and Avon Roads.	
Year Initiated	2012
Applicable Jurisdiction	City of Rochester Hills
Lead Agency/ Organization / Position	City of Rochester Hills
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Protect infrastructure from flooding
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Removed

48. Rose Township

Community Profile and Description

Rose Township is celebrating its 180th anniversary. The Act of Legislature creating Rose Township was approved on March 11th, 1837. There are at least 25 lakes within the boundaries of Rose Township. As of the 2020 U.S. Census, the population is 6,188. The total area of Rose Township is 36.4 square miles. A small part of the unincorporated Village of Holly is located within the Township and has two unincorporated communities: Rose Center and Rose Corners.

The area is rural & zoned residential (72%), Ag/Recreation/Park (20%) and Gov./Industrial/Commercial (8%). We have large agricultural buildings such as barns, feed storage, Ag fuel/chemical storage and large indoor riding arenas with stables. Only 1% of our area is protected by hydrants. Other occupancies are Camp Grounds

Hazards

Tornadoes and Winter Storms:

- With over 6,000 residents, tornadoes and winter storms are major concerns for the rural community.

Emergency Access to Manufactured Homes:

- Township officials addressed concerns about emergency access to mobile homes in the northern part of the Township.
- Instances of trains blocking entrances to the Holly Shores Manufactured Home Park have made emergency response difficult.

Train and Railroad Hazards:

- Concerns were raised about the possibility of chemical spills or fires in remote and environmentally sensitive areas related to trains and railroads.

Natural Gas and Crude Oil Pipelines:

- The presence of a 36" and 18" natural gas pipeline, a crude oil pipeline, and a pumping station pose potential hazards to the Township.

High-Voltage Tension Wires:

- High-voltage tension wires are identified as potential hazards in the community.

Communication Tower:

- The communication tower is considered a potential target for disruption, posing a risk to communications.

Aging and Inadequate Culverts:

- Aging and inadequate culverts are a major concern for residents due to their potential to cause problems like a washout leading to a train derailment.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Rose Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Tree Trimming and Replacements of obsolete electrical equipment	
Year Initiated	2023
Applicable Jurisdiction	Rose Township
Lead Agency/ Organization	Supervisor
Supporting Agencies/ Organizations	Rose Township Administration
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Asset Protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description	Coordinate with utility companies to expedite tree trimming and replacement of obsolete electrical equipment
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Ongoing Mitigation Actions

Correct Problem of Trains Blocking Emergency Vehicles	
Year Initiated	2005
Applicable Jurisdiction	Rose Township
Lead Agency / Organization / Position	Township Supervisor

Supporting Agencies/ Organizations	Canadian National Railroad
Applicable Goal(s)	1, 4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Correct the problem of trains blocking emergency vehicles from entering and exiting Holly Shores Mobile Home Park.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Does happen less frequently due to discussions with train company. 2023 Update: Ongoing. Infrequent events but when they happen all emergency vehicle access is blocked. Happened during medical emergency in 2023.

Seek Funding to Pave Rose Center Road	
Year Initiated	2012
Applicable Jurisdiction	Rose Township
Lead Agency / Organization / Position	Rose Township, Road Commission for Oakland County
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek funding to pave Rose Center Road (the only east/west roadway) and improve local road/primary road intersections.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Improve Communication/Coordinator with Adjacent Agencies	
Year Initiated	2012
Applicable Jurisdiction	Rose Township
Lead Agency / Organization / Position	Township Supervisor
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Improve communication/coordination with adjacent municipal police, fire and emergency response agencies, including Genesee County, during emergency response situations. Establish means of emergency communications with Genesee County which does not use the OakWin Radio System.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action.

	2023 Update: Ongoing. Radio system replacement is funded and underway. 2024 completion date projected.

Fire Protection Plan for High Fire Flow Areas	
Year Initiated	2017
Applicable Jurisdiction	Rose Township
Lead Agency / Organization / Position	North Oakland County Fire Authority
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3, 4
Estimated Cost & Analysis (Low, Medium, High)	Staff Time
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased protection in high fire flow areas
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2021
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description, if applicable	Currently, there are a number of barns, stables, agricultural structures, and other structures in high fire flow areas. If a fire broke out in one of these locations, there are no nearby water supplies, and an extensive amount of water would be needed to fight the fire. This mitigation action seeks to identify the best way(s) to protect these structures and fight potential fires in the area.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing. Underway and ongoing. Dry hydrant with turbodraft installed and Davisburg Road and 500 GPM well in Hills of Davisburg. Other in the works.

Completed Mitigation Actions

Install tornado sirens in the Township.	
Year Initiated	2005
Applicable Jurisdiction	Rose Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed

Advocate for a central accountability system for all emergencies including hazmat accidents.	
Year Initiated	2012
Applicable Jurisdiction	Rose Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	Improve and support public and private organizational response capabilities.
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2014 - Accountability system put in place
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Advocate for a central accountability system for all emergencies including hazmat accidents.
2023 Plan Update Status and Changes in Priority	Completed in 2014

49. City of Royal Oak

Community Profile and Description

Royal Oak was incorporated as a village, in 1891, and as a city in 1921. The popular 1990's sitcom Home Improvement was set in Royal Oak. As of the 2022 U.S. Census Bureau 2022 Population estimate is 57,495. The total area of the City of Royal Oak is 11.79 square miles. Royal Oak is home to the Woodward Dream Cruise, Arts, Beats & Eats Festival, and approximately 30 other special events throughout the year. - Royal Oak is bordered by Interstate 75, Interstate 696 and M-1 (Woodward Avenue)

Royal Oak plans to fully participate and integrate with the ongoing Oakland County HMP and unlike 2017, will not have our own stand-alone plan outside the Oakland County umbrella.

Hazards

Gas Leak or Explosion at Industrial Facility:

- Concerns exist regarding insufficient personnel and emergency equipment to handle a hazmat incident at a local industrial facility.

Need for Additional Emergency Shelters:

- City officials addressed the need for more emergency shelters to enhance preparedness and response capabilities.

High Wind Events and Power Outages:

- Large, mature trees in residential and commercial areas and above-ground electricity infrastructure make the city susceptible to wind-related power outages.

Terrorism/Active Assailant Incidents:

- Special events and high pedestrian flow in downtown Royal Oak make it a potential target for terrorism or active assailant incidents.

HAZMAT Incidents:

- Proximity to highways and railroads carrying hazardous materials increases the potential for HAZMAT incidents like train derailments or chemical spills.

Major Transportation Incidents:

- The city's location at the crossroads of major highways and railroads poses risks of major transportation incidents, including vehicular accidents and train-related emergencies.

Socio-Political Hazards:

- The city's progressive nature and frequent targeted protests on various political and social topics pose socio-political hazards.

Weapons of Mass Destruction:

- The popularity, special events, and easily-accessible transportation routes in Royal Oak make it a potential target for weapons of mass destruction incidents.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Purchase of mobile vehicular barriers to secure the perimeter of large scale events in the city.	
Year Initiated	2005
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	Royal Oak Police Department
Supporting Agencies/ Organizations	Royal Oak Department of Public Service
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	$80,000-$125,000
Potential Funding Source	FEMA via Urban Area Security Initiative (UASI), operation Stone Garden
Benefits (Loss Avoided)	These mobile vehicle barriers would protect against vehicular attacks or accidents through vulnerable points in an event perimeter.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for	High

each mitigation action during the update process)	
Hazard(s) Mitigated	Active Shooter/Active Assailant, Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description	The purpose of the mobile vehicle barriers would be to place them on roadways and other positions along the perimeter of an event that may be vulnerable to vehicular attack. The City of Royal Oak is home to a significant number of special events which require closure of roadways and parking lots immediately accessible to key roadways. Mobile vehicle barriers would provide a visible deterrent to anyone considering the use of a vehicle to effect a terrorist attack and likewise, protect citizens in the event of a vehicular attack.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Conduct a Study for Storm Water Overflow	
Year Initiated	2023
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	WRC - Oakland County
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Flood Damaged Properties
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Conduct a study to determine feasibility and efficacy of constructing a network of storm water overflow basins using undeveloped vacant city property (park land, etc.)
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Improve warming shelters and cooling shelters	
Year Initiated	2023
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak Public Safety Department
Supporting Agencies/ Organizations	Oakland County
Applicable Goal(s)	1, 2, 3, 4, 7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC/HMGP

Benefits (Loss Avoided)	provide warming/cooling shelters during these events
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Winter Storms, Extreme Heat, Infrastructure Failure
Action/Implementation Plan and Project Description	Improve warming shelters and cooling shelters with backup generators or additional alternative power sources to improve resilience to power outages from extreme heat or cold to improve our services to our vulnerable population
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland

	County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Purchase of AreaRae Rapid Deployment Kit and Remote Host for air and radiological monitoring during large scale events in the city.	
Year Initiated	2023
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Royal Oak Fire Department
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	$95,000-$120,000
Potential Funding Source	Grant Funding
Benefits (Loss Avoided)	These monitors will protect against any airborne or radiological threat at events.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short-term 2025
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire, Transportation Accidents: Highway, Transportation Accidents: Rail, Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description	The AreaRaes are air and radiological monitors that can be deployed at key locations during any special event in the city. They can be monitored in a central location up to 2 miles away. The City of Royal Oak is home to a significant number of special events which attract thousands of people. They would be placed it key locations where large groups gather and other key strategic locations to give real time results of air quality

	and background radiation levels. In the event of a hazardous materials release or terrorist attack, they can be used to determine safe evacuation routes and assist in plume modeling with their integrated weather stations
2023 Plan Update Status and Changes in Priority	New mitigation actin for 2023

Ongoing Mitigation Actions

Burying Utilities Ordinance	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Public Services
Supporting Agencies/ Organizations	DET
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Construction Budget
Benefits (Loss Avoided)	Reduced utility damage from hazards, continued utility service to residents
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2019)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure, Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Establish local ordinance regarding burying of utilities in new development, such as when developer knocks down a house to build a new one.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Expand Tree Planting Program	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	School District, Beaumont Zoo
Applicable Goal(s)	3, 4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduced flooding, increased green space
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2021)
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Expansion of the tree-planting program
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Permeable Pavement	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3,4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	MDEQ NPS Grants
Benefits (Loss Avoided)	Reduced flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2021)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Use of permeable pavement in bike lanes and parking areas to be implemented as roadway is replaced.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

City Sewer Line Cleaning	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	DET
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000-$100,000)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Cleaning of city sewer lines every 6 years to maintain maximum flow of stormwater and residential flow. Royal Oak is a combined system.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Tree Trimming & Removal	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3, 4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 - $100,000)
Potential Funding Source	Local Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Power Failure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Trimming & removal of trees as need to reduce storm damage.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Snow & Ice Control on Streets	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 - $100,000)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Life Safety
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Severe Winter Storms
Action/Implementation Plan and Project Description, if applicable	Snow & ice control on city streets
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

City Codes for Mitigation	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Low (less than $10,000)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Property damages mitigated
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Change city codes for construction (new) that require incorporating preventative measures, built-in mitigation.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Update and Expand Infrastructure	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	GLWD/DTE/Consumers
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Property Damages and Life Safety
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure

Action/Implementation Plan and Project Description, if applicable	Update & expand infrastructure: water, sewer, and electrical. S/E Michigan has infrastructure that is old and operating at or beyond capacity.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Sewer Insurance Education	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low ($5,000)
Potential Funding Source	Community Outreach/General Fund
Benefits (Loss Avoided)	Increased insurance coverage for private residents
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Educate the public on the sewer back-up insurance. Many people were not covered in the 2014 flood because they had flood insurance, but not the correct insurance for a basement backup. Consider giving something to new residents when they come in to turn in assessing paperwork on a new house.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Mitigation Website & Education	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Safety
Supporting Agencies/ Organizations	Beaumont, School District
Applicable Goal(s)	1, 3, 5
Estimated Cost & Analysis (Low, Medium, High)	Low (Less than $10,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased awareness and education
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2018)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Creation of hazard mitigation website and education campaign. Include safety shorts - videos showing how people can mitigate at home or explaining hazards.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Provide information to property owners in flood-prone areas and the need for NFIP coverage	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	DET
Applicable Goal(s)	3, 5
Estimated Cost & Analysis (Low, Medium, High)	Low (Less than $10,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased awareness and education
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2018)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	The city of Royal Oak will continue to participate in the National Flood Insurance Program and develop actions that will reduce the damage to property due to flash flooding.

2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Utility Awareness Reporting	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	All utility/DTE/Consumers Power
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2, 5
Estimated Cost & Analysis (Low, Medium, High)	Low (Less than $10,000)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Life Safety and Awareness
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Severe Winter Storms
Action/Implementation Plan and Project Description, if applicable	Increase public awareness & reporting. Encourage utility companies to have proactive maintenance programs, including inspection, preventative maintenance and report, including aggressive tree inspection and trimming.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Generators in Senior Centers and Assisted Living Facilities	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	Assisted Living Centers/Nursing Homes
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Grants (PDM and HMGP)
Benefits (Loss Avoided)	Life Safety and Compliance
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Ensure all senior centers and assisted living facilities have an operating generator, perhaps with an ordinance requiring they report to the city.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Generators for all City Buildings	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,5,6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Grant (PDM and HMGP)
Benefits (Loss Avoided)	Maintain public services during disaster
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (2019)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure

	Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Backup generators for all city buildings (including City Hall and Court).
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Rain Garden Installations	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High ($180,000)
Potential Funding Source	Michigan DEQ NPS Grants
Benefits (Loss Avoided)	Reduced basement flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Installation of rain gardens throughout the city.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Backflow Prevention Valves	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	DET
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 - $100,000)
Potential Funding Source	Sewer/water fund, grants
Benefits (Loss Avoided)	Basement and property damage reduced
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Backflow prevention valves installed leading into basement - buy-in programs similar to tree planting. Resident pays for installation. We buy in bulk at beginning of year and sell at discounts.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Stormwater Requirements for Developers	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	Low (Less than $10,000)
Potential Funding Source	MDEQ NPS Grants, Water Conservation Grants, MDNR
Benefits (Loss Avoided)	Reduced urban flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2019)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Require developers to mitigation stormwater run-off on-site or pay into larger projects in other parts of the city (i.e., parks, pavement).
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Stormwater Master Plan	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	2,3,5
Estimated Cost & Analysis (Low, Medium, High)	High ($100,000)
Potential Funding Source	MDEQ NPS Grants
Benefits (Loss Avoided)	Basement damages, road flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Development of a Stormwater Master Plan as per Stormwater Task Force
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Stormwater Storage/Management Systems	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	City of Royal Oak Community Development
Supporting Agencies/ Organizations	County Water Resources Commission
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (More than $100,000)
Potential Funding Source	Grants, Sewer rates
Benefits (Loss Avoided)	Basement flooding, claims reduced
Benefits Analysis (Low, Medium, High)	Medium/High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium/High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Construct stormwater storage or management systems to reduce the impacts of flooding (urban) by increasing the (sewer) system flexibility/capacity.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Backup Generators and All School Buildings	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	Royal Oak School District
Supporting Agencies/ Organizations	State Department of Education
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High ($500,000)
Potential Funding Source	Grants (PDM and HMGP)
Benefits (Loss Avoided)	Loss of instructional time, damage to facilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Installation of back-up generators at all school buildings.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Provide additional manpower for large scale celebrations/crowds downtown.	
Year Initiated	2005
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	2012 Update: Ongoing - In 2012, a public safety millage was passed setting the staffing level of the Royal Oak Police Department at 79 sworn officers, a maximum staffing level which remains in effect in 2023. ROPD

	continues to work with our local, county and state law enforcement partners for mutual aid as needed for large-scale events and celebrations. 2023 Update: Completed

Provide the necessary training and equipment needed to address hazmat emergencies.	
Year Initiated	2005
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed - Ongoing monthly training. Coordinated efforts and equipment through mutual aid and Oakway County Consortium.

Seek Funding for Communication Boosters	
Year Initiated	2012
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Cold, Extreme Heat, Fog, Hail, High Winds/Severe Winds, Ice and/or Sleet Storms, Riverine Flooding, Shoreline Flooding & Erosion Subsidence, Thunderstorms (Lightning), Tornadoes, Urban Flooding, Wildfire, Winter Storm and Blizzards, Criminal Acts: Arson, Criminal Acts: Mass Shootings/Active Assailant, Criminal Acts: Vandalism, Dam Failure, Gas/Oil Shortages or Supply Disruption, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure: Communication System Failure, Incident Infrastructure Failure: Electrical System Failure, Incident Infrastructure Failure: Sewer System Failure, Incident Infrastructure Failure: Storm Water System Failure Incident, Infrastructure Failure: Transportation (Bridges, Roads, Overpasses), Infrastructure System Failure Incident, Infrastructure Failure: Water System Failure Incident, Invasive Species, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Petroleum and Natural Gas Pipeline Accidents, Scrap Tire Fire, Structural Fire, Transportation Accidents: Air ,Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail, Civil Disturbances, Terrorism and Sabotage, Weapons of Mass Destruction, Pandemic/Epidemic
Action/Implementation Plan and Project Description	Seek funding for communication Ongoing monthly training. Coordinated efforts and equipment through mutual aide and Oakway County Consortium. boosters for the OakWin Radio System to address dead zones in the network.
2023 Plan Update Status and Changes in Priority	2023 Update: Complete - Oakland County is currently in the midst of moving to a new radio system and the OakWin Radio System will no longer be used as of Fall 2023. All law enforcement agencies will be on the new system. Royal Oak is scheduled to transition to the new system in September, 2023.

Increase green space throughout the city	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Local funds and grants
Benefits (Loss Avoided)	Flooding Impact Reduced
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Complete

Generator for Department of Public Services	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak: Department of Public Services
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	Grants (PDM and HMGP)
Benefits (Loss Avoided)	Continuity of Operations
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description	Backup power for the Department of Public Services to maintain operational response during extended power outages.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Completed - Generator Obtained

GPS Tracking for Snow Plows & Salting	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 4
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Local Funds and Grants
Benefits (Loss Avoided)	Stuck cars, personal property damage, injury
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Winter Storms
Action/Implementation Plan and Project Description	Install real-time GPS tracking for snow plows and salting. Can give up-to-date information to residents to help them make smarter travel decisions.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Completed - GPS Trackers and continue map updating in effect

Emergency Alert Promotion	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	School District, Beaumont Zoo
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Low ($10,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Increased residential awareness during emergencies
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (2019)
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Emergency alert (email & messenger) promotion campaign. It is set up, but it is not widely signed up for.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Complete

Hardening for High Profile and Vulnerable Events	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Local Funds and Grants
Benefits (Loss Avoided)	Life Safety
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Active Shooter/Active Assailant, Active Shooter/Active Assailant
Action/Implementation Plan and Project Description	Target hardening for high profile and vulnerable special events (mobile barriers, retractable barriers, etc.)
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Completed

Dangerous Animal Escape Plan	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	Detroit Zoological Society
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2, 3, 4
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Local funds and Grants
Benefits (Loss Avoided)	Life Safety for people and animals
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Public safety/animal escape (dangerous): How to handle and protect the public in the event of a dangerous animal escape, how to notify the public,

	barricade/quarantine areas to minimize injury/death, if need - how to dispatch or tranquilize the animal. Look into drainage system in some exhibits to reduce flooding to help prevent animal escape.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Completed - Plan created and adapted. Ongoing coordination with Royal Oak PD

Stormwater Web site & Education	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	City of Royal Oak
Supporting Agencies/ Organizations	Clinton River Watershed Council
Applicable Goal(s)	2, 4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($20,000)
Potential Funding Source	MDEQ NPS Grant
Benefits (Loss Avoided)	Basement Flooding
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Create stormwater specific webpage with information on installing residential rain gardens, directing downspouts, and installing rain barrels. Rain gardens/rain barrel education programs.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated/New 2023 Update: Completed

Compile a list of contractors with heavy equipment able to provide immediate assistance in emergency situations, particularly tornadoes and train derailments.	
Year Initiated	2005
Applicable Jurisdiction	City of Royal Oak
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	2023 Update: Completed - List compiled and completed through Oakland County. Royal Oak has access to that list.

Flood Drainage Improvement at School Buildings	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	Royal Oak Schools
Supporting Agencies/ Organizations	State Department of Education
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	High (More than $100,000)
Potential Funding Source	Grants (PDM and HMGP)
Benefits (Loss Avoided)	Local High School
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Winds, Thunderstorm and Lightning, Tornado, Winter Storm/Blizzard/Ice Storm
Action/Implementation Plan and Project Description, if applicable	Flooding (Urban/Flash)
2023 Plan Update Status and Changes in Priority	2023 Update: Completed

Removed Mitigation Actions

Bulletproof Doors	
Year Initiated	2017
Applicable Jurisdiction	City of Royal Oak
Lead Agency / Organization / Position	Royal Oak School District
Supporting Agencies/ Organizations	State of Michigan Department of Education
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High ($800,000)
Potential Funding Source	Federal Grants
Benefits (Loss Avoided)	Loss of life
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Active Shooter/Active Assailant, Socio-Political Hazards (Civil Disturbance, Social Unrest)
Action/Implementation Plan and Project Description, if applicable	Active shooter: installation of bullet/entry proof doors at all entrances of each school.
2023 Plan Update Status and Changes in Priority	2023 Update: This project is no longer applicable and should be removed

Purchase a new trailer with a special affects video system to expand the community education program about tornadoes and other hazards.	
Year Initiated	2005
Applicable Jurisdiction	
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	
Actual Completion Date	
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	2023 Update: Action Removed - As a city employee since 2001, I have never seen or been aware of a city-owned "Trailer with Special Effects Video System" and believe this to be an erroneous entry. The trailer does not exist at this time nor do I ever recall a time it did exist.

50. Royal Oak Township

Community Profile and Description

Royal Oak Township is a suburb of Detroit. Royal Oak Township was established in 1833 as a regular, 36-square-mile civil township, and at one time consisted of all or parts of the following modern cities and villages of Hazel Park, Ferndale, Oak Park, Madison Heights, Pleasant Ridge, Huntington Woods, Royal Oak, Berkley, and Clawson. The township began to shrink beginning in 1921 with the incorporation of the cities above. To provide greater protection from easy annexation, the township incorporated as a charter township in 1972. The population according to the U.S. Census for 2020 is 2,374. The total area of Royal Oak Township is 0.55 square miles.

Hazards

Structural Fires and Tornadic Events:

- Many structures in the community, particularly older wood houses east of Wyoming to Mitchelldale, and the senior citizen high rise at Wyoming and Eight Mile Road, are especially vulnerable to fires and tornadoes.

HAZMAT Incidents:

- The Township faces potential risks from accidents involving trucks carrying hazardous materials.

Flooding Incidents:

- During periods of heavy rain, the Co-Op area tends to flood, posing a risk to residents and properties in that region.

Mitigation Strategies and Actions

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Royal Oak Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue Contracting with Ferndale Fire Department	
Year Initiated	2012
Applicable Jurisdiction	Royal Oak Township
Lead Agency / Organization / Position	Royal Oak Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Maintain response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Continue contracting with Ferndale Fire Department to handle all fires and hazmat emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing

Continue Mutual Aid Agreement	
Year Initiated	2012
Applicable Jurisdiction	Royal Oak Township
Lead Agency / Organization / Position	Royal Oak Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Highway

Action/Implementation Plan and Project Description, if applicable	Continue mutual aid agreement with Michigan State Police to handle traffic accidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Oakland County is no longer on the contract. 2023 Update: Ongoing

Truck Route	
Year Initiated	2017
Applicable Jurisdiction	Royal Oak Township
Lead Agency / Organization / Position	Oakland County Road Commission
Supporting Agencies/ Organizations	Royal Oak Township
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds
Benefits (Loss Avoided)	Large trucks (some of which may be carrying hazardous materials) will be restricted only to Wyoming, making the rest of the Township's roads safer for drivers.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	December, 2017
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Road signs will be erected indicating that large trucks may only drive on Wyoming Road. This will protect drivers in Township from trucks driving on other, smaller roads.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Improve mutual assistance from surrounding communities in fighting building fires.	
Year Initiated	2005
Applicable Jurisdiction	Royal Oak Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete, date unknown.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Structural Fire
Action/Implementation Plan and Project Description	Improve mutual assistance from surrounding communities in fighting building fires.
2023 Plan Update Status and Changes in Priority	Complete

Provide Funding for Equipment to Respond to Hazmat Emergencies	
Year Initiated	2005
Applicable Jurisdiction	Royal Oak Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	Improve and support public and private organizational response capabilities.
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Complete

Purchase an ambulance for the community.	
Year Initiated	2005
Applicable Jurisdiction	Royal Oak Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete, date unknown. The Township no longer wants to purchase an ambulance. Instead, it contracts emergency services out.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Complete

51. City of South Lyon

Community Profile and Description

The City of South Lyon is located in Metro Detroit. South Lyon was founded in 1832 and was called Thompson's Corners. South Lyon was incorporated as a village in 1873 and as a city in 1930. As of the 2020 U.S. Census, the population is 11,746. The total area of the City of South Lyon is 3.73 square miles.

Hazards

Tornadoes:

- Residents of the mobile home park in the midtown area and those in assisted living and nursing home facilities on Reynoldsweet Street are highly vulnerable to tornadoes.

Flood-related Hazards:

- Heavy rain causes street overtopping at specific intersections, including South Lafayette and Liberty St, and North Lafayette & Maple St during heavy rain or Spring thaw.
- The Colonial Acres Subdivision, located south of Eleven Mile Road and west of Lafayette Street, experiences frequent flooding due to insufficient drainage. Colonial Acres Adult Community residents at 25015 Potomac Court are particularly vulnerable. Other areas prone to urban/flash flooding include Lafayette (Pontiac Trail) between Detroit Street and Reynoldsweet Parkway and Lafayette south of Heritage Blvd.

HAZMAT Incidents:

- Several companies store hazardous materials at their facilities in the City. Trains passing through the center of the City also carry hazardous materials.

Natural Gas Pipeline:

- A natural gas pipeline running through the City and a pumping station at Nine Mile Road pose potential hazmat hazards.

Extreme Cold Events:

- The Colonial Acres senior community, with over 300 residents aged 55, is at risk during extremely cold weather.

Active Shooter Incidents:

- Six South Lyon Community Schools and instructional buildings are considered vulnerable locations for potential active shooter incidents.

Infrastructure Failure Incident:

- The CSX rail line bisects the City and can block emergency responders during rail crossing incidents.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of South Lyon
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer

	Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Upgrade Generators for Police Station and City Hall	
Year Initiated	2012
Applicable Jurisdiction	City of South Lyon
Lead Agency / Organization / Position	City of South Lyon
Supporting Agencies/ Organizations	South Lyon Police Department
Applicable Goal(s)	3,4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Upgrade generators for the police station and city hall to provide power during emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Police Department has transfer switch and port for portable commercial generator. Water department supplies the generator as needed. City Hall has no generator. 2023 Update: Ongoing / Completed PD Only in April 2022

Continue a High Level of Preparedness to Respond to Tornado Emergency	
Year Initiated	2005
Applicable Jurisdiction	City of South Lyon
Lead Agency / Organization / Position	City of South Lyon Police Department, City of South Lyon Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Continue a High Level of Preparedness to Respond to Tornado Emergency
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing

Generator at North Mill St Water Tower	
Year Initiated	2017
Applicable Jurisdiction	City of South Lyon
Lead Agency / Organization / Position	City of South Lyon Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000); $10,000
Potential Funding Source	HMGP
Benefits (Loss Avoided)	Communication failure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Severe Winter Storms, Tornadoes, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Install generator at City of South Lyon water tower on North Mill Street. Need to power fire

	departments communications and water department SCADA communications.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Improve drainage to prevent future flooding in the Colonial Acres senior community	
Year Initiated	2005
Applicable Jurisdiction	City of South Lyon
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	Prevention and reduction of damage to public and private property and infrastructure.
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Improve drainage to prevent future flooding in the Colonial Acres senior community
2023 Plan Update Status and Changes in Priority	Complete

Provide the Police Department with Self-Contained Breathing Apparatus	
Year Initiated	2005
Applicable Jurisdiction	City of South Lyon
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	Improve and support public and private organizational response capabilities.
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown. Encountered funding issues.
Priority and Level of Importance (Low, Medium, High)	Medium

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Oil and Gas Well Accidents, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Provide the police department with a self-contained breathing apparatus to be better prepared for hazmat accidents.
2023 Plan Update Status and Changes in Priority	Completed

Generator Upgrade	
Year Initiated	2017
Applicable Jurisdiction	City of South Lyon
Lead Agency / Organization / Position	South Lyon Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	April 2022 (PD)
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure: Electrical System Failure Incident
Action/Implementation Plan and Project Description, if applicable	Upgrade portable generator system to a permanent built-in gas operated system in case of power outage.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: COMPLETE

52. City of Southfield

Community Profile and Description

The City of Southfield was organized in 1830 and incorporated in 1958. As of the 2020 U.S. Census, the population is 76,618. The total area of the City of Southfield is 26.28 square miles.

Hazards

Natural Hazards:

- Tornadoes, severe thunderstorms, and ice storms are identified as primary hazards of concern.
- Power outages due to high winds and falling trees are major concerns for residents.

Flooding:

- 26 miles of rivers in Southfield pose a riverine flooding issue during heavy rains.
- Tributaries of the Rouge River, such as Tamarack Creek and the Evans Branch, are vulnerable to flooding, resulting in erosion and tree loss.
- Urban and flash flooding is an issue in Section 24/25, and basement backups are common.

Highway Accidents:

- Many heavily traveled roads in Southfield result in frequent highway accidents.

HAZMAT Incidents:

- The large number of trucks carrying hazardous materials on roads like I-696, Northwestern Highway, Southfield Road, and Telegraph Road presents a potential hazard for hazmat emergencies.

Infrastructure Failure:

- The City needs to update and maintain many roads and transportation infrastructure.
- Southfield's sewer, stormwater, and water systems have aging infrastructure that needs replacement.

Invasive Species:

- Phragmites are invasive species clogging up stormwater infrastructure and natural areas.

Criminal Activities:

- Concerns about criminal activities, especially in Twelve Mile and Telegraph Roads, are addressed by the city representatives.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Change City Vehicle Fleet to EV	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	
Applicable Goal(s)	1,2,3,4
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Federal/State, Grants, Local Funds
Benefits (Loss Avoided)	Provide for a reliable vehicle during a major emergency.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Winter Storm and Blizzards, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Transportation Accidents: Highway
Action/Implementation Plan and Project Description	Implementing a fleet with EV will provide a resilient and reliable power source for critical infrastructure. Allow for rapid deployment and accessibility during emergencies. Enhanced coordination and connectivity in disaster management. Long-term benefits like reduced carbon footprint and improved air quality.

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Expand Tree Planting Program	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	Oakland County Water Resources Commission
Applicable Goal(s)	3, 4
Estimated Cost & Analysis (Low, Medium, High)	High (More than $100,000)
Potential Funding Source	Grants, US Forestry Service
Benefits (Loss Avoided)	Reduced Flooding, Increased greenspace
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Winds/Severe Winds, Flood: Riverine Flooding, Flood: Urban/Flash Flooding
Action/Implementation Plan and Project Description	Expand tree planting program.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Install stream gauges along the Rouge River and its tributaries.	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	City of Southfield, OCWRC, USGS, Alliance of Rouge Communities
Applicable Goal(s)	1, 2, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low , $20,000
Potential Funding Source	USGS, FEMA, Grants
Benefits (Loss Avoided)	Pre-plan for flooding events
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Dam Failure, Flood: Riverine Flooding, Flood: Urban/Flash Flooding, Infrastructure Failure, Transportation Accidents: Highway

Action/Implementation Plan and Project Description	Install stream gauges throughout the City to protect the community and infrastructure against potential flooding events.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Install Green Infrastructure and purchase additional greenspace for stormwater mitigation and BMPs.	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	OCWRC, Alliance of Rouge Communities, Friends of the Rouge, State/Fed agencies
Applicable Goal(s)	2,3,4,5,6
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Grants
Benefits (Loss Avoided)	Prevent flooding, improve water quality, protect infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Dam Failure, Invasive Species, Flood: Riverine Flooding, Flood: Urban/Flash Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description	Install green infrastructure and stormwater best management practices throughout the City to protect against flooding, provide habitat and wildlife and protect infrastructure. Purchase additional greenspace for stormwater management.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Adopt a stormwater utility	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	Oakland County Water Resources Commission
Applicable Goal(s)	1,2,3,4,5,6,7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Grants, Utility Funds
Benefits (Loss Avoided)	Provide for funding for stormwater management/infrastructure
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Dam Failure, Invasive Species, Flood: Riverine Flooding, Flood: Urban/Flash Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description	Adopt and Implement a stormwater utility to provide for a funding source for stormwater management projects and maintenance for stormwater infrastructure long term.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Bring all City facilities and infrastructure to compliance with the American with Disabilities Act.	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	City of Southfield
Supporting Agencies/ Organizations	Federal/State
Applicable Goal(s)	1,2,3,4,6,7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	ADA Funds/State and Federal Transportation Funds/General Funds
Benefits (Loss Avoided)	Allow for all residents to access facilities in times of need.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure, Public Health Emergencies: Pandemic/Epidemic, Transportation Accidents: Highway
Action/Implementation Plan and Project Description	Update City facilities and infrastructure to meet ADA requirements. Many City facilities were constructed before these requirements were in place and need to be updated.
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction.

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Southfield
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Provide means for detaining storm water to avoid area flooding.	
Year Initiated	2005
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Provide means for detaining storm water to avoid area flooding.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Additional Manpower and Training for Hazmat Emergencies	
Year Initiated	2005
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide additional manpower and training to deal with potential hazmat emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Continuing Training for Potential Hazmat Emergencies	
Year Initiated	2012
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Provide Continuing Training for Potential Hazmat Emergencies
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Funding to Continue to Upgrade Emergency Equipment	
Year Initiated	2012
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Fire Department, City of Southfield Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide funding to continue to upgrade emergency equipment to deal with all types of emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Reduced flooding in Combined Sewer Areas	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Property loss
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Reduce flooding and basement backups in the combined sewer areas.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Implement Projects in the City of Southfield Storm Water Master Plan	
Year Initiated	2005
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	Multi Millions

Potential Funding Source	Local/State/Various, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduce flooding, protection of infrastructure and property. Protection of local rivers, streams, fish and wildlife habitat.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Implement projects listed in the Southfield Storm Water Master Plan. A copy of the plan can be provided if needed. There are many projects listed within the plan. Specific projects will be listed as additional mitigation measures.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Woody Debris Management	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	Private Property Owners
Applicable Goal(s)	1, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	Varies
Potential Funding Source	Local, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protection of waterways, reduce erosion and flooding, protection of property adjacent to waterways
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding, Severe Summer Storms, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Program to implement woody debris management along the Rouge River. The Rouge River can become flashy and water levels can rise rapidly during rainstorms which can

	lead to streambank erosion and tree fall along the river. These fallen trees, while some protect habitat and the river system, can cause erosion, flooding, impacts to property and infrastructure. Funding for a program to mitigate the impacts of woody debris on our river system is needed.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Streambank Erosion	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	Various
Potential Funding Source	Local/State, BRIC, HMGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Reducing erosion along our waterways would prevent loss of property and potential impact to critical infrastructure.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Flood Mitigation - detention/retention	
Year Initiated	2005
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	Various
Potential Funding Source	Local, BRIC, HMGP
Benefits (Loss Avoided)	Reduced flooding, basement backups, streambank erosion
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	There are many detention basins within the city that are critical to the City's storm water system. These detention systems are in place to prevent flooding and to protect our water resources. Many of the basins within the city are failing and/or are not being maintained. Funding is needed to update these basins and maintain them properly. An inspection program should be implemented, and a staff should be hired. Funding for staff is needed.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Tamarack Basin	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000); $2,000,000
Potential Funding Source	EPA Funding/Local/State
Benefits (Loss Avoided)	Reduced flooding and erosion to downstream properties.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure, Invasive Species
Action/Implementation Plan and Project Description, if applicable	This basin has experienced deterioration, sediment buildup and additional flow from 10 Mile Road and private properties that has resulted in a lack of functionality. Proposed basin improvements include open channel rehabilitation, stabilization of the existing open channel and removal of debris and sediment.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Storm Water Asset Management Plan	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	Various
Potential Funding Source	SAW/State Grant
Benefits (Loss Avoided)	An asset management plan will allow the City to be able to evaluate all of its storm water assets and plan projects accordingly.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Dam Failure, Infrastructure Failure, Invasive Species
Action/Implementation Plan and Project Description, if applicable	A storm water asset management plan would allow the City to manage its assets property and according to need and priority.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Section 26 Flood Mitigation	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local/State, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Reduced flooding and correction of drainage issues
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure

Action/Implementation Plan and Project Description, if applicable	Section 26 experiences very poor drainage and flooding issues in the streets and into the front and rear yards. Improvements to the storm system by way of green infrastructure, or other storm water BMPs, would improve drainage and reducing flooding hazards in this area.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Invasive Species Management	
Year Initiated	2017
Applicable Jurisdiction	City of Southfield
Lead Agency / Organization / Position	City of Southfield Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3, 6
Estimated Cost & Analysis (Low, Medium, High)	Varies
Potential Funding Source	Local/State, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Invasive species management provides for a healthier environment and ecosystem, while also protecting the city's built infrastructure.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Infrastructure Failure, Invasive Species
Action/Implementation Plan and Project Description, if applicable	Southfield has many areas within the city that have issues with invasive species control. These areas should be managed to protect our natural resources and the city's infrastructure.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

53. Southfield Township

Community Profile and Description

Southfield Township, originally known as Ossewa Township, came into existence on July 12, 1830. The name was changed to Southfield Township seventeen days later. As of the 2020 U.S. Census, the population is 14,886. The total area of Southfield Township is 8.1 square miles.

Southfield Township contains the Villages of Beverly Hills, Bingham Farms, and Franklin. As such, the only properties that the Township has direct day to day response control of include a cemetery, a shopping plaza, 8 private homes, and some residential backyards. With this in mind, the Township has advised that they have no plans for mitigation activities and would prefer to rely on their Villages to cover the needs of the Township.

Southfield Township would like to add hazards that are specific to township-only areas which are not included in the Franklin or Beverly Hills Village plans. The Township does rely upon and have special assessments in place for emergency services provided by the villages' police and fire departments and will receive immediate response from those department in the event of a hazardous situation.

Hazards

Flood-related Hazards:

- Flooding and risk of slope failure along Franklin River in the northwest corner of the township, particularly along W. 14 Mile Rd.
- Additional flooding along W. 14 Mile Rd. due to insufficient/appropriate drains and culverts.

Active Shooter Incidents:

- Concerns about the Township office being a soft target for this hazard.

Cybersecurity Incidents:

- Concerns about the Township office being a soft target for cybersecurity incidents.
- Southfield Township works with CISA and has a response plan with an IT Vendor.

Infrastructure Failure Incidents:

- Flooding and risk of slope failure along Franklin River in the northwest corner of the township, potentially impacting a large water and natural gas main.
    - The water and natural gas main could also influence the flood slope and vice versa if a flooding incident occurs.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

Note: All decisions regarding hazards and mitigation for Southfield Township will be made by Township officials in consultation with and conjunction with the Villages, which provide emergency services.

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Southfield Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland

	County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

The jurisdiction did not have previous mitigation actions.

Completed Mitigation Actions

This is not applicable to this jurisdiction.

54. Springfield Township

Community Profile and Description

Springfield Township was established on March 2, 1836 by the Legislature of the State of Michigan. Springfield Township has had a long-standing commitment to Zoning and Planning dating back to the early 1950's. The primary basis for the Township's Planning, Zoning and Land Use decisions for at least the last 20 years has been the protection and preservation of our abundant and very special natural resources. As of the 2020 U.S. Census, the population is 14,703. The total area of Springfield Township is 36.7 square miles.

Hazards

Dam Failure:

- Springfield Township is actively removing the Mill Pond Dam to address the risk of flooding and dam failure. Removing the dam will mitigate potential hazards associated with its failure and reduce flood risks.

Wildfire:

- The Township's natural parks and wooded areas pose a risk of wildfire incidents.
- Implementing wildfire prevention measures, such as vegetation management, creating firebreaks, and conducting public education on fire safety, can help reduce the risk and impact of wildfires in these areas.

Infrastructure Failure Incidents:

- Springfield Township has several roadways needing repair due to infrastructure failure.
- Prioritizing infrastructure maintenance and investing in necessary repairs will help prevent accidents and hazards related to failing roads, ensuring safer transportation for residents.

Major Transportation Incidents:

- Springfield Township covers a section of I-75 considered one of Michigan's most dangerous stretches.
- To improve transportation safety and reduce the risk of major incidents on this highway, the Township should focus on measures such as enhanced signage, traffic management strategies, and public awareness campaigns.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Improve traffic and access routes at Springfield Oaks Park	
Year Initiated	2023
Applicable Jurisdiction	Springfield TWP and Oak City Parks
Lead Agency/ Organization / Position	Parks
Supporting Agencies/ Organizations	Springfield TWP
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	Unknown
Potential Funding Source	General Funds
Benefits (Loss Avoided)	speed of execution for emergency access and egress
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Extreme Heat, Severe Summer Storms, Tornadoes, Active Shooter/Active Assailant, Infrastructure Failure, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/Weapons of Mass Destruction
Action/Implementation Plan and Project Description	Improve traffic and access routes at Springfield Oaks Park due to high traffic and access limitations
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Adding Large Capacity Wells for Fire Protection	
Year Initiated	2023
Applicable Jurisdiction	Springfield TWP
Lead Agency/ Organization / Position	Fire Department

Supporting Agencies/ Organizations	Springfield TWP
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	$45,000 per well
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Millions of dollars loss saved and protect wildfires
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Within 4 months of award
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Extreme Heat, Severe Summer Storms, Tornadoes, Wildfires, Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description	Adding Large Capacity Wells for Fire Protection because there is no water infrastructure
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Springfield Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires

Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue to Provide Training for Hazmat Situations	
Year Initiated	2012
Applicable Jurisdiction	Springfield Township
Lead Agency / Organization / Position	Springfield Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance Training and response Capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue to Provide Training for Hazmat Situations
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing

Pipeline Infrastructure Monitoring	
Year Initiated	2017
Applicable Jurisdiction	Springfield Township
Lead Agency / Organization / Position	Springfield Township, Pipeline Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	Staff Time
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Enhance Training and response Capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Oil and Gas Well Accidents
Action/Implementation Plan and Project Description, if applicable	Springfield Township monitors the pipelines that travel beneath its jurisdiction. The Township works in conjunction with the companies that own and maintain the pipelines to ensure all infrastructure is operating safely and aged infrastructure is replaced when needed.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing

Completed Mitigation Actions

Install Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	Springfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed

Provide an emergency response system, bus transportation and an evacuation plan for school children in case of a railroad hazmat spill.	
Year Initiated	2005
Applicable Jurisdiction	Springfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. Have worked with bus garages to develop site specific plans with hazmat issues. Have Holly & Clarkston School Districts that have agreed to assist. Also a few churches that have buses and drivers who have agreed to assist. Still keeping up to date.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Provide an emergency response system, bus transportation and an evacuation plan for school children in case of a railroad hazmat spill.
2023 Plan Update Status and Changes in Priority	Completed

Provide Funding to Transport Individuals Involved in Multi-Vehicle Accidents	
Year Initiated	2005
Applicable Jurisdiction	Springfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown. Have 2 Bravo units licensed to transport.
Priority and Level of Importance (Low, Medium, High)	Low

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed

55. City of Sylvan Lake

Community Profile and Description

The City of Sylvan Lake was incorporated as a village in 1921 and as a City in 1947. The lake and tree lined streets in the City of Sylvan Lake enchants homeowners with a peaceful setting and small town charm. The area gives residents the best of both worlds offering safety and quality of life. As of the 2020 U.S. Census, the population is 1,723. The total area of the City of Sylvan Lake is 0.83 square miles, with 0.32 square miles being water.

Hazards

Blizzards, Heavy Snow, or Ice Storms/Sleet:

- Sylvan Lake's limited sidewalks pose a risk to non-motorized transportation during heavy snow and ice storms. Improving pedestrian infrastructure and snow removal efforts can mitigate these hazards.

High Wind Events:

- Residential areas with large, mature trees are vulnerable to damage during high wind events. Tree maintenance and removal of hazardous trees can reduce the risk of property damage and accidents.

Flooding:

- Flooding is a recurring problem in Sylvan Lake, particularly on Avondale and Garland Streets. Implementing better stormwater management and drainage systems can help alleviate the impacts of flooding.

Sanitary Sewer Backups:

- The sanitary sewers on Cheltingham and Avondale Streets have a history of backing up after heavy rains. Ensuring proper maintenance and upgrades to the sewer system can prevent backups and reduce the risk of property damage and health hazards.

OakWin Radio System Deficiencies:

- Sylvan Lake must address deficiencies in the OakWin Radio System to improve communication during fire emergencies. Using portable repeaters can enhance communication capabilities.

Water Rescue Preparedness:

- The City should address deficiencies concerning water rescues on the lakes within Sylvan Lake. Enhancing water rescue capabilities and providing adequate training to emergency responders can improve preparedness for water-related emergencies.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland

	County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Address Deficiencies in Water Rescue Capabilities	
Year Initiated	2012
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency / Organization / Position	City of Sylvan Lake Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Marine
Action/Implementation Plan and Project Description, if applicable	Address deficiencies in water rescue capabilities on area lakes.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Bury Power Lines	
Year Initiated	2017
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Utility Construction Budget

Benefits (Loss Avoided)	Ongoing utility service
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	This is already being done for many construction projects.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Address sewer back-ups on Cheltingham, Garland and Avondale Streets.	
Year Initiated	2005
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Address sewer back-ups on Cheltingham, Garland and Avondale Streets.
2023 Plan Update Status and Changes in Priority	Completed

Provide engineering assistance necessary to control the flooding in the area of Avondale and Garland Streets.	
Year Initiated	2005
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown

Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Provide engineering assistance necessary to control the flooding in the area of Avondale and Garland Streets.
2023 Plan Update Status and Changes in Priority	Completed

Removed Mitigation Actions

Provide Funding for Portable Repeaters to Address Deficiencies in OakWin Radio System	
Year Initiated	2012
Applicable Jurisdiction	City of Sylvan Lake
Lead Agency/ Organization / Position	City of Sylvan Lake
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. The county is exploring the need to replace the OakWin Radio System with a system that offers

	more interoperability, capacity, and improved communications with outside agencies (specifically with the State of Michigan). The identification and implementation of an improved radio system would address the aforementioned deficiencies identified in this action. 2023 Update: Removed

56. City of Troy

Community Profile and Description

The earliest recorded purchases of land in what was known as Troy Township occurred in 1819. Troy Township was established in 1827. In 1955, Troy was officially incorporated primarily as a strategy for preventing border cities from taking more land. The City of Troy is the 11th largest city in Michigan by population. In 2011, Troy was ranked the safest city in Michigan.

The City of Troy is located in the southeast potion of Oakland County, Michigan and is surrounded by Bloomfield Township, Birmingham, Clawson, Madison Heights, Sterling Heights, and Rochester Hills. The City has a land mass of 33.47 square miles.

According to the 2020 U.S. Census, the City of Troy has a population of 87,294 residents. From 2011-2015, approximately 5.1% of the population was identified as individuals under age 65 years old with functional needs. Many of these individuals reside in congregate care centers, but others reside in non-group homes where help is provided as needed or on-call.

Geographic features include Rouge River, Clinton River, Lake Charnwood, Walker Lake, Pebble Lake, Lake Andale, Emerald Lake, Crystal Lake, Sandshore Lake, Troy Lake, Sylvan Lake, River Rouge, Sprague Ditch/Branch, Sturgis Ditch, Lane Ditch, Gibson Drain, and Spencer Drain.

Hazards

Flooding and Storm Hazards:

- The City experiences major flooding, causing urban flooding and sewer backups.
- Strong storms and high winds periodically damage buildings, trees, and power lines.
- Winter hazards lead to accidents each year.

High-Risk Areas and Industries:

- Hazard and threat analysis identified high-risk areas near chemical facilities, commercial facilities, hospitals, transportation systems, etc.
- The major industries in Troy, such as Automotive, Advanced Manufacturing, Financial Services, Health Care, IT, and Communications, raise concerns about potential manmade and natural disasters.

SARA Title III, Tier II Sites:

- 59 sites report hazardous substances, with 23 containing extremely hazardous substances.

- Off-site emergency response plans are in place to address the specific hazardous substances on these sites.

Critical Infrastructure and Key Resources (CIKR) Sites:

- The City has several unique areas and CIKR sites that may require extra attention and planning during emergencies.
- These sites include highways, transit centers, gas pipelines, schools, commercial facilities, water systems, and healthcare facilities.

Special Events:

- Specific events like Troy Family Daze Festival and holiday celebrations at malls may pose high-risk situations.

Identified Hazards and Incidents:

- Hazmat incidents, particularly spills on I-75 during rush hour or construction, are a concern.
- Active shooter incidents, terrorism, civil disturbances, and mall mass shootings are potential hazards.
- Tornadoes and structural fires are primary concerns for the City of Troy.
- Multi-vehicle traffic accidents and hazardous material releases occur frequently on heavily traveled roads like Crooks Road and I-75, especially during snow and ice storms.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Troy
Lead Agency/ Organization	Emergency Manager, Lt. Hall

Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue Educational Programs Regarding Tornadoes, High Rise Building Fires and Other Hazards	
Year Initiated	2005
Applicable Jurisdiction	City of Troy
Lead Agency / Organization / Position	Emergency Manager/Lt. Hall
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	5, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)

Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increasing awareness, education and preparedness of public, business, non-profit, government, etc. about hazards
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Structural Fire
Action/Implementation Plan and Project Description, if applicable	Continue Educational Programs Regarding Tornadoes, High Rise Building Fires and Other Hazards
2023 Plan Update Status and Changes in Priority	Ongoing

Seek Funding for Citizens Emergency Notification System	
Year Initiated	2012
Applicable Jurisdiction	City of Troy
Lead Agency / Organization / Position	Emergency Manager/Lt. Hall
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies:

	Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Seek funding for a citizen's emergency notification system (i.e., reverse 9-1-1) to notify residents by phone, text or e-mail of emergency (e.g., hazmat accidents, traffic accidents, hazardous material accidents or natural disaster.
2023 Plan Update Status and Changes in Priority	City has a notification system now. They use CodeRed. The action is to get residents to sign up.

Tree Trimming and Management	
Year Initiated	2005
Applicable Jurisdiction	City of Troy
Lead Agency / Organization / Position	Department of Public Works
Supporting Agencies/ Organizations	DTE
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Low (Under $10,000); $5,000
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Regular maintenance and upkeep of utilities can help prevent wind damage.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Establish standards for all utilities regarding tree pruning around lines and incorporating inspection and management of hazardous trees into the drainage system. To protect power lines and infrastructure, the City of Troy will implement regular maintenance and upkeep of utilities from wind damage. Establishing standards for all utilities regarding tree pruning around lines and incorporating inspection and management of hazardous trees into the drainage system. This policy can be implemented within 1-2 years.
2023 Plan Update Status and Changes in Priority	Ongoing: The city has added urban forestry positions to address this concern.

Property Owner Flood Mitigation Education	
Year Initiated	2017
Applicable Jurisdiction	City of Troy
Lead Agency / Organization / Position	Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Residents and Businesses
Benefits (Loss Avoided)	Prevent reverse-flow flood damages
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Educate property owners regarding options for mitigating their properties from flooding through outreach activities. Educate property owners regarding options for mitigating their properties from flooding through outreach activities by encouraging homeowners and businesses to install backflow valves to prevent reverse-flow flood damages, and asking residents to help keep storm drains clear of debris during storms.
2023 Plan Update Status and Changes in Priority	Ongoing

Completed Mitigation Actions

Visit a command center in another community with experience in disaster response to learn how problems were handled.	
Year Initiated	2005
Applicable Jurisdiction	City of Troy
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Visit a command center in another community with experience in disaster response to learn how problems were handled.
2023 Plan Update Status and Changes in Priority	Completed

Seek funding to provide additional training and equipment for officers to actively and aggressively intervene in mass shooting situations.	
Year Initiated	2012
Applicable Jurisdiction	City of Troy
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	Completed
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2015
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Active Shooter/Active Assailant
Action/Implementation Plan and Project Description	Seek funding to provide additional training and equipment for officers to actively and aggressively intervene in mass shooting situations.

2023 Plan Update Status and Changes in Priority	Completed in 2015

Removed Mitigation Actions

Study the feasibility of implementing an emergency warning system that could provide different tones for different types of emergencies.	
Year Initiated	2005
Applicable Jurisdiction	City of Troy
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Removed. The City has determined that this mitigation strategy is not feasible given the constraints on the use of existing outdoor warning sirens, therefore, the City will not pursue this strategy.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Study the feasibility of implementing an emergency warning system that could provide different tones for different types of emergencies.
2023 Plan Update Status and Changes in Priority	Removed. The City has determined that this mitigation strategy is not feasible given the constraints on the use of existing outdoor warning sirens, therefore, the City will not pursue this strategy.

57. City of Walled Lake

Community Profile and Description

Walled Lake was a village inhabited by Ojibwa and Potowatamie people until 1830. As of the 2020 U.S. Census, the population is 7,250. The total area of the City of Walled Lake is 2.37 square miles. Resting spots along the Underground Railroad, where runaway slaves could sleep and eat, were called "depots". One of these was the Foster Farmhouse (built in 1833) in Walled Lake, which served as a refuge for those making their way to freedom in Canada. The Foster Farmhouse was located on Pontiac Trail near 15 mile road until 1997, when it was moved to Riley Park in downtown Walled Lake to avoid demolition.

Hazards

Tornadoes and Ice Storms:

- Tornadoes and ice storms are identified as primary hazards of concern.
- Fawn Lake Mobile Home Park and Walled Lake Villa Senior Complex are most vulnerable to tornado impacts.
- Tornados can cause physical damage to infrastructure, such as buildings and power lines, and they can also cause flooding, which can damage roads and other infrastructure.
- Tornadoes can cause injury/death.
- The City has a mobile home park.

High Winds:

- High winds can damage buildings, structures, and other infrastructure in the city. It can result in roof damage and even collapse of structures.
- The City has a mobile home park and it is highly vulnerable to high wind damage. Additionally, strong winds can disrupt power lines and cause widespread power outages.
- It will take time to restore power and cause not only inconvenience but also potential safety risks.
- The city has a large elderly population, and an extended power failure would lead to many safety concerns for them. High winds can damage trees and debris.
- High winds can uproot tress or large branches and debris to fall. This can damage buildings, vehicles, and obstruct roads, posing risks to public safety. Additionally, fallen trees can damage power lines, exacerbating the power outage situation.
- These incidents also highly take a toll on emergency services, as storm events cause added response incidents and will severely tax emergency services. Communication disruptions can also occur.

- Systems like phone lines, cellular networks, and internet connectivity. This may hinder emergency response efforts and impede communication between residents, businesses, and local authorities.
- Transportation disruptions:
    - High winds can make driving hazardous, especially for high-profile vehicles. It can lead to reduced visibility, difficulty in maintaining control, and potential accidents. In extreme cases, road closures may be required until it is safe to travel, impacting transportation within the municipality.

Floods:

- Floodwaters can damage roads, bridges, buildings, and other critical infrastructure within a municipality. The force of the water can erode soil, undermine foundations, and weaken structures, leading to potential collapse or long-term damage.
- The City of Waled Lake has multiple flood sources from lakes and ponds in our jurisdiction as well as the Greenway Drain a Rouge River tributary. The drain runs Parallel to the City Municipal complex with includes City offices, Fire Dept., Police Dept. offices.
- The flooding of the drain would impair City services greatly. This could lead to a disruption of essential services.
- The Tri-A Neighborhood, which was built before the City was established is a flooding potential hazard. This neighborhood is also affected by the Greenway drain system.
- Flooding can disrupt essential services such as water supply, sewage systems, and power grids. Sewage could back up, causing health hazards.
- Power outages can occur, affecting communications networks, traffic lights, and emergency res response systems.
- Flooding can also cause public health risks:
    - Floodwaters can carry contaminants, pollutants, and disease-causing agents, posing health risks to the population.
    - Increased risk of waterborne diseases, such as cholera and dysentery, can occur. Standing water can become breeding grounds for mosquitoes and other disease vectors.

Structural Fires:

- Several interconnected and old downtown buildings pose a risk of structural fires.
- A fire in this area could impact the entire downtown region.

Traffic Accidents:

- West Maple and Pontiac Trail are the main routes through the City, with a history of traffic accidents, including severe injuries.

HAZMAT Incidents:

- A local industrial facility presents a risk of hazardous material incidents.
- Trucks carrying hazardous materials on West Maple and Pontiac Trail may lead to hazmat incidents.

Infrastructure Failure:

- A natural gas pipeline is a major concern for public safety.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Flood Mitigation	
Year Initiated	2023
Applicable Jurisdiction	City of Walled Lake
Lead Agency/ Organization / Position	Department of Public Works
Supporting Agencies/ Organizations	Water Resource Commission
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$249,363.15
Potential Funding Source	Downtown Development Authority
Benefits (Loss Avoided)	Flood Abatement
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2023
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Replacement of storm sewer system with pre-treatment, removal and replacement or relocation of surrounding pavement, curb and gutter, sidewalk, and a dumpster enclosure in an area surrounding Mercer Beach in the City of Walled Lake.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Walled Lake
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Continue Training in Response to Tornadoes, Fires, Hazmat Accidents, Etc.	
Year Initiated	2012
Applicable Jurisdiction	City of Walled Lake
Lead Agency / Organization / Position	City of Walled Lake Fire Department, City of Walled Lake Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue training in response to tornadoes, fires, hazmat accidents and other emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Provide Funding to Upgrade Generators	
Year Initiated	2012
Applicable Jurisdiction	City of Walled Lake
Lead Agency / Organization / Position	City of Walled Lake Fire Department, City of Walled Lake Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP

Benefits (Loss Avoided)	Continuity of operations by ensuring essential functions are operational
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Provide funding to upgrade the generators at the police station and the fire hall.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing

Hazard Training	
Year Initiated	2017
Applicable Jurisdiction	City of Walled Lake
Lead Agency / Organization / Position	Walled Lake Fire Department
Supporting Agencies/ Organizations	Walled Lake Police Department
Applicable Goal(s)	1, 3, 4, 5, 6
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000); $50,000
Potential Funding Source	General Fund, donations, HSGP
Benefits (Loss Avoided)	Provide increased training for emergency responders in the area of fire, hazmat, natural disaster response, to better protect the community.
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2022
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Structural Fire, Transportation Accidents: Highway
Action/Implementation Plan and Project Description, if applicable	Continue training in response to tornadoes, fire, hazmat incidents and other emergencies. Identify community fire hazard and overall community vulnerability. Promote fire prevention education outreach programs that target schools, citizens, businesses and senior living centers. Provide free smoke alarms for residents. Increase funding for additional hazmat training for emergency responders. Conduct outreach activities to

	increase awareness of tornado risk. Educate citizen. Conduct tornado drills in schools and public buildings. Teach school children about the dangers of tornadoes and how to take safety precautions. Identify local tornado shelters. Distribute tornado shelter location information to the public. Support severe weather awareness week. Promote use of NOAA weather radios.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Upgrade the current emergency radio system to provide better communication between police and fire departments and with neighboring communities.	
Year Initiated	2005
Applicable Jurisdiction	City of Walled Lake
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Upgrade the current emergency radio system to provide better communication between police and fire departments and with neighboring communities.
2023 Plan Update Status and Changes in Priority	Completed

Provide funding to purchase an ambulance to transport accident victims to area hospitals.	
Year Initiated	2005
Applicable Jurisdiction	City of Walled Lake
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Low
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Provide funding to purchase an ambulance to transport accident victims to area hospitals.
2023 Plan Update Status and Changes in Priority	Completed

58. Waterford Township

Community Profile and Description

Waterford Township was organized in 1834. The township was named Waterford because of the vast number of lakes covering the township. As of the 2020 U.S. Census, the population is 70,565. The total area of Waterford Township is 35.3 square miles and 11.22 percent of the Township is water. Waterford Township has five unincorporated communities: Clintonville, Drayton Plains, Elizabeth Lake, Four Towns, and Waterford Village.

Hazards

Flooding:

- The Township is home to 34 lakes covering 2,923 acres and the Clinton River, leading to area flooding.
- The eastern side of Scott Lake has experienced property damage due to flooding.

Dam Failure:

- Six dams in the township could impact the safety of humans and wildlife upon failure.

Aviation Accidents:

- A plane crash at The Oakland County International Airport is a potential hazard for the Township.

Structural Fires:

- Vacant buildings pose a particular concern, as there may be a delay in contacting emergency services.

HAZMAT Incidents:

- Thirteen water treatment plants are at risk of hazmat incidents.
- A 36-inch crude oil pipeline on the west side of William Lake Road represents a potential hazmat incident affecting surrounding lakes and rivers.
- The risk of hazardous material accidents on heavily traveled roads like M-59 or at industrial facilities that use or store hazardous materials is a significant concern.

Infrastructure Failure:

- Eighteen groundwater wells that feed water treatment plants could be a potential hazard.

- The Township has nearly 6 miles of rail lines, including 6 highway crossings, which could be vulnerable to infrastructure failure incidents.

Terrorism Incidents:

- Thirteen water treatment plants could be potential targets for terrorist attacks.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Shelter Hardening Facility	
Year Initiated	2023
Applicable Jurisdiction	Waterford TWP
Lead Agency/ Organization / Position	Parks Rec / Building
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Local funds, BRIC, HMGP
Benefits (Loss Avoided)	Prevent loss of life
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, High Hazard Dams, Extreme Heat, Flooding, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Public Health Emergencies: Pandemic/Epidemic, Structural Fire,

	Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Shelter Hardening Facility, Waterford TPW Rec Center
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Waterford Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and

	underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Address Flooding Concerns Adjacent to Lakes and Rivers	
Year Initiated	2005
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	This is a continuous on-going evaluation.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description, if applicable	Address Flooding Concerns Adjacent to Lakes and Rivers
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: This is a continuous ongoing evaluation

Provide Funding to Upgrade Current, or Purchase New, Hazmat Equipment as Needed	
Year Initiated	2005
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	This is a continuous on-going evaluation.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident

Action/Implementation Plan and Project Description, if applicable	Provide Funding to Upgrade Current, or Purchase New, Hazmat Equipment as Needed
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing - need more information on this action

Implement Additional Training to Mutual Assistance	
Year Initiated	2005
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Fire Department, Waterford Township Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	This is a continuous on-going evaluation.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Implement additional training to mutual assistance in time of mass emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Two were completed during 2017. One was hazmat at a rail yard and the other was the Airport. 2023 Update: Ongoing - Not sure what they wanted from this. Look like they included 2 fire responses

Maintain Mutual Assistance Agreements	
Year Initiated	2005
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Fire Department, Waterford Township Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Enhance regional capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	This is a continuous on-going evaluation.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Air
Action/Implementation Plan and Project Description, if applicable	Maintain mutual assistance agreements for a potential emergency at the Oakland County International Airport.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Mutual Aid systems known as MABAS has been implemented and our OAKWAY partner are engaged with the public safety department in Waterford. 2023 Update: Continuing

Provide Funding for Protection and Security to Ground Water Wells	
Year Initiated	2012
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Department of Public Works, Waterford Township Police Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	This is a continuous on-going evaluation.
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Infrastructure Failure, Terrorism/ Weapons of Mass Destruction
Action/Implementation Plan and Project Description, if applicable	Provide funding for protection and security to the 18 ground water wells in the Township.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. All ground water well sites have had security upgrades including cameras and alarm systems. 2023 Update: Ongoing - sites need new cameras and auto shut offs

Provide Funding for Additional Manpower	
Year Initiated	2012
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident
Action/Implementation Plan and Project Description, if applicable	Provide funding for additional manpower for public safety for flooding issues and possible hazmat accidents.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing 2023 Update: Ongoing - covered by prior mitigation actions

Reline Water and Sewer Mains	
Year Initiated	2017
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Protect/mitigate infrastructure
Benefits Analysis (Low, Medium, High)	High

Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	Relining of water and sewer mains to ensure long term integrity of the system.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

SCADA Upgrades	
Year Initiated	2017
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township, Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	SCADA system upgrades to provide real-time data and monitor water and sewage systems.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Replace Fire Station #2	
Year Initiated	2005
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure

Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long Term (to be completed in greater than 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Fire Station #2 does not meet the needs of the fire service as it is nearly 70 years old. This station needs to be replaced. Funding is needed to complete this project.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Security Systems at all Fire Stations	
Year Initiated	2017
Applicable Jurisdiction	Waterford Township
Lead Agency / Organization / Position	Waterford Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3, 4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Improve infrastructure
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted	Medium

for each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Security systems are needed at all fire stations. Funding is needed to complete this project.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Provide funding to install generators for emergency power at the waste water lift stations.	
Year Initiated	2012
Applicable Jurisdiction	Waterford Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed, date unknown. Note that Waterford Township does not have waste water treatment facilities. There are waste water lift stations; the action has been altered from installing generators at facilities to generators at lift stations. All lift stations have emergency backup generators.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description	Provide funding to install generators for emergency power at the waste water lift stations.
2023 Plan Update Status and Changes in Priority	Completed

Sewer Slush machine used to clean and ensure proper sewage flow through the system and to prevent sewage back up.	
Year Initiated	2017
Applicable Jurisdiction	Waterford Township
Lead Agency/ Organization / Position	Waterford Township
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	
Potential Funding Source	N/A
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description	Sewer Slush machine used to clean and ensure proper sewage flow through the system and to prevent sewage back up.
2023 Plan Update Status and Changes in Priority	Completed in 2017

59. West Bloomfield Township

Community Profile and Description

West Bloomfield Township was organized in 1833. The area is known throughout metro Detroit for its large homes, nature areas, and large Jewish population. As of the 2020 U.S. Census, the population is 65,888. The total area of West Bloomfield Township is 31.2 square miles, with 3.9 square miles (12.49 percent) being water. Westacres is an Unincorporated community in the Township.

Hazards

Natural Hazards:

- Tornadoes and high winds have caused significant damage, leading to the need for extensive debris removal.
- Lightning strikes have resulted in structural fires.

Emergency Access to Medical Facility:

- The primary medical facility in the Township has only one road for access and egress.
- If this route is blocked, emergency personnel may have difficulty reaching the medical facility or evacuating patients if needed.
- There is a need to widen Maple Road to ensure emergency personnel can access the medical facility promptly.

Stormwater Management:

- Stormwater management is a priority in the Township to prevent raw sewage release when the sewer system is at capacity.
- Collaboration with neighboring communities is ongoing to improve infrastructure and protect waterways.

Hazards from Radioisotope Transportation:

- The transportation of radioisotopes between medical facilities within the Township poses a potential hazard in the event of a traffic accident.

Communication System Deficiencies:

- The OakWin Radio System used by police and fire has some deficiencies in the Township, leading to communication challenges.

Terrorism Concerns:

- High-profile individuals identified as people of concern may pose a potential terrorist hazard.

Underwater Rescue Capabilities:

- The Township lacks sufficient resources to handle underwater rescue situations.
- Currently, all underwater rescues are managed by the Oakland County Sheriff's Office.

Winter Road Maintenance:

- The Township officials emphasize the need to maintain an adequate salt supply during winter months for safe roadways.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Regional Storm Water Flooding	
Year Initiated	2023
Applicable Jurisdiction	W. Bloomfield / Oakland Community
Lead Agency/ Organization / Position	Fire
Supporting Agencies/ Organizations	Oakland County Drain Commission
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	$1 Million
Potential Funding Source	General Funds
Benefits (Loss Avoided)	Property Loss
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Regional stormwater flooding in the township. Flooding the results of extreme rain events
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Private Bridges in Subdivision	
Year Initiated	2023
Applicable Jurisdiction	W. Bloomfield TWP
Lead Agency/ Organization / Position	W. Bloomfield TWP
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	$1 Million
Potential Funding Source	Private / Municipal
Benefits (Loss Avoided)	Property Loss
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Unknown
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Infrastructure Failure, Structural Fire
Action/Implementation Plan and Project Description	Private bridges in subdivision are failing and will not support emergency vehicles (fire/EMS) and Sewer Jet and Vactor trucks of water and sewer utilities department. Bridge improvements necessary.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for	High

each mitigation action during the update process)	
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Acquire Equipment to Allow Radio Communication	
Year Initiated	2012
Applicable Jurisdiction	West Bloomfield Township
Lead Agency / Organization / Position	West Bloomfield Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Increase communication and coordination capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes,

	Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Acquire Equipment to Allow Radio Communications
2023 Plan Update Status and Changes in Priority	2017 Update: The installation of systems to ensure the amplification of radio signals on new construction is required if it is determined that the new construction will result in loss/disruption of service. Additional efforts are under way to ensure the overall radio system is improved. 2023 Update: Ongoing

Planning for Extreme Temperatures	
Year Initiated	2017
Applicable Jurisdiction	West Bloomfield Township
Lead Agency / Organization / Position	West Bloomfield Township Administration
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1,3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Severe Winter Storms, Extreme Heat, Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	- Ensure plans for extreme heat/cold during power outages -Ensure adequate shelters -Identify warming and cooling facilities for at-risk populations -Motioning system for housebound at-risk populations -Monitor SCADA on water and sewer systems
2023 Plan Update Status and Changes in Priority	2023 Update: Shelters have been identified, SCADA monitoring complete, alternative power sources are ongoing

Bury Power Lines	
Year Initiated	2017
Applicable Jurisdiction	West Bloomfield Township
Lead Agency / Organization / Position	Utility Companies
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 3
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Utility Construction Budget
Benefits (Loss Avoided)	Ongoing utility service
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	This is already being done for many construction projects.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Completed Mitigation Actions

Provide specialized technical training (e.g., confined space entry) and equipment to members of the Township public safety departments.	
Year Initiated	2005
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Competed, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure

	Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Provide specialized technical training (e.g., confined space entry) and equipment to members of the Township public safety departments.
2023 Plan Update Status and Changes in Priority	Completed

Find a solution for the flooding problems in the Township, particularly in the area of Parkland and Springwater Streets.	
Year Initiated	2005
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete. The WRC completed a flood control project to address this issue.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	Find a solution for the flooding problems in the Township, particularly in the area of Parkland and Springwater Streets.
2023 Plan Update Status and Changes in Priority	Completed

Acquire equipment to remove debris following tornadoes and/or high-wind storms.	
Year Initiated	2012
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A

Actual Completion Date	Complete. Accomplished through relationships with the Township's Parks and Rec and Water and Sewer Department. These departments have heavy equipment that can be used for these purposes.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description	Acquire equipment to remove debris following tornadoes and/or high wind storms.
2023 Plan Update Status and Changes in Priority	Completed

Continue to advocate for the widening of Maple Road to improve and maintain access to Henry Ford Hospital.	
Year Initiated	2012
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete. Project was completed in 2017. A secondary access road has also been approved for construction.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents:

	Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Continue to advocate for the widening of Maple Road to improve and maintain access to Henry Ford Hospital.
2023 Plan Update Status and Changes in Priority	Completed in 2017

Mitigate flooding on Pocono Drive: The drain on the golf course is not adequate and has debris. Results in overland flooding on the roadway.	
Year Initiated	2017
Applicable Jurisdiction	West Bloomfield Township
Lead Agency/ Organization / Position	West Bloomfield Township
Supporting Agencies/ Organizations	
Applicable Goal(s)	1, 2
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Local Funds
Benefits (Loss Avoided)	Protect infrastructure from flooding
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Flooding
Action/Implementation Plan and Project Description	The drain on the golf course is not adequate and has debris. Results in overland flooding on the roadway.
2023 Plan Update Status and Changes in Priority	Completed

60. White Lake Township

Community Profile and Description

White Lake Township was established in 1833 with approximately 10 settlers In 2016, White Lake Township was named the 6th safest place to live in Michigan. As of the 2020 U.S. Census, the population is 30,950. The total area of White Lake Township is 37.2 square miles, with 3.5 square miles (9.44 percent) covered by water. The Township has three unincorporated communities: East White Lake, Oxbow and White Lake.

Hazards

Dam Failure:

- Pontiac Lake Dam at the headwater of the Huron River poses a risk to residential homes and roadway infrastructure in case of failure.
- Lake Neva Dam is also of particular concern.

Wildfires:

- Two state parks, one campground, and one metro park are vulnerable to wildfires.
- Some areas are difficult for emergency responders to access.

Active Shooter Incidents:

- Many locations, including big box stores, school districts with multiple schools, and religious institutions, are considered vulnerable soft targets.

HAZMAT Incidents:

- A gas plant located on Young Road raises concerns about potential hazardous materials incidents.
- M-59 running through the community adds to the risk of HAZMAT incidents.

Infrastructure Failure Incidents:

- Five pump houses provide municipal and fire suppression water supply without a backup generator, posing risks during power outages.
- Long-term power outages could lead to significant challenges for residents and businesses, affecting fuel and water access.

Structural Fire Incidents:

- Senior living apartments, assisted living centers, and memory care facilities are at increased risk during structural fire incidents.

Tornadoes and High Wind Events:

- Advanced warning measures are needed to address tornado risks.
- Four manufactured home parks lack specific shelters.
- High winds are also identified as a significant hazard.

Aviation Accidents:

- The Oakland County International Airport's proximity poses concerns about potential plane crashes in heavily populated areas.

Mitigation Strategies and Actions

Each jurisdiction's mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Design and Construction of Hardened Storm Shelter	
Year Initiated	2023
Applicable Jurisdiction	White Lake
Lead Agency/ Organization / Position	White Lake Board of Trustees
Supporting Agencies/ Organizations	Police and Fire Departments
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Life Safety, protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Active Shooter/Active Assailant, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Terrorism/Weapons of Mass Destruction

Action/Implementation Plan and Project Description	Design and Construction of Gardened Storm Shelter in new public safety building (which will house police and fire staff and command)
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Design and Construction of Hardened Storm Shelter within new Fire Station #2	
Year Initiated	2023
Applicable Jurisdiction	White Lake
Lead Agency/ Organization / Position	White Lake Board of Trustees
Supporting Agencies/ Organizations	WLT Fire Departments
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Life Safety, protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2026/27
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Active Shooter/Active Assailant, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Terrorism/Weapons of Mass Destruction
Action/Implementation Plan and Project Description	Design and Construction of Hardened Storm Shelter Within New Fire Station #2
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Design and Construction of Hardened Storm Shelter within new Fire Station #3	
Year Initiated	2023
Applicable Jurisdiction	White Lake
Lead Agency/ Organization / Position	White Lake Board of Trustees
Supporting Agencies/ Organizations	Police and Fire Departments
Applicable Goal(s)	1, 2, 3
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Life Safety, protection
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2026/27
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High

Hazard(s) Mitigated	Severe Summer Storms, Tornadoes, Active Shooter/Active Assailant, Hazardous Materials Incidents: Fixed Site, Infrastructure Failure, Terrorism/Weapons of Mass Destruction
Action/Implementation Plan and Project Description	Design and Construction of Hardened Storm Shelter within New Fire Station #3
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Two Additional Back-Up Generators	
Year Initiated	2023
Applicable Jurisdiction	White Lake
Lead Agency/ Organization / Position	White Lake TWP Department of Public Services
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3,
Estimated Cost & Analysis (Low, Medium, High)	$50,000
Potential Funding Source	BRIC, HMGP
Benefits (Loss Avoided)	Maintenance municipal water supply
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description	Two Additional Back-Up Generators within pump houses / municipal water supply.
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	White Lake Township
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing

Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Install Additional Tornado Sirens	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Sever Summer Storms, Tornadoes

Action/Implementation Plan and Project Description, if applicable	Install additional tornado sirens
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Checking on the status to see if this is still needed. 2023 Update: Still needed - ongoing. Pontiac Lake State Park - Tornado in WLT in July of 2021. Highland Rec, Indian Springs

Hire Additional Public Safety Officers	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	High (greater than $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Increase response capabilities
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Low
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Hire additional public safety officers to meet the increasing needs of the Township.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Currently at adequate levels for police & fire. Also have some part-time, paid on-call firefighters. Still attempting to improve staffing at Fire Station 3. 2023 Update: Ongoing - no longer have paid on call

Provide Additional training for Responding to Airplane Crashes	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Air
Action/Implementation Plan and Project Description, if applicable	Provide additional training for responding to potential airplane crashes at the Oakland County International Airport.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Training in October with Waterford 2023 Update: Ongoing

Provide Training for Closed Space Rescue	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Air
Action/Implementation Plan and Project Description, if applicable	Provide training for closed space rescue.

2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Been some training. Technical Rescue Team ready to enter confined spaces. White Lake team who are not on the Team don't enter confined spaces, the training is focused on informing White Lake staff on what do to between their arrival on scene & Technical Rescue Team arrival. 2023 Update: Ongoing - looking to add more personnel to Tech Rescue team as well as one department

Provide Proper Training to Respond to Emergencies	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Provide proper training to respond to such emergencies as multi-vehicle accidents and trench or building collapse emergencies.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Continue to do accident response training. Specialized team members get training to respond to trench training. 2023 Update: Ongoing

Continue to Provide Training to Public Safety Officers	
Year Initiated	2012
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Department of Public Safety
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, HSGP
Benefits (Loss Avoided)	Enhance training and response capabilities
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Continue to provide training to public safety officers
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. Required to do two trainings a month that cover a variety of topics. For example, active shooter. 2023 Update: Ongoing - hosted an active shooter training in 2022

Storm Debris Management	
Year Initiated	2017
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3,4, 7
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)

Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	More cohesive response following debris generating events.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Severe Summer Storms, Tornadoes
Action/Implementation Plan and Project Description, if applicable	Roads in White Lake Township fall under three types of ownership: those that belong to the Township, the County, and private residents. As the Township does not have a Public Works department, it can be difficult to ensure those who are responsible for clearing the road do so in a timely manner following events with widespread debris (such as a tornado or high winds). Additionally, the Township is considering if/how potential debris generators can be mitigated before a storm (such as informing the owners of private roads regarding trees that may need to be removed).
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing - experienced a tornado in 2021

Replace Fire Station #3 Generator	
Year Initiated	2017
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	4
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000) $25,000
Potential Funding Source	Fire Department Budget
Benefits (Loss Avoided)	Ensure a continuous power source for Fire Station #3.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years); 2019
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Infrastructure Failure
Action/Implementation Plan and Project Description, if applicable	The generator in Fire Station #3 needs to be replaced to ensure those responding from the station have continuous access to power. The

	current plan is to get a used generator to save on costs.
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing

Civic Center Complex Sheltering Capability	
Year Initiated	2005
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Fire Department / Police Department
Supporting Agencies/ Organizations	White Lake Township Officials
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High (more than $100,000)
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Ensure that the new complex can be used as a community shelter.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2025 (2024 Ground Breaking Anticipated)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	The new Civic Center Complex will be built in the Township. The Fire Department will work to ensure the complex is built in such a fashion that it can be used as a community emergency shelter. For Police and Fire
2023 Plan Update Status and Changes in Priority	2023 Update: Ongoing - design in 2023

Mobile Home Shelter Options	
Year Initiated	2017
Applicable Jurisdiction	White Lake Township
Lead Agency / Organization / Position	White Lake Township Fire Department
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Annual Budget
Benefits (Loss Avoided)	Protection of mobile home residents
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2021
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Tornadoes
Action/Implementation Plan and Project Description, if applicable	The Township has been discussing this concern over the past few years and a suitable arrangement has not been identified. With nearly 2,000 mobile homes in four parks throughout the Township, this presents a significant concern for first responders and mobile home park residents. The Township will continue to look for potential solutions to address this concern.
2023 Plan Update Status and Changes in Priority	2017: Initiated. This project was initiated in the HMP in 2017, however the conversation has been ongoing. 2023 Update: Ongoing

Completed Mitigation Actions

This is not applicable to this jurisdiction.

61. City of Wixom

Community Profile and Description

The settlement of Wixom dates back to the 1830s. The establishment of Wixom as a place started in the early 1870s when the Holly, Wayne and Monroe Railroad was constructed through the area. Willard Wixom platted land on either side of the railroad near the Novi and Commerce Township border. The construction of a railroad depot and the naming of the area as Wixom fixed Wixom as a destination. The village of Wixom was incorporated in the 1950s following the announcement of plans to construct the Wixom Assembly Plant in Novi Township. The city was home to the former Wixom Assembly Plant, which produced the Lincoln LS, the Ford Thunderbird, the Ford GT, and the Lincoln Town Car. The plant closed its doors on May 31, 2007. As of the 2020 U.S. Census, the population is 17,193. The total area of the City of Wixom is 9.36 square miles.

Hazards

Major Transportation Incidents:

- I-96 roadway incidents, including possible spills or accidents, are a concern to the City of Wixom.
- The railroad is also identified as being at risk for transportation-related incidents.

Mitigation Strategies and Actions

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In this section, mitigation actions/projects were updated/amended, identified, evaluated, and prioritized.

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process
- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Railroad Overpass on Beck Road	
Year Initiated	2023
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	Wixom Department of Public Works
Supporting Agencies/ Organizations	NOVI
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	High
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	North / South Transport for Railroad
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long-term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Railroad Overpass on Beck Road
2023 Plan Update Status and Changes in Priority	New mitigation action for 2023

Wastewater Plant Upgrades	
Year Initiated	2023
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	Wixom Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	1, 2, 3, 4, 5, 6, 7
Estimated Cost & Analysis (Low, Medium, High)	$6 Million
Potential Funding Source	Federal and Self Funded, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Asset Protection and Resiliency
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Long-term
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site
Action/Implementation Plan and Project Description	Wastewater Plant Upgrades
2023 Plan Update Status and Changes in Priority	New Mitigation Action

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings
2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

The jurisdiction did not have previous mitigation actions.

Completed Mitigation Actions

Provide Funding for Hazmat Training and Equipment	
Year Initiated	2005
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Transportation Accidents: Highway, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed

Provide additional barricades, for emergency response personnel protection, to be used at multi-vehicle accidents.	
Year Initiated	2005
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	City of Wixom
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	Medium
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Complete, date unknown
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium

Hazard(s) Mitigated	Transportation Accidents: Highway
Action/Implementation Plan and Project Description	
2023 Plan Update Status and Changes in Priority	Completed

Obtain portable radio repeaters to provide cohesive and consistent communication between emergency response personnel.	
Year Initiated	2012
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	City of Wixom
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed. The City of Wixom identified the issue with poor performance of the system and the County evaluated and agreed it was an issue, followed the appropriate processes and installed a new cellular antenna and the performance of the system has been much improved.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Obtain portable radio repeaters to provide cohesive and consistent communication between emergency response personnel.
2023 Plan Update Status and Changes in Priority	Complete

Provide large scale disaster response training for all first responders in the City of Wixom.	
Year Initiated	2012
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	City of Wixom
Supporting Agencies/ Organizations	
Applicable Goal(s)	6
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	N/A
Actual Completion Date	Completed. A tabletop exercise was conducted addressing a train derailment and associated challenges.
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description	Provide large-scale disaster response training for all first responders in the City of Wixom.
2023 Plan Update Status and Changes in Priority	Completed

Well House Abandonment will take place at 46916 Liberty and 29730 South Wixom Road, and other locations as needed.	
Year Initiated	2017
Applicable Jurisdiction	City of Wixom
Lead Agency/ Organization / Position	Oakland County, Great Lakes Water Authority
Supporting Agencies/ Organizations	
Applicable Goal(s)	1

Estimated Cost & Analysis (Low, Medium, High)	$60,000
Potential Funding Source	Water Enterprise Fund
Benefits (Loss Avoided)	Preserve/Protect life and mitigate casualties
Benefits Analysis (Low, Medium, High)	
Projected Completion Date (Short-term, Long-term, or Ongoing)	March 31, 2018 and August 2018
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	Medium
Hazard(s) Mitigated	Subsidence, Infrastructure Failure
Action/Implementation Plan and Project Description	Well House Abandonment will take place at 46916 Liberty and 29730 South Wixom Road, and other locations as needed.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2018 Update: Wixom Business and Wixom West Tech Abandoned 2019 Update: Completed in 2019 2023 Update: still have two wells available: Grand Oaks Well and Maple Forest Well

62. Village of Wolverine Lake

Community Profile and Description

Wolverine Lake is named after the wolverine, from which Michigan acquired its unofficial nickname of Wolverine State. Wolverine Lake was created in the 1920s through a private damming and inundation project funded by local dentist and developer Howard Stuart. Wolverine Lake was created from six small lakes; Spring, Mayie, Pork Barrel, Bickling, Taylor and Bradley, all surrounded by marsh land. The Village of Wolverine Lake was incorporated in 1954. As of the 2020 U.S. Census, the population is 4,544. The total area of the Village of Wolverine Lake is 1.68 square miles.

Hazards

Failure of the Wolverine Lake Dam:

- The dam, located just north of Glengary Road, poses a significant risk as its failure could lead to the flooding of 120 homes.
- An Emergency Action Plan (EAP) is in place to address and respond to potential dam failure emergencies.

Tornado / Severe Winter Weather:

- Tornadoes and severe winter weather events are identified as hazards of concern for the Village.
- Power outages resulting from these events could disable local drinking water wells, threatening the community's access to safe drinking water.

Invasive Species:

- Phragmites are an invasive species concern.
- These invasive plants can negatively impact local ecosystems and water bodies, potentially leading to ecological imbalances and environmental issues.

Mitigation Strategies and Actions

The heart of the mitigation plan is the mitigation strategy, which serves as the long-term blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In this section, mitigation actions/projects were updated/amended, identified, evaluated, and prioritized.

Each jurisdiction’s mitigation actions are organized as follows:

- **New Mitigation Actions** - New actions identified during this 2023 update process

- **Ongoing Mitigation Actions** - These ongoing actions were included in the previous update, and have yet to be completed. Some of these actions have no definitive end. During the 2023 update, these "ongoing" mitigation actions and projects were modified and/or amended, as needed, to better define the action/project.
- **Completed and Removed Mitigation Actions** - Completed or removed actions since 2005

New Mitigation Actions

Develop and Implement Public Education Programs and Outreach on Natural Disaster Awareness, Readiness, Best Practices and Resources Available to the Public	
Year Initiated	2023
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency/ Organization	
Supporting Agencies/ Organizations	Oakland County Emergency Management & Homeland Security Department
Applicable Goal(s)	1, 3, 4, 5
Estimated Cost & Analysis (Low, Medium, High)	Low
Potential Funding Source	Local Funds, Staff Time, SHSGP
Benefits (Loss Avoided)	Life safety and greater resilience amongst residents, especially those who are underserved and/or have functional and access needs.
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	N/A
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires
Action/Implementation Plan and Project Description	Develop and implement public outreach and education programs on disaster awareness and resilience. Oakland County will assist participating jurisdictions in their outreach and education efforts. Activities may include: • Warning, public information, and education materials, such as OakAlert. • Family disaster plans and supply kits. • Preparedness events. • Web site or content for county and municipality websites and social media. • Content for county and municipal newsletters, brochures, etc. • Trainings

2023 Plan Update Status and Changes in Priority	This is a new mitigation action for the jurisdiction. Inclusion of this action is a reflection on the increasing need to ensure residents are better prepared for natural hazards, and that the community's most vulnerable and underserved populations are supported with the necessary resources and tools to ensure their safety.

Ongoing Mitigation Actions

Study Potential Effect of Dam Failure	
Year Initiated	2005
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency / Organization / Position	Village of Wolverine Lake
Supporting Agencies/ Organizations	Commerce Fire, Oakland County Sheriff, Wolverine Lake Police, DPW
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, BRIC, HMGP
Benefits (Loss Avoided)	120 homes downstream loss avoided
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	Study the potential effect of a dam failure on the proposed development located downstream.
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing - There has been some minor maintenance and repairs in the last couple years.

Continue to Plan a Response in the Event of Dam Failure	
Year Initiated	2005
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency / Organization / Position	Village of Wolverine Lake Police
Supporting Agencies/ Organizations	Police, DPW, Commerce Fire
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium
Potential Funding Source	Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	120 homes impacted downstream
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Ongoing
Actual Completion Date	Annual
Priority and Level of Importance (Low, Medium, High)	High

(Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	
Hazard(s) Mitigated	High Hazard Dams
Action/Implementation Plan and Project Description, if applicable	Continue to plan a response in the event of a dam failure on properties located downstream. Continue inspections annually and keep response info updated
2023 Plan Update Status and Changes in Priority	2017 Update: Ongoing. 2023 Update: Ongoing - the dam had some minor maintenance and repairs to it in the last couple of years.

Address Phragmites	
Year Initiated	2017
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency / Organization / Position	Village of Wolverine Lake Department of Public Works
Supporting Agencies/ Organizations	N/A
Applicable Goal(s)	3
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, Explore outside sources of funding to support implementation
Benefits (Loss Avoided)	Prevent/mitigate losses from invasive species
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	Short Term (to be completed in 1 to 5 years)
Actual Completion Date	TBD
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Invasive Species
Action/Implementation Plan and Project Description, if applicable	Address the growth and expansion of phragmites (invasive species)
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: Ongoing - Some of the Phragmites have been cut and burned to eliminate them.

Completed Mitigation Actions

Update the Dam EAP with current contact info for flow charts.	
Year Initiated	2017
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency/ Organization / Position	
Supporting Agencies/ Organizations	
Applicable Goal(s)	2
Estimated Cost & Analysis (Low, Medium, High)	N/A
Potential Funding Source	
Benefits (Loss Avoided)	
Benefits Analysis (Low, Medium, High)	

Projected Completion Date (Short-term, Long-term, or Ongoing)	November, 2017
Actual Completion Date	November, 2017
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	High Hazard Dams
Action/Implementation Plan and Project Description	Update the Dam EAP with current contact info for flow charts.
2023 Plan Update Status and Changes in Priority	2017 Update: Initiated, Completed - Completed in 2017

Generators for Community Well Houses	
Year Initiated	2012
Applicable Jurisdiction	Village of Wolverine Lake
Lead Agency / Organization / Position	Village of Wolverine Lake
Supporting Agencies/ Organizations	
Applicable Goal(s)	1
Estimated Cost & Analysis (Low, Medium, High)	Medium ($10,000 to $100,000)
Potential Funding Source	Internal (Local/County) Funds, State and Federal Grants
Benefits (Loss Avoided)	Continued water service for residents
Benefits Analysis (Low, Medium, High)	High
Projected Completion Date (Short-term, Long-term, or Ongoing)	2018
Actual Completion Date	2022
Priority and Level of Importance (Low, Medium, High) (Based on STAPLEE and/or Feasibility Analysis conducted for each mitigation action during the update process)	High
Hazard(s) Mitigated	Drought, Earthquake, Extreme Heat, Flooding, Fog, Invasive Species, High Hazard, Dams, Severe Summer Storms, Severe Winter Storms, Subsidence, Tornadoes, Wildfires, Active Shooter/Active Assailant, Cybersecurity, Hazardous Materials Incidents: Fixed Site, Hazardous Materials Incidents: Transportation Incident, Infrastructure Failure, Nuclear Power Plant Accidents, Oil and Gas Well Accidents, Public Health Emergencies: Pandemic/Epidemic, Socio-Political Hazards (Civil Disturbance, Social Unrest), Structural Fire, Terrorism/ Weapons of Mass Destruction, Transportation Accidents: Air, Transportation Accidents: Highway, Transportation Accidents: Marine, Transportation Accidents: Rail
Action/Implementation Plan and Project Description, if applicable	Acquire more generators for our community well houses. We only have one currently.

2023 Plan Update Status and Changes in Priority	2017 Update: Initiated 2023 Update: COMPLETED All municipal water wells have new generators installed (2022)