

Hazard Mitigation Plan

Oakland County Homeland Security Division
Oakland County, Michigan

July 26, 2012

ASTI ENVIRONMENTAL



July, 2012

To the Citizens of Oakland County,

The continuing effort to safeguard lives and property within Oakland County requires a commitment of continual planning, training and exercising of the response capabilities for any type of threat or disaster that may occur. Paramount to how well we respond to such an event is how well we have prepared in advance. Oakland County, in an effort to remain ever vigilant and in a position to help all citizens, businesses, organizations and partners in local government, has been engaged in updating our previous (2005) **Oakland County Hazard Mitigation Plan**. With funding assistance from the 2010 Pre-Disaster Mitigation Planning Grant, we have developed a robust Plan update. The planning process included input from each city, township, village and school district to identify potential hazards and mitigation strategies to reduce the risks from natural, human and technological hazards. This plan will provide a basis for technical assistance and pre- and post-disaster funding from the State of Michigan and the Federal Emergency Management Agency (FEMA).

Identifying and evaluating the needs and threats of the various communities was done through a comprehensive process facilitated by ASTI, Environmental. After a thorough assessment and prioritization, action items and plans were created. The 2011/2012 Plan update also included schools in the planning process in accordance with recent FEMA guidance.

It is imperative that we continue to work with our community partners to plan and protect Oakland County from potential threats. This Plan, along with other community and County response plans, will help ensure that County residents stay safe and prepared.

Be assured, that we have very proactive first responders and numerous support agencies that allow Oakland County to be a leader in response efforts across the State.

Sincerely,



L. Brooks Patterson
Oakland County Executive



L. Brooks Patterson
Oakland County Executive

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Executive Summary

Oakland County Hazard Mitigation Plan

Oakland County is subject to natural and man-made hazards that may impact health, quality of life, property, the environment and/or infrastructure. Because of the location and land use of Oakland County, certain hazard events have historically been more significant than others. Future conditions may cause other hazards to increase in significance. Providing strategies that minimize the impact of these hazards requires a commitment to a multiple-step program, including defining the problem, identifying preventive measures, implementing mitigation strategies and incorporating hazard mitigation in County-wide planning efforts. Oakland County has prepared this multi-jurisdictional *2012 Oakland County Hazard Mitigation Plan (HMP) Update* (Plan) to better understand significant Oakland County hazards and their impacts and to identify ways to mitigate those hazards. All 62 communities and 28 school districts in Oakland County participated in this process and are included in the Plan.

The Plan Process

This Plan was completed with the assistance of the Oakland County Homeland Security Division, members of the Oakland County Local Emergency Planning Committee (LEPC), members of the community, representatives and leaders from each of the 62 communities and 28 school districts in the County, the Michigan State Police Emergency Management and Homeland Security Division Mitigation Recovery Section and numerous other stakeholders. Over 240 individuals were involved in the preparation, evaluation, and community outreach components of this Plan, facilitated by ASTI Environmental. The Plan was prepared using 3 groups: an Advisory Committee provided evaluation and assessment, a group of community representatives provided local input from each community in Oakland County, and a group of community leaders provided local input and assisted with community outreach and Plan adoption.

The goal of hazard mitigation is to eliminate or reduce loss of life and property from hazards that occur in the County by protecting the health, safety and economic interests of its residents. Oakland County identified the following hazard mitigation goals.

1. Retain access to Federal Emergency Management Agency (FEMA) funding for Oakland County and its communities by complying with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities dated June 2007 (42 USC 5165) and Code of Federal Regulations (CFR), Title 44, Part 201.
2. Provide a basis for identifying and mitigating hazards that affect Oakland County and its communities.
3. Develop a method to incorporate hazard identification and mitigation into the planning process of Oakland County and its communities.

Specific tasks for the completion of this Plan included the following:

- Identifying hazards and risks
- Updating the hazard history
- Updating the community profiles
- Assessing vulnerabilities
- Identifying repetitive loss properties
- Defining community and school district goals and objectives

- Evaluating the status and relevance of previous goals and strategies
- Identifying and prioritizing hazard mitigation strategies
- Developing and updating Action Plans for a select list of mitigation strategies
- Preparing a draft report for Oakland County, municipal and public review
- Soliciting Oakland County, municipal and public feedback
- Preparing a final report
- Providing community outreach and communication
- Documenting the planning process
- Adopting the final Plan

Hazard Assessment

The Plan evaluated 50 hazards during the 2012 Oakland County HMP Update. Hazards were identified using a combination of historical research, surveys, workshops community and public meetings and reviewing the 2005 Plan. Based on that evaluation, specific hazards were identified as requiring additional consideration for mitigation and planning and are the focus of this Plan. These hazards were selected to represent both County-wide and local community concerns about hazards at the time this Plan was prepared. 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.

The following hazards were identified as significant:

- High Winds and Tornadoes
- Hazmat Incidents – Transportation
- Winter Hazards - Ice and Sleet
- Winter Hazards – Snowstorms
- Hazmat Incidents - Fixed Site
- Infrastructure Failure – All
- Transportation Accidents - All
- Flooding
- Public Health Emergencies
- Petroleum and Natural Gas Pipeline Accidents

Hazard Mitigation

Plan participants assessed 310 hazard mitigation strategies, including strategies from FEMA documents, strategies from the 2005 Oakland County Plan and suggestions from the communities, Advisory Committee members and school districts. These strategies were evaluated by the Advisory Committee during the second workshop held on November 29, 2011, resulting in a prioritized list of 24 strategies, in addition to 14 of the 15 mitigation strategies from the 2005 Plan, to serve as the basis for development of Action Plans. A total of 13 Action Plans were created for the 36 mitigation strategies. Some of the mitigation strategies were determined to be similar therefore; combined Action Plans were created.

The Hazard Mitigation Strategies are as follows:

1. Install additional tornado sirens in the community.
2. Implement additional hazmat training.
3. Hire additional people to meet the needs of municipal public safety departments.
4. Identify community roads that are susceptible to flooding during times of heavy rainfall.

5. Obtain/maintain redundant power sources for pumping and lift stations and treatment plants, including possible separation of combined storm/sanitary sewer systems, if appropriate.
6. Coordinate mutual aid assistance for failures in utility and communications systems (including 9-1-1).
7. Continue to encourage communities to acquire redundant power sources for backup power at critical facilities.
8. Ensure readiness at critical facilities by requiring facilities to perform regular maintenance and equipment checks and pre-plan for fuel needs of existing and redundant power sources (including gas stations and key facilities).
9. Equip public safety officers with hazmat detection equipment, provide additional equipment to clean up a chemical spill and upgrade and improve current respiratory equipment.
10. Encourage and facilitate mutual aid agreements for responding to incidents.
11. Enhance coordinated public health response plans.
12. Improve coordination of agencies in response planning and activities.
13. Implement rapid damage assessment.
14. Detect and prevent/discourage illegal discharges from home footing drains, downspouts and sump pumps into storm water system.
15. Encourage residents to receive immunizations against communicable diseases.
16. Continue providing resources for the development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas and other appropriate sites.
17. Utilize public warning systems for public health communications.
18. Obtain communication boosters for deficient areas in the Oakland County Wireless Integrated (OakWin) Radio System (Oakland County's 800 mhz, County-wide, interoperable radio system).
19. Improve and continue training for emergency responders and provide adequate equipment.
20. Provide mutual aid pacts for personnel and resources to assist during and following storms.
21. Increase public awareness of the causes, symptoms and protective actions for disease outbreaks and other potential public health emergencies.
22. Pre-arrange heating/cooling centers/shelters for vulnerable populations, stranded motorists, etc.
23. Pre-plan for debris management staging and storage areas.
24. Continue to encourage residents to create family escape plans and disaster supply kits.
25. Continue outreach to vulnerable populations during periods of extreme temperatures.

26. Continue to enhance and maintain early warning systems and networks.
27. Continue to train, plan and prepare for mass-casualty incidents.
28. Continue to create and update 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 currently in place.
29. Encourage communities to obtain an adequate supply of redundant power sources for temporary emergency power.
30. Provide baseline training, planning and preparedness for hazardous material incidents along roadways, railways and pipelines.
31. Adopt and enforce appropriate building codes.
32. Keep roads and driveways accessible to vehicles and emergency equipment. Bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around, etc.
33. Utilize public warning systems and networks.
34. Provide transportation for elderly and disabled persons to shelters.
35. Make sure warming and cooling centers have adequate redundant power sources.
36. Improve communications between municipalities and local, state and regional agencies in the event of mass-casualty incident.

1. Introduction

Oakland County 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 Related Authorities FEMA 592, June 2007 and 44 CFR Part 201, require local governments to develop a Hazard Mitigation Plan (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 (HMP), dated January 17, 2005, and has prepared this 2012 Oakland County HMP Update to better understand significant Oakland County hazards, their impacts and to identify ways to mitigate those hazards.

1.1. Acknowledgements

Development of the 2012 Oakland County HMP Update required the time, talents, effort and ideas of numerous individuals. Over 240 stakeholders, community leaders, residents and Oakland County staff participated in the development of this Plan. Staff from the Oakland County Homeland Security Division, members of the Oakland County Local Emergency Planning Committee (LEPC), members of the community and representatives and leaders from all 62 communities and 28 school districts in Oakland County provided input. In addition, this Plan would not have been completed without the assistance of the Michigan State Police Emergency Management and Homeland Security Division Mitigation Recovery Section.

Oakland County would like to acknowledge and thank the following people for their cooperation and assistance in developing this Plan.

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Bruce Pearson, Township Supervisor

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Kevin Sullivan, Fire Chief

Village of Franklin

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Michael Olson, Public Works Director
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Oakland Township

Bill Benoit, Building Director and Fire Chief

City of Orchard Lake

Joe George, Police Chief

Gerry McCallum, City Services Director

Orion Township

Tom Berger, Building Official

Bill Ireland, Public Works Director

Robert G. Smith, Fire Marshal

JoAnn VanTassel, Township Supervisor

Village of Ortonville

Pete Burkett, Station Commander, Oakland County Sheriff's Office

John Lyons, Village Manager

Oxford Township

Peter Scholz, Fire Chief

Village of Oxford

Peter Scholz, Fire Chief

City of Pleasant Ridge

Sherry Ball, City Manager

Karl Swieczkowski, Police Chief

City of Pontiac

Tim Atkins, Captain/Station Commander, Oakland County Sheriff's Office

Jaki Holzer, Office Administrator

Tyrone Jarrett, Sr., Fire Chief

Leon Jukowski, City Mayor

Stephanie Sumner, Executive Assistant to the Mayor

City of Rochester

Nik Banda, Deputy City Manager
Bill Bohlen, Public Works Director
John Cieslik, Fire Chief
John Hiller, Finance Director
Derrick Kozicki, Assistant to the City Manager
Lee Ann O'Connor, City Clerk
Steve Schettenhelm, Police Chief

City of Rochester Hills

Ron Crowell, Fire Chief
Mike Johnson, Captain/Substation Commander, Oakland County Sheriff's Office
Roger P. Moore, Professional Surveyor/Storm Water Manager
Allan E. Schneck, Public Safety Director

Rose Township

Alison Kalcec, Township Supervisor
Michael McCormick, Lieutenant, Michigan State Police
Lisa Speary, Lieutenant, Michigan State Police

City of Royal Oak

Mark Olsen, EMS Coordinator
Michael Schunck, Captain, Fire Department
Don Stehlin, Captain, Fire Department
Chuck Thomas, Interim Fire Chief
Rick Wiegand, Interim Assistant Fire Chief
Gordie Young, Deputy Police Chief

Royal Oak Township

Bill Morgan, Township Supervisor

City of South Lyon

Lloyd Collins, Police Chief
Mike Kennedy, Fire Chief
David Murphy, City Manager

City of Southfield

Frank Coutts, Emergency Manager Director

Southfield Township

Tony Averbuch, Fire Chief

Springfield Township

Matt Baldes, Sergeant, Oakland County Sheriff's Office
Charles Oaks, Fire Chief
Collin Walls, Township Supervisor

City of Sylvan Lake

John Martin, City Manager

City of Troy

Paul Firth, Lieutenant, Fire Department
Don Ostrowski, Sergeant, Police Department

City of Walled Lake

Paul Shakinas, Police Chief
Ken Van Sparrentak, Fire Chief

Waterford Township

Terry Biederman, Public Works Director
Daniel McCaw, Police Chief
David McKee, Water and Sewer Superintendent
Rob Merinsky, Building and Engineering Department Director
Ronald R. Spears, Fire Chief

West Bloomfield Township

Michele Economou Ureste, Township Supervisor
Dawn Ferguson, Administrative Sergeant, Police Department
Edwin Haapala, Water and Sewer Department Director
Mike Patton, Police Chief
Jay Wiseman, Fire Chief

White Lake Township

Greg Baroni, Township Supervisor
Edward Harris, Police Chief
Adam Kline, Lieutenant, Police Department
Tony Maltese, Fire Chief

City of Wixom

Clarence Goodlein, Police and Fire Services Director
Jeff Roberts, Fire Chief

Village of Wolverine Lake

John Ellsworth, Chief, Police Department
Sharon Miller, Village Administrator
Andrew Stone, Public Works Leader

School Representatives

Avondale Schools

Frank Lams, Chief Financial Officer

Berkley Schools

Dennis McDavid, Director of Schools and Human Resources

Birmingham Public Schools

Matt Hess, Assistant Manager of Operations
Steve King, Manager of Operations

Bloomfield Hills Schools

Brian Goby, Director of Physical Plant Services
Laurie McCarty, Assistant Superintendent for Instruction

Brandon School District
Arden Becker, Executive Director of Operations

Clarenceville School District
Pamela Swert, Superintendent

Clarkston Community Schools
David Reschke, Superintendent

Clawson Public Schools
Cheryl Rogers, Superintendent

Farmington Public Schools
Jon Riebe, Director of Facility Management
John Shinshe, Maintenance Supervisor

Ferndale Public Schools
Colleen ApMadoc, Operations/Adult & Alternative Education
Gary Sophiea, Director of Operations

Hazel Park Schools
Mark Brown, Director of Facilities

Holly Area Schools
Kent Barnes, Superintendent

Huron Valley Schools
Sue Gilson, Supervisor
Janet Roberts, Director of Community Relations

Lake Orion Community Schools
Wes Goodman, Director of Operations
Brian Kaplan, Principal

The Lamphere Schools
Joe Den Bau, Lamphere Schools
Rita Lewis, Director of Human Resources

Madison District Public Schools
Carol Klenow, Superintendent
Sharon Kline, Administrative Services Assistant

Novi Community School District
Steve Barr, Assistant Superintendent of Business and Operations
Mike Dragoo, Director of Maintenance and Operations

Oak Park Schools
Janette Brill, Assistant Superintendent

Oakland Community College
Michael Schmidt, Manager of Environmental Health and Safety

Oakland University

Mark Gordon, Captain, Police Department
Cora Hanson, Purchasing and Risk Management Manager
Samuel Lucido, Police Chief
Terry Stollsteimer, Facility Manager

Oxford Community Schools

Tim Loock, Assistant Superintendent

Pontiac School District

Robert Englund, Director of Facilities and Operations

Rochester Community Schools

John Stoner, Director of Operations and Transportation

Royal Oak School District

Cheryl Goodgine, Executive Director

South Lyon Community Schools

Chris Bullinger, Manager of Facilities and Grounds

Southfield Public Schools

Debbie Tremp, Assistant Superintendent

Troy Schools

Ken Miller, Executive Director

Walled Lake Consolidated Schools

William Chatfield, Director of Operations

Waterford School District

Randall Portwood, Executive Manager, Facilities

West Bloomfield School District

Neil Currie, Emergency Management Coordinator

2. Hazard Mitigation Plan Process

This multi-jurisdictional Hazard Mitigation Plan (the Plan or HMP) was originally created in 2005 and 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. Each of the 62 communities and 28 school districts within Oakland County participated in this Plan and, therefore, are covered by this Plan. Each of the 62 communities were included in the 2005 Plan and are again included in this update. However, the 28 school districts are new to the 2012 update.

This Plan is designed to comply with requirements of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities FEMA 592, June 2007 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.¹ 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* dated July 1, 2008) 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.

During the planning process, Oakland County and community representatives discussed a total of 53 hazards in 3 categories as described below. Some of these were consolidated into similar groupings (e.g., all forms of infrastructure failure were ultimately combined) and Advisory Committee and community representatives rated the importance of 31 hazards. Hazard definitions are included in Section 4. These hazards were selected based on the requirements of the *Local Multi-Hazard Mitigation Planning Guidebook* and the Michigan State Police Emergency Management and Homeland Security Division.

Natural Hazards

- Drought
- Earthquake
- Extreme Temperatures - Extreme Cold
- Extreme Temperatures - Extreme Heat
- Fire - Wildfires
- Flooding - Riverine
- Flooding - Shoreline & Erosion
- Fog
- Invasive Species
- Subsidence - Natural
- Thunderstorms - Hail
- Thunderstorms - Lightning
- Thunderstorms - Severe Wind
- Tornadoes
- Winter Hazards - Ice and Sleet

¹ Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities (42 USC 5165), 44 CFR Part 201

- Winter Hazards - Snowstorms
- Unpredictable Weather

Technological Hazards

- Fire - Scrap Tire
- Fire - Structural
- Flooding - Dam Failure
- Flooding - Urban
- Hazmat Incidents - Fixed Site
- Hazmat Incidents - Transportation
- Infrastructure Failure - Bridges, Roads, Overpasses
- Infrastructure Failure - Communications
- Infrastructure Failure - Electrical Systems
- Infrastructure Failure - Sanitary Sewer System
- Infrastructure Failure - Storm Sewer System
- Infrastructure Failure - Structural Collapse
- Infrastructure Failure - Water System
- Nuclear Power Plant Accidents
- Oil and Gas Well Accidents
- Petroleum and Natural Gas Pipeline Accidents
- Subsidence - Mining

Human Hazards

- Civil Disturbance
- Criminal Acts - Vandalism and Arson
- Criminal Acts - Due to Economic Collapse
- Criminal Acts - Mass Shootings
- Centralized Planning in Lansing & Washington, DC
- Unemployment and Underemployment
- Information Technology Intrusion
- Gas/Oil Shortages or Supply Disruptions
- Public Health Emergencies - Pandemics and Epidemics
- Public Health Emergencies - Contaminated Food/Water
- Electromagnetic Pulse
- Transportation Accidents - Air
- Transportation Accidents - Highway
- Transportation Accidents - Marine
- Transportation Accidents - Rail
- Transportation Accidents - Rail/Highway Crossings
- Transportation Accidents - Surface Roads
- Weapons of Mass Destruction

Although included in the hazard analysis section, this Plan does not include mitigation strategies for terrorism, the use of weapons of mass destruction or nuclear power plant accidents. These hazards are addressed in the Oakland County Threats and Needs Assessment, which is a homeland security and law enforcement sensitive document and, therefore, not available to the public. For security purposes, information in Oakland County's Threats and Needs Assessment is not included in the Plan.

2.1. Plan Goals and Objectives

The general goals of any Hazard Mitigation Plan include: saving lives and protecting property, preserving and protecting an area's environment and economy and preserving and maintaining an area's essential services and quality of life. The Plan includes these general goals.

Additionally, the following 3 goals were included in the 2005 Oakland County HMP. The Advisory Committee reviewed these goals during the 2012 Oakland County HMP Update process and voted to retain them. The only modification to these goals involved updating references to the most current laws. The Advisory Committee determined that these goals were still applicable and were made part of this Plan update.

1. Retain access to FEMA funding for Oakland County and its communities by complying with Section 322 of the Robert T. Stafford Disaster Relief and Emergence Assistance Act, as amended, and Related Authorities, FEMA 592, June 2007 (42 USC 5165) and 44 CFR Part 201.
2. Provide a basis for identifying and mitigating hazards that affect Oakland County and its communities.
3. Develop a method to incorporate hazard identification and mitigation into the planning process of Oakland County and its communities.

The 2005 Plan also included the following goals and objectives designed to focus mitigation activities identified in the planning process:

1. Improve public and private organizational preparedness
 - Reduce injuries and loss of life from hazards.
 - Identify infrastructure, land use and population vulnerabilities in both the public and private sectors.
 - Establish a continuous improvement program.
2. Improve public and private organizational response capabilities
 - Motivate appropriate governmental entities to identify and mitigate the hazard.
 - Inventory and identify deficiencies of existing response capabilities for all emergency responders.
 - Correct deficiencies in training, coordination and equipment distribution.
 - Implement mutual aid pacts with all responders (public and private) through researching mutual aid laws.
 - Develop an Oakland County search and rescue team.
 - Identify, train and equip volunteers to serve on the search and rescue team.
 - Seek methods of addressing vulnerabilities.
 - Establish a continuous improvement program.
 - Support public and private response organizations.
3. Improve public education and awareness
 - Improve the public's hazard response awareness.
 - Establish a continuous improvement program.
 - Support public and private response organizations.

The Advisory Committee reviewed this latter set of goals during their November 29, 2011, workshop and determined that the 2005 goals and objectives were applicable but too vague. The Advisory Committee chose to modify the 2005 goals as presented below:

1. Protect public health and safety and prevent and reduce loss of life and injury.
2. Improve and support public and private organizational response capabilities.
3. Increase awareness and preparedness of public, business, non-profit, government, etc. about hazards.
4. Prevent and reduce damage to public and private property and infrastructure.
5. Protect critical assets - hospitals, nursing homes and schools.
6. Encourage personal responsibility.

These goals, objectives and means for achieving them are discussed further in Section 6, Hazard Mitigation.

2.2. Planning Process

The Plan was prepared to provide a basis for identifying and managing natural, technological and human hazards and to meet federal, state and local requirements for hazard mitigation and FEMA grant funding. Plan preparation involved completion of the following tasks:

- Identify hazards and risks.
- Update the hazard history.
- Update the community profiles.
- Assess vulnerabilities.
- Identify repetitive loss properties.
- Define community and school district goals and objectives.
- Evaluate the status and relevance of previous goals and strategies.
- Identify and prioritize hazard mitigation strategies.
- Develop and update Action Plans for a select list of mitigation strategies.
- Prepare a draft report for Oakland County, municipal and public review.
- Solicit Oakland County, municipal and public feedback.
- Prepare a final report.
- Provide community outreach and communication.
- Document the planning process.
- Adopt the final plan.

With approved FEMA grant funding, Oakland County contracted ASTI Environmental, Inc. (ASTI) of Brighton, Michigan, to facilitate the hazard mitigation planning process and prepare the final 2012 Oakland County HMP Update. The ASTI project team included Thomas Wackerman, Paul Rentschler (Project Manager), Lisa Sullivan, Sandon Lettieri, Kyle Hosler, Sarah Pavelko, Cathy Peltier, Karen Van Tiem, Mike Soyka and Andrea Lane. As described below, updating this Plan involved assistance in identifying and evaluating hazards and mitigation options from 4 key groups: an Advisory Committee, community representatives from the 62 municipalities and 28 school districts in the County, public input and other stakeholders. Each of these is described further in Section 2.3, Plan Participation.

2.2.1 Planning Approach

Plan preparation was based on the *Proposal to Update the Hazard Mitigation Plan for Oakland County* submitted by ASTI and dated July 12, 2011. Updating the Plan began with an initial meeting between project staff and staff of the Oakland County Homeland Security Division which was held on September 9, 2012. Following this meeting, the planning process involved review of the existing Plan; updating Oakland County's hazard history; gathering information on local hazards from individual communities; gathering input on hazard priorities; identifying specific vulnerabilities and desired mitigation strategies; evaluating the previous Plan goals, objectives, and mitigation strategies; determining the status of previous mitigation strategies and Action Plans; identifying repetitive loss properties; facilitating the activities of the Advisory Committee and conducting 2 public meetings.

Information regarding hazards in the County and applicable mitigation strategies was also obtained from 3 workshops and 2 surveys. In the first survey, Advisory Committee members and community representatives were asked to rate each of the 31 hazards. Information from this survey was used in the first workshop. In the second survey, the Advisory Committee ranked over 310 mitigation alternatives. Information from this survey was used in the second and third workshops. Additional information on the surveys is included in Sections 2.4.1, 5.1 and 6.2.

The workshops included individual and small group assignments, group discussion and evaluation. Through a combination of ranking exercises, worksheets and discussion, workshop participants evaluated survey results; created evaluation criteria; evaluated the 2005 Plan goals, objectives, mitigation strategies, Action Plans and rankings; identified goals and objectives for the 2012 Oakland County HMP Update and selected options for mitigating specific hazards to be included in this Plan.

2.2.2 Existing Plans and Programs

Since a Hazard Mitigation Plan is only a part of the emergency planning, mitigation, preparedness, response and recovery process, a second objective of the planning process was to coordinate Plan preparation with existing Oakland County emergency plans, programs, procedures and organizations. For purposes of this Plan, existing hazard mitigation goals and objectives within Oakland County were reviewed. It should be noted that this Plan does not replace any existing plans or programs, but is intended to provide a reference on hazard mitigation to be used in planning and program development.

2.2.3 County Goals and Objectives

Successful implementation of this Plan requires that it fit within, and be consistent with, other goals, objectives and programs of Oakland County government. As such, identified goals and objectives, mission statements and other guiding principles of relevant Oakland County agencies were reviewed as part of the planning process. Oakland County's Hazard Mitigation Planning Process is not intended to replace any other County planning effort, but should be considered in future County-wide planning. Specific goals and objectives developed as part of this 2012 Oakland County HMP Update fit within the context of the existing role of the Oakland County Homeland Security Division and the strategic initiatives of Oakland County.

Coordinating Oakland County's hazard mitigation planning and implementation is, largely, a function of including this Plan's information and a general focus on hazard mitigation within the overall planning and goal setting activities of the County. Future coordination of this Plan with other activities in Oakland County will be conducted by the Oakland County LEPC as described in Section 2.5.

Homeland Security Division

In 2005, Oakland County Emergency Response and Preparedness (ERP) served as the lead agency for development of the Oakland County Hazard Mitigation Plan. ERP has since been renamed the Oakland County Homeland Security Division (HSD). The HSD handles all matters of emergency management within Oakland County and is the lead agency for both development and implementation of this HMP Update. Roles and responsibilities of the Homeland Security Division include the following.²

Mitigation: Eliminate, reduce or prevent long-term risk to human life and property from natural and man-made hazards.

Emergency Preparedness: Advance emergency planning that develops operational capabilities and facilitates an effective response in the event an emergency occurs.

Emergency Response: Action taken immediately before, during or directly after an emergency to save lives, minimize damage to property and enhance the effectiveness of recovery.

Recovery: Short-term activity to return vital life support systems to minimum operating standards and long term activity designed to return life to normal or improved levels.

Oakland County

Oakland County's key initiatives changed from the 2005 Plan. The key initiatives in 2005 included the following:³

- Making Oakland County the economic engine of Michigan.
- Conservative and prudent fiscal management of Oakland County government.
- Create and promote innovative programs and service.
- Technological superiority.

The following are current key initiatives of Oakland County:⁴

- Increase jobs and diversify the job market while increasing the presence in international markets.
- Conservative and prudent fiscal management of Oakland County government.
- Increase educational opportunities available to children to prepare them for success.
- Create and promote innovative programs and services that increase the quality of life of the residents including the Rail-to-Trails system and Oak Street program.

² Source: Oakland County Homeland Security Division website, <http://www.oakgov.com/homelandsecurity/about/>, January 5, 2012.

³ Source: Oakland County Executive website, <http://www.co.oakland.mi.us/exec/initiatives/>, September 7, 2004.

⁴ Source: Oakland County Executive website, <http://www.co.oakland.mi.us/exec/initiatives/>, January 5, 2012.

- Reduce infant mortality rates for residents and encourage maternal health.
- Provide free wireless internet to all residents of Oakland County.

2.3. Plan Participation

The focus of the 2012 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. Social media and email communications, as well as an interactive project website, enabled project staff 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 website including copies of all presentations, surveys, announcements and background materials.
- Facebook and LinkedIn social media groups provided updates and announcements.
- Flyers describing the planning process made available to the Advisory Committee, municipal officials and the general public.
- Monthly newsletters providing updates on Plan progress posted on the project website and social media.
- Internet-based surveys provided to the Advisory Committee and community committee members.
- Workshops for the identification and prioritization of hazards, hazard mitigation strategies and Action Plans.
- Email communication with leaders and representatives from each of the communities, school districts and Advisory Committee.
- Telephone and face-to-face interviews with leaders and representatives from each of the County's 62 municipalities and 28 public schools districts.
- Public meetings.
- Copies of the draft plan available on the project web site.

2.3.1 County Participation

The Oakland County Homeland Security Division provided contract administration, participation on the Advisory 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 preparing county maps and data, providing a meeting location for the Advisory Committee, 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.

2.3.2 Advisory Committee

A project Advisory Committee was formed to provide input on the hazards and mitigation options applicable to Oakland County and to oversee the 2012 Oakland County HMP Update. The Advisory Committee was made up of people who assisted in the previous plan, as well as new members. The existing Oakland County Local Emergency Planning Committee (LEPC) made up the core of the Advisory Committee. Additional stakeholders within Oakland County, and from neighboring counties, were also invited to participate. Sixty-two (62) individuals were invited to participate in the Advisory Committee. The final committee consisted of the thirty-nine (39) individuals listed in Section 1.1.

The Advisory Committee participated in the hazard identification and risk assessment, determined Plan goals and objectives, evaluated mitigation alternatives and prepared the final Action Plans through a series of workshops and surveys.

2.3.3 Community Representatives

Representatives for each of the 62 municipalities coordinated community input and met with project staff to discuss hazard identification, mitigation options and community-specific vulnerabilities. The communities also evaluated the status of the 2005 Plan goals, hazards and mitigation strategies. Based on availability, individual community representatives were composed of the municipality's Emergency Management Coordinator (EMC), fire and police personnel, and/or community leaders (mayor, township supervisor, etc.) for each of the 62 municipalities.

Community representatives were kept informed on the planning progress through the project web site and email correspondence and were invited to comment on the Draft Plan posted on the web site. Community representatives received an initial announcement concerning the project, emails and flyers outlining various methods of participating in the project, and access to the draft Plan. A list of community representatives is included in Section 1.1.

2.3.4 School District Representatives

Emergency planning and response personnel and/or safe school representatives for each of Oakland County's 28 public school districts and 2 public universities were contacted and interviewed by project staff. Each school representative was asked to identify hazards associated with the school district and ways in which those hazards could be mitigated. The schools were not included in the 2005 Plan since public school districts were not considered separate government agencies when the 2005 Plan was written; therefore, no evaluation of past goals, hazards or mitigation strategies was conducted. A list of the school district representatives is included in Section 1.1.

2.3.5 Public Outreach

Two public meetings were held at the Oakland County Executive Office Building Conference Center in the Oakland County government complex located at 2100 Pontiac Lake Road, Waterford, Michigan. The first public meeting was held at 7 p.m., October 10, 2011. The purpose of the meeting was to introduce project team members, provide an overview of the project, discuss the processes and purposes of the planning process and resulting HMP and to provide the project contacts and web links individuals could use to receive further information, or to provide input, regarding the Plan and planning process. The second public meeting was held at 7 p.m. on March 22, 2012, and was conducted to solicit input on the draft Plan.

The 2 meetings were publicized with advertisements in the Oakland Press and the Spinal Column newspapers, by email flyers sent to members of the Advisory Committee, posted on the project web site and social media sites and by flyers made available for the public at Oakland County and municipal offices. Copies of public meeting materials, and a summary of all public comments received, are provided in Appendices A and B, respectively.

2.3.6 Other Stakeholders

In addition to involving representatives of regional agencies and neighboring communities as part of the project Advisory Committee, the following stakeholders were invited to provide input on the draft Plan:

- American Red Cross – Southeastern Michigan Chapter
- Michigan State University Cooperative Extension Service
- Oakland County Water Resources Commissioner’s Office
- Road Commission for Oakland County
- Oakland County Sheriff’s Office
- Friends of the Rouge
- Clinton River Watershed Council
- Huron River Watershed Council
- Genesee County LEPC
- Lapeer County LEPC
- Livingston County LEPC
- Macomb County LEPC
- St. Clair County LEPC
- Washtenaw County LEPC
- Wayne County LEPC
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- National Weather Service
- Southeast Michigan Council of Governments (SEMCOG)

2.4. Plan Activities

2.4.1 Surveys

Two surveys were provided to the planning participants. Each survey was designed to provide data for discussion in a subsequent workshop and to provide a basis for discussing hazard evaluation or mitigation options. In the first survey, participants were asked to rate the importance of hazards affecting Oakland County. The collective rating of hazards was used to rank hazards in order of importance. The second survey assisted in narrowing and prioritizing mitigation options.

First Survey

This first survey, conducted online through the project website, consisted of 11 questions to prioritize 13 natural, 10 technological and 8 human-related hazards. Forty-eight (48) individuals were invited to serve on the Advisory Committee and 225 community representatives were asked to rate the relative importance of each hazard for Oakland County. Importance was defined as an evaluation of the negative consequences of the hazard on the population, economy and environment of the County. Five rankings (“Not Important,” “Somewhat Important,” “Important,” “Very Important” and “Extremely Important”) were provided for each hazard. Twenty-three (23) members of the Advisory Committee (48%) and 45 community representatives (20%) responded to the survey.

Second Survey

Advisory Committee members were asked to evaluate possible hazard mitigation strategies for 19 hazards in an on-line survey prior to the second workshop. Mitigation strategies presented in this survey were developed from a list of mitigation strategies identified in the interviews with individual municipalities, strategies included in the 2005 Oakland County HMP and from lists of potential mitigation strategies developed by other communities undertaking hazard mitigation planning in Michigan and elsewhere.

To reduce the time required to complete the survey, it was divided into 2 parts. Part 1 of the survey contained the hazards that had been identified in the first workshop as the top 10 priority hazards (Winter Hazards - Ice & Sleet and Snowstorms were combined in the survey). Part 2 contained hazards identified as lower priority 9 hazards) but that had been part of discussions during either the 2005 or 2011 planning processes. Advisory Committee members were asked to complete Part 1 of the survey at a minimum, but were encouraged to complete both parts if time allowed.

A minimum of 17 and a maximum of 32 specific mitigation strategies were evaluated for each hazard in Part 1 of the survey. An additional 9 general mitigation strategies were also included in Part 1. The number of mitigation strategies evaluated for each hazard in Part 2 of the survey ranged from 1 to 60. The survey also included a "No Action" option for each hazard and space for respondents to add other mitigation strategies. In total, 179 mitigation strategies were evaluated in Part 1 of the survey and another 131 mitigation strategies were evaluated in the second part of the survey (310 total). Fifteen (15) Advisory Committee members (39%) participated in Part 1 of the survey and 7 (18%) of those same respondents completed Part 2 of the survey prior to the second workshop.

The following scoring system was used for ranking mitigation alternatives in the pre-workshop survey:

- 0: Cannot Assess
- 1: Not Important
- 3: Neutral
- 4: Important
- 5: Very Important

2.4.2 Workshops

The Advisory Committee met 3 times between September and December 2011, in a series of workshops. The workshops were conducted in a similar way to the 2005 Plan workshops with the addition of evaluating the 2005 Plan goals, objectives, hazards and mitigation strategies. The following describes each workshop and the procedures used to focus this Plan on the hazards and mitigation strategies specific to Oakland County.

First Workshop – Risk Analysis Workshop

The first workshop was conducted on September 20, 2011, and attended by 27 Advisory Committee members. This meeting began with an orientation to familiarize committee members to the hazard mitigation planning process. A risk and vulnerability assessment was also conducted to identify and rank priority hazards in Oakland County, to assess the risk from the top ranked hazards and to determine Oakland County's unique critical assets and specific vulnerabilities. The objective of the workshop was to use a rational approach to focus the Plan on the most critical hazards and vulnerable assets in the County.

The first step in the hazard assessment portion of the meeting was to review the hazard history of Oakland County and the results of the first survey. The hazard history was summarized by ranking historical hazards based on frequency and impacts in 3 categories: health and safety, area affected and economic effects. The survey results were presented by ranking responses from Advisory Committee members and community representatives separately in order to evaluate differences between County-wide and local perspectives.

Based on the historical information and the results of the survey, the top 10 hazards of significance for Oakland County were identified. This short list of hazards was then discussed

to determine if it reflected the hazards upon which the County should focus future mitigation efforts. During the discussion, some hazards were expanded or combined and some hazards were eliminated in order to develop the final list of top hazards.

The Advisory Committee was then asked to select and weigh criteria for individually evaluating the top hazards. Participants were asked to brainstorm (individually and then in small groups) to create a list of evaluation criteria specifically applicable to Oakland County. These criteria were used to evaluate the top 10 hazards regarding consequence and frequency.

During the same workshop, the Advisory Committee also evaluated 11 general asset categories that exist in Oakland County (e.g., residential areas, industrial sites, etc.). These assets were evaluated to determine how critical they may be if impacted by a hazard. They were then evaluated in the context of consequence and frequency of individual hazard impacts.

Second Workshop – Mitigation Strategies Workshop

The second workshop was conducted on November 29, 2011, and attended by 18 members of Advisory Committee. This workshop focused on (1) identifying, evaluating and prioritizing hazard mitigation alternatives for the key hazards; (2) developing a process to select mitigation strategies and (3) identifying strategies for development of final Action Plans.

Advisory Committee members reviewed the goals and objectives described in the 2005 Plan for framing and focusing hazard mitigation in Oakland County and were asked to brainstorm (individually and then in small groups) a list of goals for hazard mitigation in Oakland County. Questions provided to stimulate thought included: “What are the top 5 priorities for the community when considering hazard mitigation?” and “What do community leaders represent as important?”

Workshop participants discussed 29 different goals before selecting the 3 general goals and 6 additional goals to focus mitigation strategy implementation described in Sections 2.1 and 6.1.

The Advisory Committee reviewed the ratings and rankings for the 310 mitigation strategies included in the survey and generated new ideas, ultimately reviewing a list of 349 mitigation strategies.

Evaluation criteria for the review of mitigation alternatives were developed individually, in small groups and then discussed and finalized by the Advisory Committee as a whole. The resulting criteria are presented in Section 6.1.1. These criteria were evaluated relative to one another to develop a weighting system for the evaluation of possible hazard mitigation activities. Because retaining access to FEMA pre and post disaster funding is one of the goals of the 2012 Oakland County HMP Update, the Advisory Committee also reviewed mitigation strategies traditionally funded by FEMA under the Hazard Mitigation Grant Program (HMGP) as they developed and prioritized the final list of mitigation strategies. From the beginning list of 349 strategies, Advisory Committee members combined strategies to avoid duplication, eliminated those that were not applicable at the County level and selected a list of 24 high priority hazard mitigation strategies. Action Plans were subsequently developed for 13 of the mitigation strategies (Section 7.1). Agenda, minutes and materials for the workshops are provided in Appendix D.

Third Workshop – Action Plan Workshop

Prior to the third workshop held on December 20, 2011, Advisory Committee participants from the second workshop were asked to develop 1 or 2 Action Plans for the top priority mitigation strategies. Project staff provided a template and draft Action Plans were submitted to project staff prior to the third workshop. These were compiled and distributed for review at the workshop.

Advisory Committee participants worked in groups to discuss the following questions for each Action Plan:

- Are all key hazards addressed?
- Does each strategy support an overall mitigation goal?
- Will the strategy mitigate hazards?
- Is it achievable?

Participants reviewed each Action Plan and provided edits and as much additional information as possible. The agenda and minutes of this third workshop are presented in Appendix D.

2.4.3 Community Meetings

Representatives from each community in Oakland County were interviewed to identify hazards of particular concern to that community and to evaluate the status of the 2005 mitigation strategies and goals. Local community concerns regarding individual hazards may be based on the history of hazard occurrence, potential for future hazard occurrence, consequence(s) of the hazard or hazards that are highlighted in community mitigation goals and objectives. The interview process was completed in 3 segments:

1. Initial phone contact and interview: A representative for each community, typically the emergency management coordinator, was identified as the initial contact. The individual was contacted to confirm their community's participation and was asked to identify other individuals within the community that should also participate in discussion involving hazard mitigation.
2. Survey: Community representatives were asked to participate in the first survey described in Section 2.4.1 above.
3. Face-to-face interviews and meetings with the community representatives: Project staff contacted representatives from each community to schedule face-to-face interviews. In some cases, community representatives requested that the interviews take place by phone or written survey. The objective of these meetings was to identify and discuss locally significant hazards and preferred mitigation strategies. Meeting participation varied, but typically included the police and/or fire chief or local emergency management coordinator; the mayor, township supervisor, or village president and/or the leaders of one or more other municipal department. A list of meeting participants for each community is included in Section 1.1.

2.5. 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 Advisory Committee, including the project representative from the Michigan State Police, for review and comment. Copies of the Draft Plan were also provided to each municipality in Oakland County, to other stakeholders and the

public via the project website. Comments received on the Draft Plan are included in Appendix C.

Upon final review by Oakland County officials involved in the planning process, the Plan was presented to the Oakland County Board of Commissioners for approval and adoption. The Oakland County Hazard Mitigation Plan was formally adopted by the Oakland County Board of Commissioners on [Insert Date of Adoption]. A copy of the County's resolution is included in Appendix E.

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 by letter and during the face-to-face interviews. A sample resolution of adoption was provided to each community by mail with a letter announcing the availability of the Draft Plan for review. 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. The communities listed in Table 1 have adopted this Plan, either in whole or in part, as indicated.

2.6. Plan Maintenance

Oakland County Homeland Security Division staff and the Oakland County Local Emergency Planning Committee (LEPC) will periodically review the Plan for required changes. Plan evaluation and maintenance is the responsibility of the Oakland County Homeland Security Division. Reviews of the hazard priorities, mitigation strategies and Action Plans will be conducted as necessary to maintain consistency with changes in the community, hazard history, and goals and objectives of Oakland County.

Changes constituting a substantive revision to the Plan will require that the new Plan be provided to the Oakland County Board of Commissioners, and the individual communities participating in the Plan, for approval and re-adoption.

The Plan must be updated and approved by FEMA within 5 years of the previous Plan's approval for Oakland County and Oakland County communities and school districts to remain eligible for pre-disaster and post-disaster funding.

Table 1.
Community Adoption
Oakland County Hazard Mitigation Plan

<u>Community</u>	<u>Items Adopted</u>	<u>Dated Adopted</u>
Addison, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Auburn Hills, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Berkley, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Beverly Hills, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Bingham Farms, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Birmingham, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Bloomfield Hills, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Bloomfield, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Brandon, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Bloomfield, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Clarkston, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Clawson, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Commerce, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Farmington, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Farmington Hills, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Ferndale, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Franklin, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Groveland, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Hazel Park, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Highland, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Holly, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Holly, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Huntington Woods, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Independence, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Keego Harbor, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Lake Angelus, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Lake Orion, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Lathrup Village, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Leonard, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Lyon Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Madison Heights, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Milford Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Milford, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Northville, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Novi, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Novi, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Oakland Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Oak Park, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Orchard Lake, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Orion, Township of	[Insert Full or Section #]	[Insert Date of Adoption]

Table 1. (continued)
Community Adoption
Oakland County Hazard Mitigation Plan

<u>Community</u>	<u>Items Adopted</u>	<u>Dated Adopted</u>
Ortonville, Village of	[Insert Full or Section #]	[Insert Date of Adoption]
Oxford, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Oxford, Village	[Insert Full or Section #]	[Insert Date of Adoption]
Pleasant Ridge, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Pontiac, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Rochester, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Rochester Hills, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Royal Oak, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Royal Oak, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Rose, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Southfield, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Southfield, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
South Lyon, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Springfield, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Sylvan Lake, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Troy, City	[Insert Full or Section #]	[Insert Date of Adoption]
Walled Lake, City	[Insert Full or Section #]	[Insert Date of Adoption]
Waterford, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
West Bloomfield, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
White Lake, Township of	[Insert Full or Section #]	[Insert Date of Adoption]
Wixom, City of	[Insert Full or Section #]	[Insert Date of Adoption]
Wolverine, Village of	[Insert Full or Section #]	[Insert Date of Adoption]

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).

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. Oakland County is the thirty-second (32nd) most populous County in the United States.⁵

3.2. Geography and Climate

Oakland County is located in southeast Michigan, north of Wayne County and west of Macomb County (Figure 1). The topography of Oakland County ranges from flat to gently rolling. Oakland County contains the headwaters for 5 major river systems or watersheds.

Table 2. Oakland County Temperature and Precipitation Averages

Month	Average Daily Temperature (F°)	Average Precipitation (inches)	Average Snowfall (inches)
January	22.9	1.77	7.9
February	25.8	2.02	7.3
March	35.3	2.18	5.8
April	47.0	2.75	1.6
May	58.7	3.16	0.0
June	67.7	3.25	0.0
July	71.9	2.86	0.0
August	70.1	2.88	0.0
September	62.7	3.10	0.0
October	50.9	2.97	0.1
November	39.2	2.75	2.5
December	27.8	2.20	8.1
Annual Ave/Total	48.3	31.89	33.3

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center, www.ncdc.noaa.gov, Pontiac Michigan, January 2012.

⁵ Oakland County, Michigan website, http://www.oakgov.com/services_index/government/history.html, About Oakland County, History & Heritage, website visited January 5, 2012.

Weather in Oakland County is consistent with non-coastal areas of southeastern Michigan. Table 2 provides average monthly weather conditions as published by the National Climatic Data Center.

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 current major land use in Oakland County is single-family residential followed by parks and recreational lands and open space. Since 1990, the land use category that has exhibited the greatest acreage increase has been single-family residential. The greatest decline exhibited has been in agricultural acreage. The Land Use Patterns and Trends table below details land use/land cover in Oakland County.

The increase in single-family residential land use is mirrored by Oakland County's housing characteristics. According to the 2010 U.S. Census,⁶ 75.5% of Oakland County's housing units consist of single-family detached homes and 22.0% consist of multiple family housing units. The median home value in Oakland County is \$214,600 and the median gross rent is \$859 per rental unit per month. Approximately 8% of all housing units in Oakland County are vacant.

Table 3. 2000 to 2008 Land Use Patterns & Trends

Land Use Type	2000 Acres	2008 Acres	Change
Single-Family	218,285	313,547	95,262
Multiple-Family	12,608	7,369	-5,239
Commercial	19,655	26,589	6,934
Governmental/Institutional	13,711	26,014	12,303
Industrial	18,961	29,442	10,481
Transportation, Communication, and Utility	9,917	60,623	50,706
Park, Recreation, and Open Space	22,789	66,314	43,525
Agriculture	42,920	21,005	-21,915
Other	193,302	832	NA
Water	28,310	28,895	585
Total Acres	580,458	580,628	170

Source: Southeast Michigan Council of Governments, www.semco.org, Community Profile for Oakland County, viewed January 5, 2012

⁶ United States Census Bureau, quickfacts.census.gov/qfd/states/26/26125.html and 2010.census.gov/2010census/data/, viewed January 5, 2012

3.4. Transportation Network

There are approximately 7,343 miles of public roads within Oakland County.⁷ Oakland County roads are maintained by the Road Commission for Oakland County. The Road Commission for Oakland County is charged with maintaining over 2,700 miles of county roads, 230 miles of state highway and 90 bridges.⁸ 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 7 days per week, 22 hours per day and provide 12 million rides per day. SMART also provides specialized services to the elderly and handicapped.⁹

Oakland County has 3 first-class airports: Oakland County International Airport, Oakland Southwest Airport and Oakland Troy Airport.¹⁰ The Oakland County International Airport is designated a general aviation reliever airport that serves individuals, business and industry. It is the world's 12th busiest general aviation airport with an average of 120,000 takeoffs/landings per year. Over 800 aircraft are based at the airport.¹¹

The Oakland Southwest Airport is a public airport located in Hudson, Michigan, and services southwest Oakland County. Approximately 61 aircraft are based at the airport, 57 of which are single engine planes.¹² Oakland Troy Airport is used by private, corporate and charter aircraft. Approximately 103 aircraft are based at the airport, of which 91 are single engine planes and 4 are helicopters. Charter passenger, air freight, aircraft maintenance and fueling are available on the field.¹³

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 CN North America and CSX Transportation.¹⁴

3.5. Population Characteristics

Oakland County is the second most populous county in Michigan.¹⁵ Population projections estimate that in 2035 the population will increase approximately 10% above 2010 U.S. Census values. The following tables contain demographic information for Oakland County, as provided by the Southeast Michigan Council of Governments (SEMCOG) and the 2010 U.S. Census Bureau.¹⁶

⁷ SEMCOG, <http://www.semco.org/Data/Apps/comprof/transportation.cfm?cpid=2999>, viewed January 5, 2012.

⁸ Oakland County Road Commission, <http://www.rcocweb.org/Commuters/Commuters.aspx>, viewed January 11, 2012.

⁹ SMART, <http://www.smartbus.org/aboutus/overview/Pages/default.aspx>, viewed January 23, 2012.

¹⁰ Oakland County, <http://www.oakgov.com/aviation/>, viewed January 23, 2012.

¹¹ Ibid.

¹² Air Nav, www.airnav.com/airport/Y47, viewed January 23, 2012.

¹³ Air Nav, www.airnav.com/airport/KVLL, viewed January 23, 2012.

¹⁴ Oakland County, http://www.oakgov.com/globaloakland/oakland_county/profile/transportation.html, viewed January 5, 2012.

¹⁵ U.S. Census Bureau, <http://2010.census.gov/news/releases/operations/cb11-cn106.html>, viewed January 5, 2012.

¹⁶ SEMCOG, <http://www.semco.org/Data/apps/comprof/people.cfm?cpid=2999>, viewed January 5, 2012

Table 4. 1990 through 2035 Oakland County Population Projection

Year	Population Count/Projection
1990	1,083,592
2000	1,194,156
2010	1,202,362
2035	1,336,761

Source: SEMCOG, viewed January 5, 2012

Table 5. 2010 Household Characteristics

Subject	Number	Percent
Total Households	527,255	100.0
Family Households	483,698	91.7
Family Households with Own Children	153,639	29.1
Average Household Size	2.46	-

Source: 2010 U.S. Census Bureau, viewed January 5, 2012

Table 6. 2010 Oakland County Age, Gender, and Race Statistics

Subject	Number	Percent
Total Population	1,202,362	100.0
Age		
Under 5 years	68,506	5.7
5 to 17 years	213,599	17.7
18 to 34 years	234,771	19.5
35 to 64 years	526,362	43.8
65+ years	159,124	13.2
Race		
Non-Hispanic	1,160,442	96.5
White	903,398	75.1
Black or African American	162,303	13.5
Asian	67,577	5.6
Multi-racial	22,641	1.9
Other	4,523	0.4
Hispanic	41,920	3.5

Source: 2010 U.S. Census Bureau, viewed January 5, 2012

3.6. Economic Characteristics

In 2005, there were 867,687 jobs within Oakland County. Approximately 82% of the Oakland County population is over 16 years of age with 61% of that population in the workforce. Approximately 12.6% of the labor force is employed in the health care industry, 12.5% is in the professional, scientific and technical services and 11.7% in retail trade. Manufacturing employs

10.9% of the labor force. The following tables provide detailed employment information for Oakland County.¹⁷

Table 7. 2005 Occupation & Industry Characteristics

Subject	Number	Percent
Natural Resources & Mining	607	0.09
Manufacturing	74,344	10.9
Wholesale Trade	39,097	5.7
Retail Trade	79,894	11.7
Transportation & Warehousing	12,139	1.8
Utilities	1,070	0.16
Information	15,955	2.3
Financial Activities	60,345	8.8
Professional, Scientific, & Technical Services	85,162	12.5
Management of Companies & Enterprises	19,351	2.8
Administrative, Support, & Waste Services	65,634	9.6
Education Services	44,651	6.5
Health Care & Social Assistance	86,342	12.6
Leisure & Hospitality	62,032	9.1
Other Services	21,074	3.1
Public Administration	15,355	2.2

Source: SEMCOG, viewed January 5, 2012

Table 8. 2010 Income & Poverty Status Characteristics

Subject	Number	Percent
Median Family Income (2010 dollars)	66,390	-
Household Income \$200,00 +	34,429	7.2
Household Income \$100,000-199,999	113,940	23.7
Household Income \$50,000-99,999	151,359	31.5
Household Income \$30,000-49,999	78,821	16.4
Household Income \$10,000-29,999	77,963	16.2
Household Income less than \$10,000	24,528	5.1
Number of Households below Poverty Level	40,761	8.5
Number of Individuals below Poverty Level	103,874	8.7

Source: SEMCOG 5-Year ACS, viewed January 23, 2012

3.7. Community Services/Organizations

Natural gas service is provided to Oakland County customers by Consumers Energy, MichCon 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 Energy. The primary telephone service providers are AT&T, CenturyTel Midwest, Frontier and Verizon North. Sewer

¹⁷ SEMCOG, <http://www.semCog.org/Data/apps/comprof/economy.cfm?cpid=2999>, viewed January 5, 2012.

service for a large portion of Oakland County is provided by the City of Detroit. The City of Detroit also provides water service to most of the County.

Oakland County provides a number of services to residents through various agencies and departments, including the Office of the Water Resources Commissioner, Homeland Security Division, 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 also served by 35 public school districts, of which 28 are entirely within Oakland County and 7 are partially within the County. Also within Oakland County are 17 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 13 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, the Palace of Auburn Hills and the DTE Energy Music Theatre.

3.8. 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 2005 Plan included adding "other response facilities" to hospitals and removing natural areas from the list. Natural areas are included under open spaces. The advisory committee voted on the following critical assets list during the first workshop:

- Central business districts
- Commercial sites
- Hospitals/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.

4. Hazard History

4.1. Civil Disturbances

Definition

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.

Historical Events

In Michigan, large civil disturbances are not common and typically are a result of the following causes:

- Labor disputes
- Controversial court judgment or government actions
- Resource shortages
- Demonstrations by special interest groups
- Unfair death or injury
- Celebrating a victory by a sports team.

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.¹⁸ Neighboring areas, such as the City of Detroit, have a history of major civil disturbances, primarily as a result of civil rights demonstrations and labor disputes.

Frequency & Probability

A civil disturbance occurs in Michigan approximately once every 10 years.¹⁹ Civil disturbances are most common in areas of economic or social inequality, sporting events, universities and colleges and prisons. The most likely causes for a civil disturbance in the County would be a result of a labor dispute, a sporting event or a demonstration at a college, government or military facility within the County. Oakland County houses the Palace of Auburn Hills, 17 universities and colleges, 10 detention facilities/correctional camps and numerous cities.

Although there is limited history of civil disturbances within Oakland County, the potential for this hazard to occur is somewhat elevated due to the number of sport/entertainment venues, educational facilities, detention facilities and government facilities within the County.

Health & Safety

The 2008 Pontiac riot was small and localized. There were no reports of death or serious injuries resulting from the riot. state-wide, there have been over 75 deaths and over 1,700 injuries from major civil disturbances since 1943.²⁰

¹⁸ Oakland County Sheriff Report, July 2, 2008.

¹⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 7 and 16-22.

²⁰ Oakland County Sheriff Report, July 2, 2008.

Area Impacted

Civil disturbance events often involve acts of arson, looting and vandalism which can result in devastating levels of property damage. There were no reports found listing the amount of property damage resulting from the Pontiac riot. From 1967 to 2001, civil disturbances in Michigan have totaled over \$50 million in property damage.²¹

Places of public gathering such as festivals, sporting and entertainment venues, colleges and universities, detention facilities and government facilities are the most likely places for a civil disturbance to occur.

Economic Impact

The economic impact of a civil disturbance reaches far beyond emergency response costs and property damage. Economic recovery from civil disturbances is very slow and often requires government assistance to revive the local economy. This hazard can tarnish an area's image and deter potential investors and residents. The Pontiac riot was small and localized. The economic impact of the riot was localized and short term because of limited publicity and short duration without any reported deaths or serious injuries.

Critical Facilities/Services

The nature of civil disturbances is such that local emergency response services are often overwhelmed. As a result, aid is often required from other local or state units.

The high degree of property damage that may occur from this hazard can greatly impact the ability to operate or provide services at the hazard location (particularly sporting and entertainment venues, colleges and universities, detention facilities and government facilities). The Pontiac riot required Michigan State Police and the Oakland County Sheriff's Office to assist the Pontiac Police Department. The riot occurred at a hospital after the police arrived to inspect the body of a rapper who had been shot and killed. Fortunately, the police were able to keep the riot localized and were able to diffuse the situation before any serious impacts.

4.2. Criminal Acts

4.2.1 Vandalism

Definition

Vandalism is the willful or malicious destruction, injury, disfigurement or defacement of any public or private property, real or personal, without consent of the owner or person having control. A vandalism offense is an act of vandalism which is reported to a law enforcement agency.

Historical Events

Examples of acts of vandalism can include graffiti, tampering with traffic signs and damage to vacant buildings. In more extreme cases, vandalism can occur to public facilities or infrastructure and has the potential to result in significant impact to the community.

Oakland County certainly is not immune from acts of vandalism. In February 1984, vandals entered a parking lot for public school buses in Lake Orion. The vandals discharged fire

²¹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 7 and 16-22.

extinguishers in nearly the entire fleet of 52 buses. This act of vandalism cancelled school for 5,000 Lake Orion students.²²

Frequency & Probability

From 1997 through 2006, there were a total of 94,207 vandalism offenses reported in Oakland County, an average of 9,421 vandalism offenses each year.²³ Given the well-established frequency of this hazard in recent years, it is anticipated that this hazard will continue to occur in the future.

Health & Safety

There is no data available for death or injury rates due to acts of vandalism. It is anticipated that the majority of these acts do not pose a threat to human health or safety. However, this may not be the case in instances of vandalism involving public infrastructure.

Area Impacted

Due to the nature of vandalism, property damage can be expected with each occurrence. Data regarding property damage due to vandalism is not available for Oakland County; however, the amount of property damage is directly related to the severity of the event. All areas of Oakland County are potential targets for vandalism. Higher rates of occurrence can be anticipated in areas of urban blight or vacant buildings.

Economic Impact

No information is available regarding the economic impact of vandalism in Oakland County. However, considering the effects of this crime, high rates of vandalism can decrease the attractiveness of neighborhoods or business districts. This can result in economic loss due to loss of residents or businesses.

Critical Facilities/Services

Although not common, critical facilities and services can be directly impacted by vandalism. The 1984 vandalism of the Lake Orion school bus fleet is an example of the potentially far-reaching effects of vandalism.

4.2.2 Arson

Definition

Arson is the willful or malicious burning or attempt to burn, with or without intent to defraud, a dwelling, public building, motor vehicle or personal property of another. An arson offense is an act of arson which is reported to a law enforcement agency.

Table 9. Total Vandalism Offenses Oakland County

Year	Total
1997	10,753
1998	11,444
1999	8,206
2000	10,110
2001	10,117
2002	9,471
2003	9,610
2004	8,207
2005	8,002
2006	8,287

Source: Michigan State Police, Uniform Crime Reports, Requested November 4, 2011

²² Detroit Free Press, State Edition, February 17, 1984, Page 3A.

²³ Michigan State Police, Uniform Crime Reports, Crime Statistics, Oakland County, 1997-2006 Requested on November 4, 2011.

Historical Events

According to the U.S. Fire Administration, arson is the second leading cause of residential fires and residential fire deaths in the United States. At commercial sites, arson is the major cause of deaths, injuries, and dollar loss.

There were 3,200 reported arson fires in Oakland County from 1997 through 2010. Oakland County has experienced numerous arson fires at both private and public properties. A residential arson fire on April 7, 2000, in Royal Oak Township killed 5 children, seriously injured 2 children and destroyed a home.²⁴

On March 27, 2003, arson fires in a South Lyon school resulted in smoke and water damage and closed the school of 1,800 students for a day.²⁵

Frequency & Probability

For the period of 1997 through 2010, Oakland County averaged 229 arson fires per year.²⁶

Health & Safety

According to the Oakland County Sheriff's Office, there were 6 arson related deaths investigated in 2007 and 2008.

Area Impacted

In the United States, arson is the leading cause of dollar loss from fires and one-fifth of all property loss is due to arson.²⁷ According to the Michigan Chapter of the International Association of Arson Investigators, Oakland County had \$19.2 million worth of arson and suspicious fire damage in 2010, ranking fourth amongst Michigan counties.

Any property is a potential target for arson. Given that arson is a property crime, it is anticipated that arson will occur in areas with high property crime rates.

Economic Impact

Information regarding the economic impact of arson in Oakland County is not available. However, considering the effects of this crime, high rates of arson can decrease the attractiveness of neighborhoods or business districts. This can result in economic loss due to loss of residents or businesses.

Table 10. Total Arson Offenses Oakland County

Year	Total
1997	212
1998	300
1999	246
2000	236
2001	265
2002	257
2003	206
2004	166
2005	213
2006	226
2007	230
2008	239
2009	199
2010	205

Source: Michigan State Police, Uniform Crime Reports, Requested November 4, 2011

²⁴ Detroit Free Press, April 8, 2000, "Investigators search for clues in arson that killed 5 children".

²⁵ Detroit Free Press, March 28, 2003, "School closed by arson to reopen".

²⁶ Michigan State Police, Uniform Crime Reports, Crime Statistics, Oakland County, 1997 through 2010, requested in November 2011.

²⁷ U.S. Fire Administration, www.usfa.fema.gov.

Critical Facilities/Services

Although not common, critical facilities and services can be directly impacted by arson. The March 2003 arson at South Lyon High School is an example of the potentially far-reaching effects of this crime. Although arson can occur anywhere within Oakland County, an arson fire involving any of the County's assets could temporarily impede the County's ability to provide that service.

4.2.3 Criminal Acts - Mass Shootings

Definition

A mass shooting is the discharge of firearm(s) multiple times by 1 or more parties resulting in the death of at least 4 persons.

Historical Events

There have been at least 2 mass shootings in Michigan since 1991, with 1 in Oakland County. On November 14, 1991, Thomas McIlvane killed 4 supervisors and wounded 5 other employees before killing himself at the Royal Oak Post Office after being fired for insubordination.²⁸ Another incident at the Ford Motor Company factory in Wixom occurred November 14, 1996. It did not result in 4 or more deaths and, therefore, did not meet the technical definition of a mass shooting. However, 1 person was killed and several Ford employees and 2 Oakland County Sheriff's deputies were shot and wounded. This incident and September 11, 2001, have been credited with the push to implement the Oakland County Wireless Integrated (OakWin) System in Oakland County communities.²⁹

The most recent mass shooting event that occurred in Michigan was on July 7, 2011. Rodrick Dantzler killed 8 people, including himself, and wounded 2 others after opening fire in a residential area. The fatally wounded included his estranged wife, girlfriend and daughter.³⁰

Frequency & Probability

The majority of mass shootings occur at the place of employment or schools and are conducted by someone that the victims know. Since 1991, there has been 1 occurrence of mass shooting in Oakland County and at least 2 in the state. The probability of this act occurring in the County is relatively low.

Health & Safety

The mass shooting incidents that have occurred in the state have been conducted by a single gunman. The single gunman limits the amount of guns, bullets and casualties. The number of deaths and injuries is dependent on the type of guns and bullets used, the location, number of people present, cover and escape routes and the intent of the gunman. The impact to health and safety has the potential to be high.

²⁸Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 202-205.

²⁹Oakland Press. July 27, 2010, New radio system to be fully implemented by year's end.
http://www.theoaklandpress.com/articles/2010/06/27/news/local_news/doc4c28009cacd9e959991745.txt

³⁰MSNBC Police: Killer of 7 was 'hunting' ex-girlfriends, relatives, July 8, 2011.

Area Impacted

The area impacted by mass shootings tends to be relatively localized to a single building or block. However, nearby schools, nursing homes and shopping districts may be temporarily locked down or closed to ensure the safety of individuals.

Economic Impact

The economic impact is dependent on the incident location, target and severity. A single gunman in a residential neighborhood who targets and kills known persons may affect housing values in the area in the short term. While multiple gunmen in a crowded business district with no discernible target may affect housing values, commercial values, retail sales, etc. for longer period of time. Mass shooting incidents disrupt the feeling of security and can have long term psychological effects on the community.

Critical Facilities/Services

Critical facilities and services have been historically targeted by gunmen. Critical facilities in the United States that have been targeted by mass shooting gunmen include open space, military bases, civic centers, nursing homes, schools, central business districts, and churches.

One of the most famous incidents is the 1999 Columbine shootings in which 2 teenage boys shot and killed 12 classmates and a teacher before killing themselves. In 2007, a student shot and killed 32 people and wounded 15 others at Virginia Tech before taking his own life. In that same year, a gunman killed 9 people and injured 5 others in a shopping center in Nebraska. In 2009, a man killed 13 people at a civic center in New York. In that same year, a US Army psychologist opened fire at a military base in Texas, killing 13 and injuring 42.³¹

4.3. Drought

Definition

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

Historical 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 1976.³²

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 put into place 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 an U.S. Department of Agriculture Disaster Declaration for 82 of the state's counties, including Oakland County. The drought led to water shortages in southeast Michigan forcing local officials to issue water usage restrictions.³³

³¹ New York Crime Commission, <http://www.nycrimecommission.org/initiative1-shootings.php>, viewed January 5, 2012.

³² Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 23.

³³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 23.

Frequency & Probability

On average, there is 1 significant damaging drought every 10-15 years in the State of Michigan.³⁴ Between January 1, 1950 and 2010, 4 moderate to severe drought events have been recorded for Oakland County.³⁵ The State of Michigan had a Palmer Drought Severity Index (PDSI) reading below zero for 3 or more consecutive months during the growing season in 27 out of the last 60 years.³⁶ The probability of a drought event occurring in Oakland County is likely because droughts affect the entire state and occur on average once every 10-15 years.

Health & Safety

The risk to human life from a drought event is low.³⁷ Possible loss of human life from a drought event is due to secondary effects such as extreme heat (refer to Section 4.5.1), fire (refer to Section 4.6) and other health-related problems such as increased pollutant concentrations in surface water.

Area Impacted

Impacts primarily affect those employed in agriculture. Drought affects large widespread areas; however, the greatest impact is generally to agricultural lands. As of 2008, Oakland County contained approximately 21,005 acres of active agricultural land³⁸ (Figure 2).

Natural resources such as lakes, streams and other bodies of water could be affected by decreases in water levels. Also, fires resulting from drought can result in the destruction of trees and other natural habitats, as well as homes and businesses. The July 2001 drought affected 12 southeast Michigan counties, including Oakland County. The drought in September 2002 affected 12 counties, including Oakland County.³⁹

Economic Impact

The impacts of drought on a community include water shortages; a decrease in the quantity and quality of agricultural crops; a decline of water levels in lakes, streams and other bodies of water; poor nourishment for wildlife and livestock; an increase in wildfires and increases in insect infestations, plant disease and wind erosion.

The 1988 drought/heat wave in the central and eastern U.S. (an event that greatly impacted Michigan) caused an estimated \$40 billion in damages from agricultural losses, disruption of river transportation, water supply shortages, wildfires and related economic impacts.⁴⁰

The July 2001 drought resulted in \$150 million in crop damage over a 12 county area of southeast Michigan reducing yields of corn, dry beans and soybeans to one-third of normal.⁴¹

³⁴ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 23-28.

³⁵ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, November 2011.

³⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/, November 2011.

³⁷ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 23-28.

³⁸ SEMCOG, *Land Use in Southeast Michigan 2000-2010*, Specific to Oakland County, November 2011.

³⁹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, November 2011.

⁴⁰ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 24.

The drought that occurred in September 2002 resulted in agriculture yields less than 50% of normal and many counties across eastern Michigan were declared agricultural disaster areas.⁴²

Critical Facilities/Services

Most facilities impacted from drought would be related to agriculture. Farms, large grain facilities and fruit and vegetable vendors/markets could potentially see a significant decrease in production and sales.

Local and regional governmental services may be required to respond to drought. However, if the severity of the drought is significant, state and federal assistance could be required. Agricultural services and departments such as the Farm Bureau Agency and the U.S. Department of Agriculture may also be required to provide assistance.

4.4. Earthquake

Definition

An earthquake is a sudden movement or motion in the earth caused by an abrupt release of slowly accumulating strain which results in ground shaking, surface faulting or ground failures.

Historical Events

Most earthquakes that occur in Michigan are minor tremors resulting in little damage. Several mildly damaging earthquakes have been documented in Michigan since the 1800s. Michigan has fault lines in the bedrock geology that are considered stable; however, data is poorly documented. Michigan is most likely to be affected by earthquakes which occur in the New Madrid Seismic Zone (centered near the Arkansas/Tennessee state line) and upstate New York.

No severely destructive earthquakes have been documented in Michigan. However, several mildly damaging earthquakes have occurred since the early 1800s.⁴³ There are no records of earthquakes originating within Oakland County. However, there have been several low-magnitude earthquakes centered outside of the County which have been felt in the County.⁴⁴

Frequency & Probability

Since 1938, there have been earthquakes that have been reported as centered in Michigan. The largest recorded earthquake originating in Michigan was centered in Coldwater and registered a 4.7 on the Richter scale. Since 1938, there have been approximately 26 earthquake related disturbances in Michigan.⁴⁵ 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 small disturbance from an earthquake is possible, the probability for a significant earthquake to occur in Oakland County is very low.

⁴¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, November 2011.

⁴² Ibid.

⁴³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 29-31.

⁴⁴ United States Geological Survey, *Earthquake History of Michigan*, <http://earthquake.usgs.gov/earthquakes/states/michigan/history.php>, viewed January 11, 2012.

⁴⁵ Michigan State University, <https://www.msu.edu/~fujita/earthquake/mieqlist.pdf>, viewed January 23, 2012.

Some earthquakes have been attributed to hydraulic fracturing, or fracking.⁴⁶ Environmental experts from the USGS have determined that recent earthquakes in Ohio and Oklahoma may be the direct result of fracking. Fracking involves the use of a mixture of chemicals in a high pressure water stream that is pushed into layers of bedrock. This causes the natural gas located in the area to be freed. Scientists state that fracking increases damage to existing fault lines causing them to shift or become unsteady.

Health & Safety

There have not been any recorded deaths or injuries related to earthquakes in Michigan. The risk rating for human life related to earthquake events is low.⁴⁷

Area Impacted

The number of people affected is dependent upon the earthquake magnitude and distance from the epicenter. Typically, an earthquake affects a large region, not a specific location. Because earthquakes typically have regional affects, the entire Oakland County population could be affected. However, given the historic severity, only a fraction of the population would be affected by a typical event. The impact of an earthquake would be primarily on water, sewer and gas pipelines which are located throughout Oakland County (Figure 3).

Oakland County includes an area of low seismic activity referred to as the Grenville Front.⁴⁸ This front is a line marking relatively old changes in geological changes making it less of a hazard than a true fault line (Figure 3).

Economic Impact

Damage occurs primarily to any type of structure or improvement. The amount of damage is directly proportional to the earthquake magnitude and a large amount of property damage could be anticipated due to the high development density in southern Oakland County. Given the historical severity, economic impacts are expected to be minimal. Since 1884, only a few earthquakes (most of which were minor tremors) resulted in minimal structural damage such as cracked plaster and damaged chimneys.

In Oakland County, the impact of an earthquake would be primarily on water, sewer and gas pipelines. The United States averages approximately \$550,000 per accident to natural gas and liquid pipelines due to earth movements.

Critical Facilities/Services

Due to the low probability of a severely destructive earthquake, response would most likely be limited to primary utility services and pipeline owners. Due to the lack of earthquake events in Michigan, additional investigation of the impact to critical facilities/services is not recommended at this time.

⁴⁶ Reuters, Fracking Official Cause of Ohio Earthquakes, January 4, 2011.

⁴⁷ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 29-31.

⁴⁸ Oakland County Michigan Emergency Management, *Hazard Study*, August 1998, page 13.

4.5. Extreme Temperatures

4.5.1 Extreme Heat

Definition

A prolonged period of extreme heat often accompanied by conditions such as high humidity, high winds and lack of rain. Although no standardized temperature is used to define extreme heat, prolonged periods of temperatures greater than 90° F are certainly of concern. The minimum mortality temperature threshold is lower in northern latitudes (from 65° to 70° F) than in the southern United States (from 76° to 90° F). Human health effects of heat are also dependent upon the age, health and physical activity of an individual, as well as humidity and access to air conditioning.

Historical Events

The highest temperature recorded in Michigan was 112° F 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.⁴⁹

During a heat wave in the summer of 1988, 39 days had temperatures of 90° F or greater. Temperatures in southeast Michigan topped the 100° F mark on 5 occasions.⁵⁰

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 1 in Michigan.⁵¹ Between December 12, 1995 and September 30, 2011, 14 extreme temperature events were reported in Oakland County. Of the 20 events, 12 were heat related (record warmth or excessive heat). These events resulted in a total of 4 deaths and 594 injuries.⁵²

Frequency & Probability

Between 1995 and 2011, there were 12 extreme heat days in Oakland County, although high temperatures that can lead to heat stress occur annually in the state. Extreme heat events are likely in Oakland County, but are based on seasonal weather patterns.

Health & Safety

The major threats associated with extreme heat are heatstroke and heat exhaustion. Nationally, extreme heat is responsible for 200 deaths a year.⁵³ Extreme heat primarily affects the most vulnerable segments of society such as the elderly, children, impoverished individuals and people in poor health.

⁴⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 45-49.

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² National Climatic Data Sponsored Website, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>, viewed December 20, 2011.

⁵³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 45-49.

Area Impacted

Extreme heat typically affects entire counties or regions of Michigan. Although the entire County would be affected, open spaces (at-risk for wildfires) and elderly housing areas (there are 39 nursing homes in Oakland County.⁵⁴) would be most impacted.

Economic Impact

Extreme heat is usually accompanied by drought and can have hazardous effects on livestock, agricultural crops and energy demands and is associated with wildfires. Drought is discussed in Section 4.3. Medical costs and increased emergency response costs would be anticipated.

Critical Facilities/Services

Primarily local and regional governmental services would be requested to assist in the event of extremely high temperatures. Hospitals and clinics would expect an increase in heat exhaustion and other heat-related illness cases.

Local utility companies would be essential for providing enough resources to supply an increased demand for power (increased demand for air conditioning).

If the severity of the extreme heat is significant enough to cause a drought, state and federal assistance could be available. Agricultural services and departments such as the Farm Bureau Agency and the U.S. Department of Agriculture will be the most likely type of agencies to provide assistance and aid.

4.5.2 Extreme Cold

Definition

A prolonged period of extreme cold is usually accompanied by snowstorms, sleet and ice storms or hail. As with extreme heat, no standardized temperature is used to define extreme cold, although prolonged periods of temperatures below freezing, and especially below 20° F are of concern. Also, similarly to extreme heat, human mortality temperature thresholds vary with latitude. Areas of the southern United States are more susceptible to human health impacts from cold than areas in the north. Human health effects vary with an individual's age, physical condition, physical activity, wind chill and access to heated buildings.

Historical Events

The lowest temperature ever recorded in Michigan was -51° F on February 9, 1934, in Vanderbilt.⁵⁵

Between 1995 and 2011, 8 extreme cold events were reported in Oakland County. The events resulted in a total of 10 deaths and 39 injuries. An extreme cold event in Oakland County on December 21, 2000, caused an estimated \$475,000 in property damage.⁵⁶

⁵⁴ Michigan Department of Community Health Website, www.cis.state.mi.us/bhs_car/rs_car.asp, Statewide Search for Nursing Homes-Oakland County search, December 20, 2011.

⁵⁵ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 49.

⁵⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed January 5, 2012.

During an extreme cold event on January 4, 1999, 3 cold related deaths were reported: a Pontiac man died of exposure while walking home, an elderly woman died of exposure in the driveway at her nursing home and in West Bloomfield, a young adult male was found dead outside, though the exact cause of death was unknown.⁵⁷

On March 2, 2002, it was reported that an 84 year old woman in Troy was found dead on her retirement home patio. Hypothermia was the suspected cause of death.⁵⁸

Frequency & Probability

Michigan has 3t to 50+ days per year below 0° F and 90-180+ days per year below freezing.⁵⁹ The occurrence of an extreme cold event in Oakland County is likely, but is based on seasonal weather patterns.

Health & Safety

Extreme cold poses a significant health risk to the same segments of the population as extreme heat. Although extreme cold would affect the entire population, the populations most at-risk for health hazards from extreme cold include children, the elderly, disabled and impoverished persons. Nationally, extreme cold is responsible for approximately 700 deaths per year.⁶⁰ Ten (10) deaths and 39 injuries have been reported in Oakland County since 1999.⁶¹ Hypothermia and frostbite are the most common conditions associated with extreme cold. It should be noted that a significant number of cold-related deaths are due to illnesses and diseases that are exacerbated by severely cold weather.

Over half of the approximately 700 annual deaths nationally are persons 60 years of age or older (there are 39 nursing homes in Oakland County⁶²). According to the 2010 census for Oakland County, nearly 6% of the population is under the age of 5 and over 13% is aged 65 years or more.⁶³ Approximately 19% of the Oakland County population is at risk in an extreme cold emergency based solely on age.

Area Impacted

Extreme cold events are caused by arctic air and polar winds causing wide areas to become bitterly cold. The elderly, young and those with pre-existing medical conditions are most at risk for injury or death. Water mains are at risk of freezing and rupture, which can cause flooding and leave citizens without water. Rapid freezing of lakes can damage structures stored in the water and can damage aquatic life populations short term.

⁵⁷ Ibid.

⁵⁸ Ibid.

⁵⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 49.

⁶⁰ Ibid.

⁶¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed December 20, 2011.

⁶² Michigan Department of Community Health Website. www.cis.state.mi.us/bhs_car/rs_car.asp. Statewide Search for Nursing Homes-Oakland County search, viewed December 20, 2011.

⁶³ U.S. Census Bureau, *Profile of General Demographic Characteristics: 2010*, Oakland County, Michigan.

Economic Impact

Water mains and household pipes are at risk of freezing and rupture. Bus systems may be forced to close down because it is too cold for people to be outdoors. Medical costs and increased emergency response costs would be anticipated.

During February 3-6, 2007, wind chills were between -15° and -25° F. Schools were forced to close because it was too cold for students to walk or wait for a bus. Hospitals reported numerous cold related injuries including frostbite. Frozen pipes and water mains ruptured throughout southeast Michigan, flooding some areas and leaving many without water. Fire sprinkler lines froze and ruptured flooding large areas. Area homeless shelters were filled to capacity. In all, damages to southeast Michigan were estimated at \$475,000.⁶⁴

Critical Facilities/Services

Primarily local and regional governmental services would be needed to assist those in need. Hospitals and clinics would see an increase in hypothermia, frostbite and other cold-related illnesses. Schools and transportation services may be closed due to safety concerns. Nursing homes, homeless shelters and other vulnerable populations would need to have the resources available to ensure the safety of the residents.

Local distribution companies would be essential in repairing lines and providing enough resources to supply an increased demand for heat.

4.6. Fire Hazards

4.6.1 Wildfire

Definition

An uncontrolled fire within an open space, forested area, brush or grassed area or wild land.

Historical Events

Limited data is available regarding wildfires. The NFIRS system referenced during the writing of the 2005 HMP is no longer available for public use; therefore, information specifically pertaining to Oakland County could not be updated. The National Climatic Data Center does not list any wildfires or forest fires for Oakland County between 1950 and 2011. Michigan had 23 significant fires between 1995 and 2011, resulting in over \$12 million in property damage.⁶⁵

In October 1871, Michigan's first recorded catastrophic fire occurred after a prolonged drought over much of the Great Lakes region. The wildfire killed 200 people and burned 1.2 million acres in Michigan's Lower Peninsula.⁶⁶

In August 1976, a fire near Seney burned approximately 74,000 acres. Fire suppression and damage costs exceeded \$8 million.

⁶⁴ National Climatic Data Sponsored Website, <http://www4.ncdc.noaa.gov/cgiwin/wwcgi.dll?wwevent~ShowEvent~662910>, viewed January 23, 2012.

⁶⁵ National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>, viewed December 20, 2011.

⁶⁶ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 66.

In August 2007, a lightning strike caused a wildfire in Luce County. The fire burned 18,500 acres of forest land and cost over \$7 million in equipment and personnel to extinguish.⁶⁷

Frequency & Probability

Michigan has between 8,000 and 10,000 wildfires per year, most of which are small in size burning between 5 and 50 acres. Most wildfires occur between March and May.⁶⁸ The National Climatic Data Center lists 23 significant fires for the State of Michigan between 1995 and 2011, none of which were located in Oakland County. Between 1981 and 2005, Oakland County had 55 (DNR jurisdiction only) wildfires.⁶⁹ Oakland County has approximately 66,314 acres of parks, recreation lands and open space.

Health & Safety

Between 1995 and 2011, no deaths were reported from wildfires in Michigan.⁷⁰

Between 1998 and 2003 a total of 14 injuries (civilian and firefighter) were reported in Oakland County as a result of wildfires.⁷¹ Generally, heat exhaustion and smoke inhalation pose the greatest risk of injury. The risk to human life is low to moderate for wildfires.⁷²

Area Impacted

In Michigan, 2% of all wildfires are caused by lightning strikes and the rest are caused by human activity. Forests cover approximately 49% (18.2 million acres) of Michigan's total land base.⁷³ Approximately 11% of Oakland County is forest or other open space⁷⁴ (Figure 4).

Populations adjacent to open space or undeveloped land may be affected by wildfire. The extent of the affected area depends greatly on response time, weather conditions, wind direction and fire control. Open spaces and undeveloped land are most at-risk for wildfires.

Economic Impacts

The risk rate for property damage resulting from a wildfire is moderate to high (very high for timber loss).⁷⁵

Total property loss for wildfires in Oakland County between January 1, 1998 and December 31, 2003, was \$34,480. Total property loss for related special outside fires or cultivated fires was \$44,456.⁷⁶

⁶⁷ National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>, viewed January 23, 2012

⁶⁸ Michigan State University, firewise.msu.edu, viewed January 25, 2012.

⁶⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 72.

⁷⁰ National Climatic Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>, viewed December 20, 2011.

⁷¹ Federal Emergency Management Association Website, www.nfirs.fema.gov, *NFIRS 5.0 National Reporting*, June 24, 2004.

⁷² Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 66-71.

⁷³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 66-71.

⁷⁴ SEMCOG, *Land Use in Southeast Michigan 2000-2008*, Specific to Oakland County, December 20, 2011.

⁷⁵ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 66-71.

⁷⁶ Michigan Department of Environmental Quality, http://www.michigan.gov/deq/0,4561,7-135-3312_4122-9262--,00.html, January 10, 2012.

Secondary effects of wildfires include infrastructure damage, timber loss, property loss, wildlife loss and loss of life or injury to persons.

Critical Facilities/Services

There are 40 fire departments which respond to fires within Oakland County. Emergency response assistance is provided to fire departments through mutual aid agreements. For all types of fire department responses, mutual aid is provided amongst the 40 fire departments in Oakland County an average of 108 times each year.

4.6.2 Scrap Tire Fire

Definition

Scrap tire fires are large fires which occur at a location where scrap tires are being stored for processing, recycling or re-use.

Historical Events

Oakland County does not have an extensive history of scrap tire fires. Although no records of scrap tire fires were found, there was a tire fire at a retail tire store in Farmington in 1994.

The Michigan Department of Environmental Quality (MDEQ) requires a scrap tire collection site to be registered if it exceeds established tire storage thresholds. Scrap tire collection sites can include businesses such as scrap tire processors, new tire retailers, junkyards, farms and go-kart tracks. In 2004, the U.S. EPA, Region 5, developed a program to reduce the number of scrap tire collection sites. The MDEQ has developed additional programs and grant funding to encourage the reduction of scrap tires. Oakland County has 2 regulated commercial scrap tire sites: 1 in Pontiac/Waterford and 1 in Lake Orion.⁷⁷

Frequency & Probability

In the past 15 years, there has been 1 tire fire at a retail tire store in Farmington. This fire occurred in 1994 at Farmington Auto Parts and was controlled by the local fire department.⁷⁸ In Michigan there have been 8 major scrap tire fires since 1987.⁷⁹

Health & Safety

Scrap tire facilities present significant environmental and fire hazards. In addition, scrap tires are known for providing breeding grounds for mosquitoes, thus contributing hazards to public health. Scrap tire fires are also capable of producing acrid smoke and an oily residue which can leach into the soil.

Area Impacted

Scrap tire fires can be difficult to contain and, aside from the fire hazard presented, inhaling the smoke produced from the fire can be hazardous to human health. As a result, scrap tire fires often require people in surrounding areas to evacuate or shelter-in-place.

⁷⁷ Michigan Department of Environmental Quality, http://www.michigan.gov/deq/0,4561,7-135-3312_4122-9262--,00.html, January 10, 2012.

⁷⁸ Michigan Department of Environmental Quality, Scrap Tire Program, Staff Telephone Interview, August 30, 2004.

⁷⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 53-54.

The oily material produced by scrap tire fires can also negatively impact the soil, and possibly groundwater and surface water, in the area of the fire. If groundwater or surface water is impacted, the affects can potentially extend significantly beyond the boundaries of the fire.

Within Oakland County, there are 2 registered scrap tire facilities: Warehouse Tire in Pontiac/Waterford and Environmental Wood Solution Inc. in Lake Orion. No unregistered scrap tire facilities were found. The EPA and MDEQ have made a significant effort to reduce the number of scrap tire facilities in the region.⁸⁰

Economic Impact

A scrap tire fire will inevitably result in property damage and inventory loss to the collection site. In addition, environmental clean-up costs after the fire is extinguished can be significant.

Due to the amount of response required, extinguishing a scrap tire fire can be financially draining for local emergency response departments. For example, the largest scrap tire fire in recent Michigan history occurred in Osceola County in 1997. That fire burned over 1.5 million tires and cost approximately \$300,000 to extinguish. The State of Michigan paid \$100,000 to Osceola County as reimbursement for fighting that fire.

Critical Facilities/Services

Scrap tire fires can be very difficult to extinguish, often lasting for extended periods, and can require a substantial amount of resources from local emergency response departments. The response effort typically requires assistance from neighboring fire departments.

4.6.3 Structural Fire

Definition

A structural fire is a fire of any origin which ignites 1 or more structures and causes loss of life and/or property.

Historical Events

Limited data is available regarding structural fires. The NFIRS system that was used during development of the previous plan is no longer available for public use. ASTI used the most recently published *Michigan Hazard Analysis* by the Michigan State Police. The data available is from 2003 and earlier. Structural fires are commonly known as the “universal hazard” because they can occur anywhere.

According to the Michigan State Police Fire Marshal Division, there were 19,000 structural fires in Michigan in 2003, resulting in 161 deaths and 624 injuries, an average of 1 structural fire every 28 minutes 6 seconds. The U.S. Fire Administration estimates that in 2008, there were 14.8 deaths per million residents due to structural fires. Oakland County has experienced

Table 11. Major Causes of Structural Fires in Oakland County

Fire Cause	% of Structural Fires Due to Cause
Unknown	27.89
Cooking	24.45
Heating Equipment	8.38
Incendiary or Suspicious	6.06
Other Equipment	5.14
Appliances or Air Conditioning	4.33
Other Heat, Flame or Spark	3.45
Open Flame, Ember or Torch	3.24
Electrical	3.04
Smoking	2.34
Natural	1.22
Children Playing	0.28
Exposure	0.09

Source: NFIRS 5.0 National Reporting, Tally by Incident Type, January 1, 1998 through December 31, 2003, report generated on June 24, 2004, filtered for Oakland County reporting only.

⁸⁰ Michigan Department of Environmental Quality, <http://www.michigan.gov/deq>, viewed January 11, 2012.

numerous structural fires throughout its history. One (1) of the most tragic structural fires in recent history occurred at a residence in Royal Oak Township during the early hours of April 7, 2000. The fire claimed the lives of 5 children and injured 4 others.

Frequency & Probability

From 1998 through 2003, 3,265 structural fires in Oakland County were reported to the FEMA National Fire Incident Reporting System.⁸¹ This equals an average of 544 structural fires per year in Oakland County. From 1998 through 2003, structural fires accounted for nearly 29% of all fires in Oakland County.⁸²

The occurrence of structural fires within Oakland County has a well-established history. This hazard will continue to occur in the future.

Health & Safety

Structural fires in Oakland County account for 80% of deaths and nearly 85% of injuries from all fire types. From 1998 through 2003, there were a total of 48 deaths and 219 injuries due to structural fires in Oakland County. This equates to an average of 8 deaths and nearly 37 injuries per year.⁸³

Area Impacted

Structural fires can occur on any parcel in which a structure is present. Structural development in Oakland County is more concentrated in the southern portion of the County (Figure 5). Therefore, a higher frequency of structural fires can be expected in southern Oakland County.

Economic Impact

Property loss from structural fires can be very high. From 1998 through 2003, Oakland County experienced a total of \$132,576,049 in property and content loss from structural fires, an average of \$22,096,008 per year, or \$40,605 per structural fire.

Critical Facilities/Services

There are 40 fire departments which respond to structural fires within Oakland County.⁸⁴ During 1998 through 2003, there were no firefighter deaths from structural fires; however, an average of nearly 23 firefighters are injured each year from responding to structural fires. Almost 57% of all firefighter injuries in Oakland County result from responding to structural fires. Emergency response assistance is provided to fire departments through mutual aid agreements. For all types of fire department responses, mutual aid is given amongst the 40 fire departments in Oakland County an average of 108 times each year.⁸⁵

⁸¹ NFIRS 5.0 National Reporting, Tally by Incident Type, January 1, 1998 through December 31, 2003, report generated on June 24, 2004, filtered for Oakland County reporting only.

⁸² Ibid.

⁸³ NFIRS 5.0 National Reporting, Tally by Incident Type, January 1, 1998 through December 31, 2003, report generated on June 24, 2004, filtered for Oakland County reporting only.

⁸⁴ Ibid.

⁸⁵ Ibid.

4.7.

4.8. Flooding

4.8.1 Dam Failure

Definition

The failure of an impoundment located in a river, stream, lake or other waterway resulting in downstream flooding.

Historical Events

Dam failure can result in loss of property, life and natural resources for miles downstream of a dam. Dam failures not only occur during flood events, but also can be caused by poor operation, lack of maintenance and vandalism.

Examples of significant dam failures in 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. Currently, there are 2,400 dams identified state-wide.

Since the passage of the Dam Safety Statute in 1990, Michigan has had 28 documented dam failures (none catastrophic).⁸⁶

Frequency & Probability

Oakland County has 8 high and 15 significant dam hazards and has had 18 reported dam failures.⁸⁷ Based on the number of high and significant dam hazards, it is very probable that a dam failure will occur in the future within the County.

Health & Safety

No deaths or major injuries have been reported as a result of dam failure in the state.⁸⁸ The risk to human life as a result of dam hazards is moderate to high.⁸⁹

Table 12. High and Significant Hazard Dams in Oakland County

Name	Hazard	H8	Head
Clarkston	High	34	30
Clintonville	Significant	14	30
Loon Lake	Significant	8	6
Ford Dam #3 (Hubbell Pond)	Significant	25	15
Gehrke	Significant	18	10
Holly	Significant	12	9
Lake Louise	Significant	12	11
Lake Orion	Significant	18	13
Oxbow	High	15	8
Pontiac Lake	High	21	15
Quarton	Significant	19	15
Waterford Multi-Lakes Level	Significant	12	11
Wildwood Lake	High	22	6
Winkler Pond	Significant	13	9
Lake Neva	High	17	13
Lake Sherwood	Significant	22	15
Endicott	Significant	14	11
Heron	High	26	20
Davisburg Trout Farm	Significant	12	7
Dawson Millpond	High	9	8
Wolverine Lake	Significant	14	11
Pontiac Motor Division Detention Area	Significant	12	12
Wau-Me-Gah Lake	Significant	8	3

Source: State of Michigan Department of Environmental Quality Geological and Land Management Division.

⁸⁶ The State of Michigan, www.michigan.gov, viewed January 25, 2012

⁸⁷ Michigan Department of State Police, Emergency Management Division, *Michigan Hazard Analysis*, March 2006, page 80.

⁸⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 79.

⁸⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 77-81.

Area Impacted

Areas located downstream from a dam, within a floodplain, are at greatest risk for impact from a dam failure. Approximately 5,784 structures are located within FEMA-mapped 100-year floodplains in Oakland County.

Economic Impact

The risk for property damage as a result of dam hazards is moderate to high.⁹⁰ Property loss and content loss can be very high as a result of a dam failure. Variable costs to repair a damaged dam are anticipated.

Critical Facilities/Services

Flooding events can require a substantial amount of resources and assistance from multiple agencies and departments including local emergency response departments and state and federal departments such as the MDEQ Water Resources Division, Dam Safety Unit and FEMA. If flooding from a dam resulted in significant damage to homes, the American Red Cross may also provide assistance.

4.8.2 Riverine Flooding

Definition

The periodic occurrence of overbank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain.

Historical Events

There were 18 floods from 1995 through 2011, resulting in 1 death and approximately \$103 million worth of damage (not all damage was exclusively in Oakland County). Some historical floods are listed below.

In September 2008, heavy rainfall led to flooding of roads and basements. Roads were closed, people were evacuated from their homes and a woman had to be rescued when her car became submerged on a flooded road.⁹¹

On June 30, 2004, a Presidential Disaster Declaration was issued for Oakland County and 22 other counties in Michigan to provide individual assistance to households and individuals affected by flooding.⁹² On February 9, 2001, flood waters from the Rouge River surrounded 5 homes. In Wixom, an apartment complex parking lot and basements were flooded by Norton Creek.⁹³

⁹⁰ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 79.

⁹¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, December 20, 2011.

⁹² *Ibid.*

⁹³ *Ibid.*

Frequency & Probability

From 1975 through 2011, 11 major riverine floods in Michigan resulted in Presidential Major Disaster Declarations.⁹⁴ Two (2) of Oakland County's major rivers, the Clinton and Rouge Rivers, are likely to 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. It is highly probable that riverine flooding will continue to be a hazard in Oakland County.

Health & Safety

In Oakland County, there has been 1 death from riverine flooding since 1995.⁹⁵ The risk to human life is low.⁹⁶

Area Impacted

Riverine floods in Oakland County primarily affect streets and infrastructure located in or near floodplains and in areas with inadequate drainage. Approximately 5,784 structures are located within the FEMA 100-year floodplain within Oakland County. Figure 6 shows the location of all dams, floodplains and flood-prone areas within the County.

Economic Impact

Property loss from flood events can be very high. Property damage from flooding in Michigan is estimated at \$60 million to \$100 million annually.⁹⁷ Flood insurance coverage for Oakland County was estimated at \$330 million in 2005. Farmington Hills had the second highest flood insurance claims in Michigan at \$1.6 million (May 31, 2005, data). The risk of property damage resulting from riverine flooding hazards is high.⁹⁸

Critical Facilities/Services

Flooding events can require a substantial amount of resources and assistance from multiple agencies and departments including local emergency response departments, as well as state, federal and nongovernmental agencies such as the American Red Cross. Significant crop yield losses may result from flood events. Agricultural services such as the U.S. Department of Agriculture may provide assistance. The National Weather Service issues flood watch and warnings to give advanced warning of potential flooding to areas.

National Flood Insurance Program (NFIP) Participation

All but 6 of the 62 Oakland County communities are listed in FEMA's Community Status Book Report of Michigan communities participating in the National Flood Program. Those communities not listed include Addison Township, Village of Leonard, Novi Township, Village of Oxford, Oxford Township and Royal Oak Township.

It should be noted that Bloomfield Village is also not listed in FEMA's Community Status Book Report; however, Bloomfield Village is a subdivision within Bloomfield Township and is not a separate political jurisdiction. Bloomfield Township is a participant in the NFIP.

⁹⁴FEMA, <http://www.fema.gov/femaNews/disasterSearch.do>, January 25, 2012.

⁹⁵ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 82-101.

⁹⁶ National Climatic Data Sponsored Website, , www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, December 20, 2011.

⁹⁷ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 82-101.

⁹⁸ Ibid.

Digital Flood Insurance Rate Maps (DFIRMs) are available from FEMA for, and used by, all but the 2 communities of Rose Township and Southfield Township.

Royal Oak Township, although not listed as participating in the NFIP, does have a DFIRM available for use. There is also a DFIRM available that covers all Oakland County jurisdictions.

All 62 Oakland County communities, with the exceptions of the Cities of Berkley, 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, Part 31, Water Resources Protection, Act 451 of 1994, as amended, regulates activities that result in occupation, fill or grade lands within floodplains along watercourses with a drainage area in excess of 2 square miles. Such activities require an application, review and permit issuance from the MDEQ prior to disturbance.

Repetitive Loss

According to March 31, 2010, repetitive loss report, FEMA has identified 17 repetitive loss properties in Oakland County. Severe repetitive loss properties are defined as residential properties covered under an NFIP flood insurance policy; and

(a) have at least 4 NFIP claim payments (including building and contents) over \$5,000 each, with the cumulative amount of such claims payments exceeding \$20,000; or

(b) at least 2 separate claims payments (building payments only) been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least 2 of the referenced claims must have occurred within any 10 year period and must be greater than 10 days apart.

Repetitive loss properties comprise approximately 1% of currently insured properties but account for 25%-30% of flood claims. They constitute a significant expense of the NFIP. Flood mitigation activities for reducing the potential of further damages to these properties are a priority. By addressing these high-priority, at-risk properties, not only would all of the normal benefits of hazard mitigation be enjoyed, but the reduction in insurance claims would be expected to help keep flood insurance costs lower for everyone else in these NFIP-participating communities.

The identified repetitive-loss properties are located in 4 Oakland County communities. Although generally in the southeast quadrant of the County, these communities are not clustered in one particular geographic area and are located within more than 1 river watershed. The following list summarizes the number and types of repetitive-loss properties, by community, in Oakland County.

City of Birmingham: Two (2) properties, both non-residential (Zoning AE and C), totaling more than \$25,000 in damages from 6 claims. The average claim amount for each of these properties was approximately \$4,000. The locations are in or near the downtown area (more detail about these properties is not allowed to be published in this plan due to NFIP data use regulations).

City of Farmington Hills: Eleven (11) properties, 8 of which are zoned as single-family residential (Zoning A, C, and X) and 3 that are zoned “other residential” (Zoning B), totaling approximately \$1.4 million in damages from 29 claims (an average of about \$48,000 for each property’s claim, although the average for each individual property varies from less than \$2,000 to more than \$135,000). Most of these properties are widely separated from each other across the City, with the exception of 2 residential units that are located on the same street and 3 buildings (at a different location) that are part of the same apartment complex.

City of Troy: One (1) property which is zoned single-family residential, totaling more than \$15,000 in flood damages from 3 separate claims.

Waterford Township: Three (3) properties all zoned single-family residential, together totaling more than \$25,000 from 6 flood damage claims. The average claim was approximately \$4,500 (ranging from \$3,333 to \$6,014 between the 3 properties). While not located near each other, these properties are all located adjacent to small lakes in the Township.

4.8.3 Urban Flooding

Definition

Urban flooding involves the overflow of storm sewer systems and is usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

Historical Events

Urban flooding is typically the result of intense rainfall, snowmelt, ice jams, dam failures (considered separately above) or a combination of these factors. Secondary hazards associated with urban flooding include infrastructure damage, dam failure, riverine flooding and shoreline flooding and erosion.

Eighteen (18) flood events were reported in Oakland County between 1995 and 2011. Of these, 6 were flash flood events.⁹⁹

Between April 4 and 11, 1947, flooding resulted in significant damage in Northville, where floodwaters filled basements and inundated the first floors of numerous residences.¹⁰⁰

On August 6 1998, flooded roads impacted the morning commute in Southfield, Troy, Livonia, Novi and other cities. Parts of I-75, I-696 and Woodward Avenue were closed. Basements were flooded in Farmington and Royal Oak and several businesses in Farmington Hills experienced water damage. In Northville, a train derailed when it attempted to cross tracks that were washed out. Nineteen hundred (1,900) gallons of diesel fuel were spilled.¹⁰¹

On June 28, 1999, runoff caused flash flooding in northern Oakland County with several gravel roads washed out in rural areas and some street flooding in the towns of Holly and Ortonville.¹⁰²

⁹⁹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed January 5, 2012.

¹⁰⁰ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 82-101.

¹⁰¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed January 5, 2012.

¹⁰² *Ibid.*

On June 25, 2000, flash flooding in Auburn Hills washed out the entrance ramp from southbound Lapeer Road to Interstate I-75 and a creek in Rochester Hills flooded a parking lot that damaged 5 cars. Some low-lying roads were closed for much of the day, including Walnut Lake Road in West Bloomfield and Halstead Road in Farmington Hills.¹⁰³

In September 2000, a Presidential Major Disaster Declaration was granted to Wayne and Oakland Counties for urban flooding and sewer backups caused by an intense rainfall on September 10 and 11, 2000.¹⁰⁴

In May 2004, portions of Dixie Highway were closed due to flooding from heavy rains that exceeded a foot of standing water.¹⁰⁵

One (1) man drowned in West Bloomfield Township on June 18, 1996, when he drove his car across a flooded parking lot into a pond that was obscured by the flood waters.¹⁰⁶ During July 2000, a stranded family was rescued by a boat in Novi after their car stalled in flood waters.¹⁰⁷

Frequency & Probability

There have been 6 flash flood events in Oakland County since 1995. 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 during the spring when thunderstorms and snow melt are more prominent. Many areas of Oakland County are moderately to heavily populated. Most of these areas are connected to a municipal sewer system (storm water and/or sanitary sewer), therefore, it is highly probable that urban flooding will occur in the future within the County. As development continues within the County, an increase in urban flooding may occur.

Health & Safety

Possible loss of life would be primarily from drowning incidents. Other potential health-related problems could be from sewer back-ups and increased pollutant concentrations.

Area Impacted

An urban flood in Oakland County would primarily affect streets and infrastructure located in and near floodplains and in areas with inadequate drainage. Approximately 5,784 structures are located within the FEMA 100-year floodplain within Oakland County. Figure 6 shows the location of all floodplains and flood-prone areas within the County.

Economic Impact

Current flood damages in Michigan are estimated between \$60 million to \$100 million per year.¹⁰⁸ Eighteen (18) flood events were reported in Oakland County between 1995 and 2011,

¹⁰³ Ibid.

¹⁰⁴ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed January 5, 2012.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid.

¹⁰⁷ Ibid.

¹⁰⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 82-101.

resulting in property damage totaling an estimated \$103 million (not all of the damage was located within Oakland County).¹⁰⁹

From 1975 through 2011, Michigan has experienced 11 flood disasters that resulted in both a Presidential Major Disaster Declaration and a Governor's Disaster Declaration. These flood disasters have damaged homes, businesses, personal property and agriculture resulting in hundreds of millions of dollars' worth of damage.¹¹⁰

In April 1975, widespread flooding over 21 counties in southeast Michigan resulted in public and private damage of nearly \$58 million.¹¹¹ A Presidential Disaster Declaration was granted for the 21 affected counties.

Critical Facilities/Services

Flooding events can require a substantial amount of resources and assistance from multiple agencies and departments including local emergency response departments, as well as state, federal and nongovernmental agencies such as the American Red Cross.

The NFIP was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. Currently there are approximately 25,259 flood insurance policies in force in Michigan, which amounts to approximately \$3 billion worth of coverage.¹¹² Oakland County ranks third in Michigan for counties having the highest amount of flood insurance coverage.

4.8.4 Shoreline Flooding & Erosion

Definition

Shoreline erosion hazards typically involve the loss of property as sand or soil is removed by water action and is carried away over time.

Historical Events

Shoreline flooding and erosion typically occurs along the Great Lakes shoreline and is caused by high water levels. The most recent high water period in Michigan was in 1997 through 1998. During this period, the Great Lakes were at or near record levels set in the mid-1980s. In 1985 through 1986, record high lake levels resulted in a Governor's Disaster Declaration for 17 shoreline counties. During 1972 through 1973, high water levels caused flooding in 30 counties in Michigan.

Oakland County does not have any Great Lakes shoreline; therefore, this hazard is not included further within this Plan.

¹⁰⁹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, viewed January 5, 2012.

¹¹⁰ FEMA, Natural Disaster Reports, viewed January 5, 2012.

¹¹¹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 82-101.

¹¹² *Ibid.*

4.9. Fog

Definition

Fog is condensed water vapor in a cloudlike mass that is located close to the ground and limits visibility.

Historical Events

In 2005, up to 200 cars collided during a heavy fog in Ingham County. Two (2) people were killed, 37 were injured and both lanes of I-96 were closed for hours.¹¹³ In 1995, dense fog lasted for over 24 hours resulting in numerous traffic accidents and 4 fatalities. Schools were delayed and flights were delayed, cancelled or diverted.¹¹⁴

Frequency & Probability

Michigan has approximately 1 major fog event every 2 years. NOAA lists 2 major fog events for Oakland County since 1995.

Health & Safety

Low visibility can cause large multi-car accidents resulting in personal injury and death. No records of death or injury from fog events were found for Oakland County.

Area Impacted

Fog is usually limited to low lying areas and valleys; however, during significant events, large portions of the County may be affected. The areas of most concern would be highways, freeways, areas of high traffic volumes and airports.

Economic Impact

Fog is normally limited to the early morning hours which may delay the morning commute. Low visibility may lead to accidents, property damage and injury. The economic impacts are typically short term and localized.

Critical Facilities/Services

Critical facilities and services that depend on transportation are most affected by fog. School buses and emergency response vehicles may be significantly delayed. The affect should be temporary and limited to the duration of the fog event or shortly thereafter.

4.10. Gas/Oil Shortages or Supply Disruption

Definition

A gas/oil shortage is when demand for gas/oil exceeds the available supply.

Historical Events

In 2005, Hurricane Katrina disrupted oil refinery stations that affected Michigan's supply of fuel. Cold temperatures in 1976, 1977 and 2000 lead to a fall in propane inventories. The propane industry found it difficult to maintain deliveries causing the price of propane to hit record highs.

¹¹³ Michigan Department of State Police Emergency Management and Homeland Security Division. *Michigan Hazard Analysis*, March 2006.

¹¹⁴ Ibid.

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.

Frequency & Probability

Since 1965, there have been 7 major gas/oil shortages that impacted Oakland County. The conflicts in the Middle East as well as increased demand around the globe can be expected to lead to additional shortages in the future.

Health & Safety

Although no information could be found regarding specific injuries or deaths caused by gas/oil shortages, they are possible. Shortages in heating fuels and increased cost may lead some individuals to be unable to heat their homes and result in a number of health issues attributed to cold weather (e.g., hypothermia, chilblains, etc.) collectively referred to as cold stress. Long term shortages in gasoline and fuel may lead to violent outburst. Overall the risk to health and safety is low.

Area Impacted

All of Oakland County would be impacted by a gas/oil shortage. Depending on the type of fuel, certain areas may be more impacted than others. Propane shortages would impact rural areas while gasoline shortages would have a larger impact on commuters and businesses.

Economic Impact

Economic impact includes increased prices of gas/oil, reduction in spending on other items and less driving. Long-term widespread shortages may lead to job loss, high inflation, recession and social unrest. Propane or natural gas shortages may affect the ability of people to heat their homes and may lead to damage to personal property.

Critical Facilities/Services

Critical facilities and services are impacted by gas/oil disruptions and shortages. Critical facilities such as emergency response and schools rely on transportation fleets with relatively poor mileage. Generators run on diesel fuel. Most critical facilities are limited to fixed finances such as schools, emergency response and nursing homes that find it difficult to make up the increased cost of heating and transportation.

Table 13. Fixed Site Hazmat Releases in Oakland County

Community Name	Number of Releases
Pontiac	59
New Hudson	15
Troy	46
Novi	11
Farmington Hills	28
Rochester and Rochester Hills	30
Waterford	21
Royal Oak	19
Southfield	27
Auburn Hills	11
Hazel Park	9
Oxford	13
West Bloomfield	7
Birmingham	5
Bloomfield Hills	3
Clarkston	9
Clawson	6
Ferndale	13
Holly	11
Lake Orion	8
Leonard	3
Oak Park	11
Ortonville	1
South Lyon	7
Springfield	2
Farmington	8
Franklin Village	1
Keego Harbor	2
Madison H8s	18
Milford	23
Northville	1

Source: U.S. Coast Guard, National Response Center website, www.nrc.uscg.mi.foia.html, Standard Query Report for Oakland County, Fixed Incidents, January 1, 1990 through December 21, 2011.

4.11. Hazmat Incidents

4.11.1 Fixed Site

Definition

Hazardous Material (Hazmat) Incident – Fixed Site is defined as an uncontrolled release of a hazardous material originating from a building, structure or fixed equipment which is capable of posing a risk to life, health, safety, property or the environment.

Historical Events

According to Oakland County's 2010 SARA Title III reports, Oakland County had 195 Extremely Hazardous Substance (EHS) facilities and 502 active hazardous substance facilities.¹¹⁵ Oakland County has an average of 25 reported hazmat incidents per year. Although most hazmat incidents occur at industrial facilities, this is not always the case. 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 evacuation of the building and several people were exposed to the spilled material, 6 people required hospitalization.¹¹⁶

Frequency & Probability

From 1990 through December 2011, there were a total of 547 reported fixed site hazmat incidents in Oakland County, an average of 25 incidents per year.¹¹⁷ As the County continues to develop and attract new business and industry, it is anticipated that the probability of occurrence for this hazard will increase.

Health & Safety

Given the frequency of hazmat incidents in Oakland County, the number of deaths and injuries from this event is relatively low. In Michigan, there were 23 deaths and 62 injuries recorded from 1999 through 2006.¹¹⁸

Area Impacted

In Oakland County, fixed site hazmat incidents have rarely required an evacuation. The majority of hazmat material releases in Oakland County are releases to water, followed by land/soil and air.¹¹⁹ Environmental contamination which results from this hazard can extend to off-site locations.

Economic Impact

The economic impact due to this hazard can be highly variable, especially when including the costs of environmental remediation. According to the U.S. EPA Hazmat Response Team, costs for responding to a hazmat incident can range from \$1,000-\$100,000. Some property damage from this type of event can be expected, especially if the release results in a fire or explosion. Additional impact in the form of lost business revenue, can result if the incident causes a business to close.

¹¹⁵ Oakland County LEPC, January 20, 2012.

¹¹⁶ U.S. Coast Guard, National Response Center website, www.nrc.uscg.mi/foia.html, Standard Query Report for Oakland County, Fixed Incidents, January 11, 2012.

¹¹⁷ Ibid.

¹¹⁸ Ibid.

¹¹⁹ Ibid.

Critical Facilities/Services

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. Additional impact could result from environmental remediation and restoring public confidence in the environmental health of the County.

4.11.2 Transportation Incident

Definition

Hazardous Material (Hazmat) Incident – Transportation is defined as an uncontrolled release of a hazardous material during transport which is capable of posing a risk to life, health, safety, property or the environment.

Historical Events

One (1) 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 2 trains near Clarkston. As a result of the collision, 2 of the rail crew members were killed and 2 more were injured.¹²⁰ 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 1 mile radius around the incident site was evacuated, impacting approximately 719 people. Fortunately, after investigation by the hazmat team, it was determined that there was no release from the rail car.¹²¹

Frequency & Probability

Since 1978, there have been 4 significant hazardous material transportation incidents in Oakland County. Three (3) involved train derailments and 1 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.¹²² As the County continues to develop and attract new business and industry, it is anticipated that the probability of occurrence for this hazard will increase.

Table 14. Transportation Related Hazmat Releases in Oakland County January 1, 1990 through 2011

Community Name	Number of Releases
Pontiac	18
Novi	5
Milford	5
Holly	1
Lake Orion	9
Sylvan Lake	2
Auburn Hills	4
Farmington Hills	4
Hazel Park	4
Highland	3
Northville	1
Rochester Hills	3
Sylvan Lake	2
Waterford	3
Wixom	3
Wood Lake	1

Source: U.S. Coast Guard, National Response Center website, www.nrc.uscg.mi/foia.html, Standard Query Report for Oakland County, Mobile and Transportation Incidents, January 1, 1990 through December 31, 2011

¹²⁰ Federal Railroad Administration, Safety Data Reports for 2001, <http://safetydata.fra.gov>, filtered for Oakland County, May 19, 2004.

¹²¹ U.S. Coast Guard, National Response Center website, www.nrc.uscg.mi/foia.html, Standard Query Report for Oakland County, Rail Incidents, January 11, 2012.

¹²² Ibid.

Health & Safety

Compared to fixed site hazmat incidents in Oakland County, transportation related incidents are more likely to result in death or injury. Oakland County experiences 1 death every 3 years and 1 injury each year, on average, as a result of transportation related hazmat accidents.¹²³ Deaths and injuries are typically limited to the operators of the transportation vessel.

Area Impacted

As shown on Figure 7, there are 134 miles of freight railroads and approximately 62 miles of interstate and major state highway 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 impacts can include evacuation, closure of roadways and environmental contamination.

Economic Impact

The economic impact due to this hazard can be highly variable, especially when including the costs of environmental remediation. According to the U.S. EPA HazMat Response Team, costs for responding to a hazmat incident can range from \$1,000-\$100,000. Damage to transportation equipment is expected with this event, however, these costs are the responsibility of the transporter. Costs to the public can include response efforts, commuter delays and damage to transportation infrastructure.

Critical Facilities/Services

Although transportation related hazmat incidents are not common in Oakland County, such an incident is very possible. As demonstrated by the November 15, 2001, incident, a significant incident can involve response efforts from multiple agencies and departments. Additional impact could result from environmental remediation and restoring public confidence in the environmental health of the County.

4.12. Infrastructure Failure

Definition

An infrastructure failure is the failure of a critical public or private utility infrastructure which results in a short-term loss of service.

4.12.1 Water System

Historical 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. Local officials estimated the water emergency resulted in economic losses in the tens of millions of dollars.¹²⁴

¹²³ U.S. Coast Guard, National Response Center website, www.nrc.uscg.mi./foia.html, Standard Query Report for Oakland County, Rail Incidents, January 11, 2012.

¹²⁴ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 137-148.

Frequency & Probability

Water system failures can be attributed to causes such as construction/excavation activities, underground freezing, power outages and system blockages. Two (2) significant water main breaks have occurred in Oakland County since 1999.

In 2003, there were 257 water line breaks, including service line breaks. 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 County-wide development continues.¹²⁵

Health & Safety

The availability of clean drinking water is crucial to the health and safety of the public. Water service interruptions can cause untreated or poorly treated drinking water to enter the water supply, resulting in boil water advisories.

Area Impacted

The Oakland County Water Resources Commissioner's Office (OCWRC) maintains the water system for some of the communities which have water supplied from the Detroit Water and Sewerage Department and for certain communities with well-supplied water. (Figure 9) The water system for the remaining portions of the County is operated and/or maintained by the Detroit Water and Sewerage Department and/or the local municipality. The OCWRC's water system has been designed to minimize the number of people impacted from service interruption. The goal of planning is to limit impacts to no more than 28 customers with each break. However, the impact of each line break is highly variable.

Economic Impact

Water is a vital component in operating schools, hospitals, businesses and in maintaining public health. Information regarding the economic impact of water system failures is not available. It is anticipated that an interruption in service can be extremely costly, depending upon the number of affected customers and duration of the event.

Critical Facilities/Services

Maintaining a functional water system is a critical service of the OCWRC in portions of Oakland County. Loss of water service can make it difficult to operate other critical facilities such as schools, hospitals, businesses and sport/entertainment venues.

4.12.2 Electrical System

Historical 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.¹²⁶

¹²⁵ Ibid.

¹²⁶ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 137-148.

Frequency & Probability

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.¹²⁷

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.

Health & Safety

Electrical service is incredibly important in maintaining the health and safety of the public. Electricity is required to heat and cool homes, operate traffic signals and operate hospitals and emergency services. Power outages can be particularly dangerous during times of extreme heat or cold. In addition, power outages can have a negative impact on the infirm. The number of people impacted by a power outage is highly variable with each event.

Economic Impact

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 of the number of affected customers and duration of the event.

Critical Facilities/Services

As demonstrated by the August 2003 blackout, electricity is an integral part of every service the County provides to its residents. The blackout caused traffic backups, loss of water service and gasoline shortages making it difficult to provide even the most common services. Fortunately, large-scale electrical failures are not common. However, the blackout was a good “test” for the County’s systems to determine effectiveness under disaster conditions.

4.12.3 Communications System

Historical Events

Oakland County operates internal communications systems such as a 9-1-1 Public Safety Answering Point (PSAP) and an emergency public radio system. There are an additional 29 PSAPs within the County that are operated by local cities, townships and villages.

¹²⁷ DTE Energy Media Relations, November 2011.

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.¹²⁸ Since 1987, construction projects within the County have caused 2 service interruptions in the 9-1-1 system.¹²⁹

Frequency & Probability

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 problem with the communications system itself.

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 each year. Power outages can also interrupt operation of the 9-1-1 PSAP.

As the County continues to grow and demand for communications services increase, it is anticipated that this hazard will occur more frequently and with greater consequence.

Health & Safety

Communications systems are a vital link between the public and emergency response services. As a result, a failure of the system can have secondary impacts to the health and safety of the affected public. The number of people that experience a loss of service due to a communications failure is directly related to the severity of the event. However, people requiring emergency services during a failure are at greater risk for impact.

Area Impacted

A failure of private telephone communications is limited to the service area network. However, a failure of the emergency communications system can impact the entire County.

Economic Impact

The majority of economic impact from this hazard would result to loss of productivity for affected businesses.

Critical Facilities/Services

The 9-1-1 PSAP and emergency dispatch systems are vital services provided to Oakland County residents. Power outages and downed lines can greatly impact the County's ability to operate these systems. Backup generators are utilized to maintain emergency communications during power outages. If phone lines to the 9-1-1 PSAPs are downed, the calls are automatically re-routed to an alternate PSAP to maintain 9-1-1 phone services.

4.12.4 Storm Water System

Historical 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 major cause of the sewer backups was a temporary loss of power at pumping stations and insufficient

¹²⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 137-148.

¹²⁹ Oakland County Homeland Security Division, November 2011.

capacity of the storm sewer system due to the high rains. 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 provide disaster assistance to affected businesses and individuals.¹³⁰

Frequency & Probability

There are 2 primary types of storm water sewers in Oakland County – open drains and enclosed, underground systems. The primary problems associated with open drains are log jams, plugged drains and siltation. The major dilemma with the County's storm water sewers, both open drains and enclosed systems, is that the County's drainage needs exceed system capacity. The open storm sewer system was originally designed to manage storm water for farmlands. However, the rise in development has resulted in less pervious ground cover; therefore, more storm water must drain to the storm sewer system.

Problems with the storm water sewer system are made evident during periods of high rain or snowmelt. Some degree of storm sewer flooding can be expected with any major rain or snowmelt event. Such small, frequent events occur with regularity and are planned for. It is anticipated that this hazard will become more frequent and more severe as the system ages and new development requires greater system flow capacity.

Health & Safety

The storm water sewer system is of great importance to protecting human health and safety. Flooding which results during system failures can create safety problems and sewer backups in combined storm and sanitary systems, presenting a health concern.

Area Impacted

County drains are found throughout Oakland County. The Oakland County Water Resources Commissioner's Office (OCWRC) is charged with the responsibility of maintaining the County drain system. The storm water sewer system for the remaining portions of Oakland County is operated and/or maintained by the Detroit Water and Sewerage Department and/or local municipalities. The area impacted is dependent upon the drainage area for the failed storm sewer. Areas with combined sewers (storm water sewer system combined with the sanitary sewer system) are more frequently found in the southern portions of the County. These areas can be at increased risk for sewer backups and basement flooding.

Economic Impact

As demonstrated by the September 2000 system failure, flooding can result in major property damage costs. Storm sewer system upgrades can also be very costly to implement. Funding is available for maintaining all Oakland County drains; however, maintenance funding is limited for approximately 200 County drains which were established under the 1956 Drain Code. Each year claims are filed with OCWRC for property damage due to flooding caused by poorly functioning County drains.¹³¹

¹³⁰ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 138.

¹³¹ Oakland County Water Resources Commissioner, November 22, 2011

Critical Facilities/Services

Maintaining a functional water system is a critical service provided by the OCWRC to Oakland County. The storm sewer system is important to protect property, both public and private, and to maintain public health.

4.12.5 Sewer System

Historical Events

Failures of the sanitary sewer system can result in significant risks to public health and safety. A system failure can result in sewer backups in homes or businesses and discharges of untreated sewage to rivers and lakes.

The most recent major sanitary sewer system failure in Oakland County occurred in November 1998 when a pump station failed and resulted in sewage overflow discharge to Cass Lake.¹³² This event sparked a thorough review of sewer system structures to identify deficiencies and make necessary improvements.

Frequency & Probability

A major system failure occurs within the County approximately once every 20 to 25 years. Smaller problems are more frequent. During major storm events, it is highly possible for a loss of power to occur at certain pump stations. This can create the potential for an overflow discharge to local rivers or lakes.¹³³ It is expected that problems will become more frequent as the system structures age.

Health & Safety

Human exposure to untreated sewage presents a major health and safety threat. Discharges of untreated sewage to lakes or rivers can also significantly impact the environmental health of local waterways.

Area Impacted

OCWRC operates or maintains sanitary sewer systems in the some of the communities of Oakland County. (Figure 9) The sewer system for the remaining portions of the County are operated and/or maintained by the Detroit Water and Sewerage Department and/or the local municipality. Rural areas of the County have no municipal sewer service available.

The sanitary sewer systems in the communities of Beverly Hills and Franklin Village have been identified as areas with the most frequent maintenance needs. The oldest parts of the system are in the Bloomfield Hills area, with the average construction date ranging from 1950 to the mid-1960s.¹³⁴

The number of sewer users impacted by each failure is dependent upon the severity of the event. Lakes or rivers could also be impacted due to sewer overflow discharges, making them temporarily unsafe for recreational activity.

¹³² Oakland County Water Resources Commissioner, http://www.oakgov.com/water/services/infrastructure_service.html December 20, 2011.

¹³³ Ibid.

¹³⁴ Oakland County Water Resources Commissioner, http://www.oakgov.com/water/services/infrastructure_service.html December 20, 2011.

Economic Impact

Information regarding the economic impact of sanitary sewer system failures is not available. The sanitary sewer system is a vital part of the operations system for a wide range of businesses. It is anticipated that a failure could be extremely costly, depending upon the number of affected customers and duration of the event.

Critical Facilities/Services

Maintaining a functional sanitary sewer system is a critical service provided by the OCWRC to portions of Oakland County. It is OCWRC's policy to respond to all maintenance needs within 1 hour. Loss of sanitary sewer service can make it difficult to operate other critical facilities such as schools, hospitals, businesses and sport/entertainment venues.

4.12.6 Bridges, Roads, and Overpasses

Historical Events

There have been 37 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.

Frequency & Probability

Although there has only been 1 bridge collapse, it is possible for other bridge/overpass failures in the future. According to 2010 data from SEMCOG, Oakland County has 7,343 miles of public roads. Of these, 14% are in good condition, 57% are in fair condition and 29% are rated as being in poor condition. There are 450 bridges in Oakland County; 424 of those are open, 24 are open with restrictions and 2 are closed. As of 2009, 41.1% (185) of the County's bridges were determined to be deficient. The Federal Highway Administration reports 39 structurally deficient bridges and 82 functionally obsolete bridges in Oakland County.¹³⁵

Road collapse can lead to sink holes. Sink holes are normally the result of collapsed water mains. The probability of sink holes is relatively low.

Health & Safety

At least 472 people were killed and numerous other individuals were injured during 37 significant bridge failures in the U.S. Falls, debris and drowning are the biggest threats from bridge failures. Sink holes rarely injure people.

Economic Impact

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.

Critical Facilities/Services

Damage to roads and bridges can lead to congested roads or severely limit the ability of emergency personnel to respond to emergency situations. Depending on the severity of the failure and location of a transportation infrastructure failure, critical facilities such as hospitals, schools and nursing homes may be isolated.

¹³⁵ SEMCOG, <http://www.semco.org/Data/Apps/comprof/transportation.cfm?cpid=2999>, December 20, 2011

4.12.7 Invasive Species

Definition

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.

Historical Events

Some of the most notable invasive species include emerald ash borer, Asian carp, gypsy moth, zebra mussels, *Phragmite*, and Japanese beetles. Each of these species have significantly impacted the environment and resulted in decreased revenue and profits.

Frequency & Probability

At least 200 high-impact invasive species occur in the United States. A new invasive species is established every 2 to 5 years.¹³⁶ The probability of new invasive species to become established in Oakland County is relatively high.

Health & Safety

While most invasive species do not pose a direct significant threat to a person's health or safety, they can make life less enjoyable. Certain plant species, such as glossy buckthorn and multi-flora rose, have thorns that can cause injuries. Certain insects can bite and sting which can lead to allergic reactions. Certain diseases may affect herd populations such as deer or cattle. Diseases such as Chronic Wasting Disease and Foot and Mouth Disease are of most concern.

Economic Impact

The economic impact of invasive species can be rather high. It is estimated that the cost of invasive species is \$138 billion annually in the U.S. Invasive species can kill desirable plant and animal species, cause disease, reduce crop production, cause fish kills, decrease biodiversity, change hydrology, reduce aesthetic value and hurt tourism. Removal or control of invasive species is very costly and can be ineffective in certain species.

Critical Facilities/Services

Impact to critical facilities is relatively low. Invasive species tend to be located in natural areas and open spaces.

4.13. Nuclear Power Plant Accidents

Definition

A nuclear power plant accident would involve an actual or potential release of radioactive material at a nuclear facility in a quantity sufficient to constitute a threat to the health and safety of off-site populations.

Historic Events

In Michigan, there are 3 nuclear power plants in operation. The operation of these facilities is heavily regulated by the Federal Nuclear Regulatory Commission. There has never been an off-site release of radioactive material from a nuclear power plant in Michigan. However, an on-site release did occur on October 5, 1966, at the Enrico Fermi-1 Atomic Power Plant in Monroe County, Michigan. The release was a result of fuel meltdown; however, the radioactive material

¹³⁶ Michigan State Police, *Michigan Hazard Analysis*, March 2006.

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 the Fermi-1.

Frequency & Probability

The southern portion of Oakland County is within the Secondary Emergency Planning Zone of the Fermi-2 Atomic Power Plant. The Secondary Emergency Planning Zone consists of a 50-mile radius around the plant. Although there has never been an off-site release from the plant, it is possible for a release from the plant to impact Oakland County.

Health & Safety

An accident at a nuclear power plant could result in radioactive materials becoming airborne or in direct impact to areas adjacent to the plant. The severity of radiological contamination from such an event is directly proportionate to the type and amount of radioactive material released, weather conditions at the time of the release and the location relative to wind direction following the release.

Although the southern portion of Oakland County is within the Secondary Emergency Planning Zone of the Fermi-2 Atomic Power Plant in Monroe County, prevailing wind patterns generally place the plant downwind of Oakland County. For areas within this zone, the primary concern is radiological contamination of food sources. Procedures have been developed by the plant and emergency response agencies to prevent radiation from contaminating food supplies and to prevent contaminated foods from being consumed, indicating that the risk to human health is considered low.

Area Impacted

As shown on Figure 9, approximately 460 square miles in the southern portion of Oakland County is within the Secondary Emergency Planning Zone of the Enrico Fermi-2 plant. However, the actual area impacted by a release would depend greatly on the type and amount of radioactive material released, weather conditions at the time of the release and the location relative to wind direction following the release.

Economic Impact

Due to the low frequency of this event in the United States, it is difficult to establish the economic impacts. It is anticipated that the impact could be very high, depending on the severity of the event.

Critical Facilities/Services

Nuclear power plant owners/operators work closely with emergency planners to develop response plans in the event of a release of radioactive materials. In Michigan, the responsibility to respond to such events is shared by the plant owner/operator and all levels of government. Response to an off-site release would likely involve multiple agencies and departments from all levels of government.

4.14. Oil and Gas Well Accidents

Definition

An oil or gas well incident is an uncontrolled release of oil, natural gas or a release of hydrogen sulfide gas, a by-product of production wells.

Historic Events

In 2006, there were 53 active or producing wells within Oakland County.¹³⁷ The last significant oil/gas well accident in Michigan was in 1994, when an explosion and fire occurred killing 1 employee and injuring another.¹³⁸

Frequency & Probability

Since 1973, there have been 7 significant oil or natural gas well accidents in Michigan. The probability of an accident in Oakland County is relatively low.¹³⁹ According to the MDEQ, the most common problems associated with oil and gas wells in Oakland County are small spills and odor complaints.

Health & Safety

There are several hazards related to oil and gas wells. Producing wells can generate hydrogen sulfide gas as a by-product. Hydrogen sulfide gas is extremely poisonous and presents a number of chemical safety hazards to responders and adjacent populations. Accidental releases, fire and explosion can also result from such an event.

In Michigan, death and injury rates associated with oil and gas well accidents are very low. To date, there has been 1 death and 1 injury from accidents since 1973. In those cases, death and injury resulted to the employees servicing the wells.¹⁴⁰

Area Impacted

Lands with oil and gas wells and surrounding areas are most at risk for impact from well accidents. As shown on Figure 10, the location of wells is concentrated in the southwestern portion of the County.

Table 15. Major Causes of Transmission Pipeline Accidents in the United States 1991-2010

Cause	% of Total Incidents
Excavation Damage	38.3
Corrosion	3.9
Equipment Failure	4.8
Natural Force	9.5
Other Outside Force Damage	11.1
Incorrect Operation	7.6
All Other Causes	24.4

Source: U.S. Department of Transportation, Office of Pipeline Safety, Transmission Pipeline, Incident Summary by Cause, January 25, 2012

¹³⁷ Source: Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 173.

¹³⁸ Source: Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 170.

¹³⁹ Ibid.

¹⁴⁰ Source: Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 172.

Oil and gas well accidents often result in a release, or potential release, of hazardous gases. As a result, areas adjacent to the site of the incident may be evacuated as a precaution. In Michigan, there have been no oil or gas well accidents which have resulted in off-site property damage. However, areas of evacuation have been large enough to include residents within a one-half mile radius.

Economic Impact

Accidents of this nature are not common in Michigan and have not resulted in significant property damage or other loss. Therefore, information regarding the economic impact of oil and gas wells is limited and further investigation is not warranted at this time.

Critical Facilities/Services

Oil and gas wells in Oakland County are owned and operated by private companies; however, response to an accident would involve public agencies. The level of public response would depend upon the severity of the accident. Due to the possibility of evacuation with this type of accident, involvement from multiple emergency response agencies would likely be required.

4.15. Petroleum and Natural Gas Pipeline Accidents

Definition

A petroleum or natural gas pipeline incident would involve an uncontrolled release of petroleum, natural gas or hydrogen sulfide gas from a pipeline.

Historical Events

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. One of the most injurious 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 2 others.¹⁴¹

Frequency & Probability

Since 1990, there have been 33 pipeline incidents in Oakland County.¹⁴² Two (2) 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.

Health & Safety

Pipeline accidents can pose a significant threat to the public due to the potential for fires, explosions and ruptures. Since 1990, 2 pipeline accident-related deaths and 14 injuries have occurred in Oakland County.¹⁴³

¹⁴¹ U.S. Coast Guard, National Response Center, www.nrc.uscg.mil/foia.html, Standard Query Report, Pipelines, Oakland County Michigan, report generated on January 5, 2012.

¹⁴² Ibid.

¹⁴³ Ibid.

Area Impacted

As shown on Figure 11, there are 363 miles of natural gas transmission pipelines, 120 miles of large natural gas distribution lines and 107 miles of petroleum transmission lines in Oakland County. There is also 1 pipeline terminal, 2 natural gas compression facilities and 1 major natural gas processing plant within the County. Smaller natural gas distribution lines can be found throughout the County with Consumers Energy providing natural gas service to the majority the County and Michigan Consolidated Gas Company providing service to approximately 36 square miles of the County.

Natural gas or petroleum pipelines can be found throughout the County, which means that pipeline accidents can occur anywhere. Typically, pipeline accidents only impact the immediate area. However, evacuations of adjacent buildings can be required as a precaution.

Economic Impact

In the United States since 1991, the property damage caused by transmission pipeline accidents is over \$1 billion. These costs are largely due to damage to the pipeline structures.¹⁴⁴ Other impacts may result due to a decrease in product availability.

Critical Facilities/Services

Local fire and police departments would respond to pipeline accidents. This type of hazard may also require response from hazmat teams. Oakland County fire departments frequently respond to gas leaks in the County.

4.16. Public Health Emergencies

Definition

A public health emergency is a widespread and/or severe epidemic, incident of contamination or other situation that presents a danger to, or otherwise negatively impacts, the general health and well-being of the public.

Historical Events

Public health emergencies can result from a number of causes such as food borne illness, waterborne pathogens, loss of sewer/water service and epidemics of communicable diseases. In recent years, the risk of a public health emergency resulting from an intentional release of a chemical, biological or radiological agent has become more apparent.

Table 16. Reportable Disease and Conditions in Michigan 2005-2009

Disease or Condition	Average Number of Cases (per year)
Amebiasis (Amoebiasis)	45.2
Campylobacteriosis	918.4
Cryptosporidiosis	209
Dengue Fever	9.2
E. Coli 0157:H7	88.6
Giardiasis	677.2
Hepatitis A	121.4
Hepatitis C	89.6
HIV/AIDS	828.4
Influenza	200,000+
Legionellosis	169
Listeriosis	23.6
Lyme Disease	73.4
Malaria	23.4
Pertussis	492.4
Q Fever	2.2
Salmonellosis	962.6
Shigellosis	188.4
Streptococcal Disease	195
Tuberculosis	28.8
Yersiniosis	22.6

Source: Michigan Association of Public and Preventive Medicine Physicians, Reportable Infectious Diseases in Michigan, 2005-2009, http://www.michigan.gov/documents/mdch/2009_CDEpiProfile_337815_7.pdf

¹⁴⁴ U.S. Department of Transportation, Office of Pipeline Safety, Incident Summary by Cause, January 25, 2012.

The largest botulism epidemic in U.S. history originated in Oakland County in March 1977. The cause was traced to home-canned peppers which were served at a Pontiac restaurant. The restaurant used home-canned peppers because of a shortage of commercially prepared peppers following a crop failure. Although no one died from the poisoning, 59 people became ill, many of which required intensive medical treatment.¹⁴⁵

In September 2002, a Legionnaire's Disease outbreak originated from an air conditioning unit at a Farmington grocery store. The Legionnaire's outbreak resulted in 4 deaths and 30 illnesses.

Frequency & Probability

Public health emergencies can arise from a wide range of causes and may result in varying levels of severity, thus making it difficult to establish a frequency of occurrence. Since 1973, there have been 10 major public health emergencies in Michigan, an average of 1 emergency almost every 4 years.¹⁴⁶

It is important to note that some of the same causes of a public health emergency (i.e. food borne illness, etc.) do occur with regularity within Oakland County. However, these cases are isolated to a few individuals with limited impact to the general public.

It is anticipated that this hazard will become more likely to occur in the future as the County population ages and increases.

Health & Safety

Public health emergencies are an obvious threat to human health and safety. A public health emergency can take many forms and spread by various means. As a result, it is not feasible to determine a death or injury rate for this hazard.

Public health emergencies are of particular concern for populations with weakened or undeveloped immune systems. Within Oakland County, nearly 6% of the population is under the age of 5 and over 13% are over the age of 65.¹⁴⁷ Collectively, almost 19% of the Oakland County population is at risk for greater impact from a public health emergency based solely upon age.

Area Impacted

Due to the nature of public health emergencies, impacts from this event tend to be more widespread rather than confined to a specific location. It is important to note that a public health emergency may originate outside of Oakland County, yet impact communities within the County.

Economic Impact

Economic impacts from this hazard can be severe if the source is infrastructure related (i.e., if improvements are needed to the public water supply system). However, it is more likely that economic impacts will result through lost wages and medical expenses for impacted persons.

¹⁴⁵ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 175-181.

¹⁴⁶ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 183-190.

¹⁴⁷ U.S. Census Bureau, *Profile of General Demographic Characteristics: 2010*, Oakland County, Michigan.

Additional impact may result if a business is determined to be the source of the emergency, (i.e., a restaurant must close). Due to the low frequency of this hazard, additional investigation of the economic impact is not recommended at this time.

Critical Facilities/Services

A major public health emergency would likely involve varying degrees of response from local, state and possibly federal public health agencies. The Oakland County Health Division operates 2 locations within the County and numerous private hospitals and clinics offer medical services to residents.

4.17. Subsidence

4.17.1 Natural

Definition

Lowering or collapse of the land surface due to loss of subsurface support.

Historical Events

No natural subsidence events are known to have been recorded in Oakland County. There are no natural subsidence hazards in Oakland County according to the Geological and Survey Division of the MDEQ.¹⁴⁸

Frequency & Probability

No known natural subsidence events have been recorded in Oakland County. Therefore, the frequency of events cannot be adequately determined. The only known potential incident of natural subsidence in the County would be sink holes most likely caused from water main breaks. Based on the amount of underground utilities (specifically water mains) within in the County, there is probability that a sink hole event can occur from this non-natural source. The probability of this occurrence increases as water systems age.

Health & Safety

In the event of a sinkhole, potential health and safety issues are dependent on the location and size of the sink hole. A sink hole occurring near or within a street or public access area could potentially cause injury. Injury could also occur if a sink hole occurred beneath a building causing structural damage or, if severe enough, collapse. Following the event, the sink hole could pose a risk to the health and safety of people within the area if it is not properly marked and barricaded. Workers are at risk for cave-ins or confined space entry concerns if entering the sink hole is required to correct the problem.

Area Impacted

The area impacted would be the area immediately surrounding the sink hole.

¹⁴⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, Michigan Hazard Analysis, March 2006, pages 217-225.

Economic Impact

Economic impacts incurred from the occurrence of a sink hole could include a disturbance in transportation and costs incurred to fill the sink hole. If a sink hole were to occur beneath a building foundation, potential cost to stabilize, repair or rebuild could be substantial, dependent on the size of the sink hole.

Critical Facilities/Services

Response would be primarily localized police and fire departments, utility services and potentially road services such as the local road commission or MDOT.

4.17.2 Mining

Definition

Lowering or collapse of the land surface due to loss of subsurface support in mining areas.

Historical Events

No known mining subsidence events are recorded for Oakland County. There are no mining subsidence hazards in Oakland County according to the Geological and Survey Division of the MDEQ.¹⁴⁹

4.18. Thunderstorm Hazards

Oakland County experiences 30-40 thunderstorms per year.¹⁵⁰ In 2011, 13 severe thunderstorm watches and 15 severe thunderstorm warnings were issued in Oakland County.¹⁵¹

4.18.1 Hail

Definition

Conditions where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth.

Historical Events

In Oakland County, 164 hail events have been reported since 1960.¹⁵² On June 4, 2010, severe thunderstorms produced large hail that broke windows resulting in \$10,000 worth of damage.

On June 24, 1998, 2 tracks of severe thunderstorms crossed the state moving east to west – 1 stretched across central Michigan, while the other moved across the southern portion of the state. The more northerly thunderstorms produced large amounts of hail in several counties, ranging from dime-size to baseball-size hail.¹⁵³

¹⁴⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 217-225.

¹⁵⁰ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 226.

¹⁵¹ Oakland County Emergency Management, *Tone Alert Broadcast Log*, January 20, 2012

¹⁵² National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012

¹⁵³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 227-229.

On June 26, 1995, a severe thunderstorm caused nickel-sized hail and ground lightning that resulted in 3 injuries.

Frequency & Probability

In Michigan, there is 1 intense hailstorm per year that causes significant damage to property.¹⁵⁴ Hail events are highly likely to occur in the County.

Health & Safety

The human health and safety risk associated with hail is low. However, hail is often associated with tornado activity. Tornadoes are discussed in Section 4.15.

Area Impacted

Hail storms are typically localized as they move through Michigan. The entire County could be affected; however, impacts will more likely be localized to residents directly under the center of the storm.

Economic Impact

Nationally, property damage from hail exceeds \$3.1 million annually. Hail storms can impact infrastructure, power lines, roads, businesses and personal property. Property damage, loss of business revenues and response costs can result from hail events. Hail is especially damaging to crops, property and automobiles.

Critical Facilities/Services

Response to a hail related emergency would be localized. Utilities may require repair and maintenance resulting from hail.

The National Weather Service and local media can alert the public of severe storms capable of producing large hail, high winds and lightning. Storms are detected using radar, weather data, spotters and, in the event of high winds or tornados, outdoor warning sirens can alert those not near a radio or television of an approaching storm. Outdoor warning sirens are located throughout the County (Figure 12).

4.18.2 Lightning

Definition

The discharge of electricity from within a thunderstorm.

Historical Events

On July 29, 1996, a 38-year old woman was struck by lightning and killed in Milford Township while standing near a tree on the patio of her parent's home.¹⁵⁵

On August 25, 1998, lightning struck an apartment building in Southfield causing a fire that destroyed 2 units and damaged the administrative office.¹⁵⁶

¹⁵⁴ Ibid.

¹⁵⁵ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁵⁶ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 230-234.

In July 2000, Oakland County suffered a lightning strike which affected the County's public safety radio system.¹⁵⁷

On September 11, 2000, the 9-1-1 phone system at the Milford Police Department was struck by lightning causing substantial damage to electronic equipment.¹⁵⁸

On April 7, 2001, lightning struck a satellite dish outside a Brandon Township residence. The strike followed the outside wiring and entered the home. A fire resulted and the contents of the basement were lost.¹⁵⁹

On August 1, 2003, a boy in Troy was struck by lightning and was revived by CPR.¹⁶⁰

Four (4) days later on August 5, 2003, lightning struck the Oxford Village Dispatch Center's 110-foot tower causing widespread equipment failure and damage.¹⁶¹

On August 6, 2010, a lightning strike caused a house fire causing extensive electrical and roof damage exceeding \$150,000.

Frequency & Probability

There have been 42 major lightning events (resulting in fire, injury, death, etc.) reported in Oakland County since 1994.¹⁶² Over 50% of lightning casualties occur in the months of June and July, and another 28% of deaths occur in May and August.¹⁶³ Lightning occurrences happen every year; therefore, lightning events will continue to occur in the future within the County.

Health & Safety

During the 42 storms, 1 death and 6 injuries were reported.¹⁶⁴ Thirteen (13) people in Michigan were killed by lightning strikes between 1990 and 2003. Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of rhythm. Lightning can also cause severe skin burns that can lead to death if complications from infections ensue. Lightning strikes kill 1 person 91% of the time and 2 or more victims 9% of the

Table 17. Lightning Statistics

Location of Lightning Strikes

- 40% are at unspecified locations
- 27% occur in open fields and recreation areas (not golf courses)
- 14% occur to someone under a tree (not on golf course)
- 8% are water-related (boating, fishing, swimming, etc.)
- 5% are golf-related (on golf course or under tree at golf course)
- 3% are related to heavy equipment and machinery
- 2.4% are radio, transmitter, and antenna-related

Months of Most Strikes

- July - 30%
- August - 22%
- June - 21%

Time of Most Strikes

2:00p.m. - 6:00 p.m.

Source: National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the periods 1959-1994(last update)

¹⁵⁷ Oakland County Executive, Special Projects Staff, September 15, 2004.

¹⁵⁸ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁵⁹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁶⁰ Ibid.

¹⁶¹ Ibid.

¹⁶² Ibid.

¹⁶³ Oakland County Michigan Emergency Management, *Hazard Study*, August 1998, page 17.

¹⁶⁴ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 230-234.

time.¹⁶⁵ Approximately 20% of lightning strike victims die and 70% of survivors suffer serious long-term after effects, such as memory and attention deficits, sleep disturbance, fatigue, dizziness and numbness.¹⁶⁶

Area Impacted

The effects of lightning are very localized; however, thunderstorms can cover a large area.

Economic Impact

Property damage estimates from lightning strikes in Oakland County since 1994 equal \$2.348 million.¹⁶⁷

On July 26, 1997, lightning started a fire that caused \$750,000 of damage to a 2-story apartment building in Farmington Hills.¹⁶⁸

Because lightning-related damage information is compiled by a number of different sources, it is difficult to accurately determine collective damage figures resulting from lightning strikes.

Critical Facilities/Services

Initial response to a lightning strike would be local emergency responders (fire, police, emergency medical care, etc.). Power outages as a result of a lightning strike may impede emergency response. Local utility companies across the County estimate as much as \$1 billion per year in damaged equipment and lost revenue from lightning.¹⁶⁹

Communication services can be damaged and destroyed (cell and communication towers, computer systems, phone services, etc.). Local utility companies and the services they offer are often affected from lightning strikes.

Lightning is associated directly with severe thunderstorms. The National Weather Service and local media can alert the public of the severe storms capable of producing large hail and lightning.

4.18.3 Severe Wind

Definition

Winds greater than 50 miles per hour (mph), not including tornadoes, are classified as high winds.

Historical Events

Since 1957, there have been 422 thunderstorms with high winds and 24 high wind events (without thunderstorm) reported in Oakland County.¹⁷⁰

¹⁶⁵ Ibid.

¹⁶⁶ Ibid.

¹⁶⁷ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁶⁸ Ibid.

¹⁶⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 190.

¹⁷⁰ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

On August 19, 2010, a thunderstorm with high winds resulted in \$100,000 worth of damage in Oxford. The storm uprooted trees and damaged roofs and siding.

On June 8, 2008, a thunderstorm with high winds resulted in over \$1.2 million in damages. Wind gusts exceeded 85 mph, downing trees and power lines and damaging roofs/siding and vehicles.

On March 13, 2006, a storm produced sustained winds of 30-40 mph with gusts to 50 mph. The high winds caused a tree to fall and land on a vehicle, killing 1 and injuring 2 others.¹⁷¹

Frequency & Probability

Oakland County receives 30-40 thunderstorms per year.¹⁷² On average, wind events can be expected 5-7 times a year in the southern Lower Peninsula.¹⁷³ Therefore, it is probable that wind events will occur every year with in the County.

Health & Safety

From 1987 through 2011, there were 3 deaths and 20 injuries reported in Oakland County from high winds.¹⁷⁴ The public is most at risk from falling trees and electrical lines, blowing debris and collapsed buildings or roofs. High winds can be a direct effect of tornadoes which are discussed in Section 4.15.

Area Impacted

High winds affect entire populations, but the greatest risk is to those housed in mobile homes. There are approximately 63,732 mobile homes in Oakland County.¹⁷⁵

Economic Impact

Since 1990, approximately \$39.3 million in property damage has resulted from high wind events in Oakland County.¹⁷⁶ Property damage is the greatest contributor to economic loss. Power outages resulting from high winds can also have an economic impact due to costs to restore and repair power lines and loss of revenues from prolonged outages to businesses.

Critical Facilities/Services

The National Weather Service and local media can alert the public of severe storms capable of producing large hail, high winds and lightning. Outdoor warning sirens can alert those not near a radio or television of approaching high winds (≥ 70 mph) or tornadoes. Outdoor warning sirens are located throughout the County (Figure 12).

Initial response activities due to emergencies from high winds would primarily be associated with local response from police, fire and medical emergency services.

¹⁷¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁷² Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 235-242.

¹⁷³ Ibid.

¹⁷⁴ Ibid.

¹⁷⁵ SEMCOG, *Land Use in Southeast Michigan 1990*, Specific to Oakland County.

¹⁷⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

Local utility companies are essential in repairing lines and shutting down power or gas services that represent a threat to safety. Private or governmental tree removal services (urban forestry services) are also essential in providing preventive measures and are often involved clearing downed trees from power lines, roadways and buildings following severe wind incidents. Following the initial response, regional, state and local agencies may assist in cleanup and aid.

4.19. Tornadoes

Definition

A violently rotating column of air extending downward to the ground from a cumulonimbus cloud.

Historical Events

According to the National Weather Service, the first recorded tornado in Oakland County occurred on April 6, 1882.¹⁷⁷ Since 1950, approximately 4% of tornadoes in Michigan have been classified as violent tornadoes (F4 or F5 intensity).¹⁷⁸ However, these few violent tornadoes have been responsible for 78% of Michigan’s tornado-related deaths.¹⁷⁹

On March 20, 1976, a Category F4 tornado with winds in excess of 200 mph destroyed homes from Farmington Hills to West Bloomfield Township. Homes and businesses collapsed or were ripped off their foundations. A 15-year old girl died when the car she was in was hurled across Maple Road. Fifty-five (55) injuries were reported and the cleanup afterward cost an estimated \$25 million.¹⁸⁰

On July 2, 1997, a series of thunderstorms went through south-central and southeast Michigan spawning 16 tornadoes, 13 of which occurred in southeastern Michigan counties.¹⁸¹

Frequency & Probability

The months of April through June have historically been the period of greatest tornado frequency.¹⁸² Tornadoes in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the polar regions to generate severe thunderstorms.¹⁸³ Most tornadoes in Michigan occur in the southern Lower Peninsula, which averages 17 tornadoes per year.¹⁸⁴

Table 18. Tornado Magnitude in Oakland County

Magnitude	Number	Deaths/ Injuries	Property Damage
F0	6	0/0	\$82,000
F1	13	1/10	\$9.92M
F2	7	1/7	\$3.5M
F3	3	0/4	\$7.5M
F4	2	1/57	\$25.2M

Source: National Climatic Data Center, www.ncdc.noaa.gov, Oakland County, January 1, 1950 through 2011.

¹⁷⁷ Oakland County Michigan Emergency Management, *Hazard Study*, August 1998, page 20.

¹⁷⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 244-256.

¹⁷⁹ Ibid.

¹⁸⁰ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁸¹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 244-256.

¹⁸² Oakland County Michigan Emergency Management, *Hazard Study*, August 1998, page 20.

¹⁸³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 244-256.

¹⁸⁴ Ibid.

Oakland County has had 31 official tornadoes since 1953.¹⁸⁵ It is very probable that tornadoes will continue to represent a hazard to the County.

Health & Safety

Michigan's tornadoes have resulted in more deaths than in many other tornado-prone states. Michigan ranks in the top 10 states for single killer tornadoes, deaths per 10,000 square miles, and killer tornadoes as a percent of all tornadoes. Between 1950 and 2011, 3 tornado-related deaths and 78 injuries have occurred in Oakland County.¹⁸⁶

Area Impacted

A tornado would affect an entire population in the tornado's path. The most vulnerable populations would be mobile home residents. According to 2000 land use data, there are approximately 63,732 mobile homes in the County.¹⁸⁷ Novi and White Lake Township have the highest number of mobile home establishments, with approximately 300 acres each.

The average tornado track is 16 miles long. The longest tracks have been reported at 200 miles long.¹⁸⁸ The tornado path width is typically less than one-quarter mile, but can be over 1 mile.

Economic Impact

Property damage is the greatest contributor to economic loss. The amount of damage varies greatly with the severity of the tornado. Also, damage or destruction to utility lines (primarily overhead) can result in the loss of power and other utilities lasting a few moments to several days. Tornadoes can also destroy or damage agricultural fields, trees and other flora and disrupt transportation services due to debris and/or downed power lines.

Since 1950, Michigan has averaged \$16 million per year in tornado-related damage.¹⁸⁹ Between January 1, 1950 and 2011, property damage by tornadoes totaled over \$46.1 million in Oakland County.¹⁹⁰

A series of 13 tornadoes that swept through southeast Michigan on July 2, 1997, resulted in 2,900 damaged or destroyed homes, 200 damaged or destroyed businesses, over \$25 million in public damage and nearly \$30 million in private damage. Two (2) deaths were caused directly by tornadoes and 120 injuries were reported. Approximately 350,000 electrical customers lost electrical power as a result.¹⁹¹

¹⁸⁵ Ibid.

¹⁸⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁸⁷ SEMCOG, *Land Use in Southeast Michigan -2000-2010*, Specific to Oakland County, December 20, 2011.

¹⁸⁸ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 244-256.

¹⁸⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 253.

¹⁹⁰ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

¹⁹¹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 244-256.

A tornado that occurred on May 21, 2001, resulted in \$5.5 million in property damages and \$400,000 in agricultural damages primarily in Kalamazoo, Livingston and Oakland Counties.¹⁹²

Critical Facilities/Services

Tornado warnings systems play a major role in limiting the number of deaths and injuries related to tornadoes. Outdoor warning sirens are located throughout the County. (Figure 12) The National Weather Service and local television and radio also provide advanced warning notice to communities. Outdoor warning sirens can be heard in most areas throughout the County.

Initial response activities due to tornadoes would primarily be associated with local response from fire, police and emergency medical care.

Local utility companies would be essential in repairing lines and shutting down power or gas services that represent a threat to safety. Following the initial response, regional, state and local agencies may also assist in cleanup and aid.

4.20. Transportation Accidents

Definition

A transportation accident is a crash or other accident involving an air, land or water-based passenger carrier. (Note: Transportation accidents involving hazardous materials are addressed in Section 4.8.2, Hazmat Incidents – Transportation.)

4.20.1 Air

There are 3 public airports, 3 private airports, 1 sea plane base, and 20 private heliports in Oakland County. Air transportation accidents result from 4 major causes.

- In-air collision between 2 aircraft.
- A crash during in-air cruising due to mechanical failure, sabotage, etc.
- A crash during takeoff or landing.
- A collision between 2 aircraft during taxi or staging.

The majority of air transportation accidents occur during takeoff or landing and, therefore, impacted areas that are typically located near airports or runways. Response to air transportation accidents may involve fire control, survivor rescue/first aid, site security and crowd/traffic control.

Historical Events

The deadliest airplane accident in Oakland County history occurred on March 2, 1973, in Pontiac, when a small, private aircraft stalled in flight and crashed, killing all 4 people on board.¹⁹³ The National Transportation Safety Board determined the probable cause of the crash was 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

¹⁹² Ibid.

¹⁹³ National Transportation Safety Board, www.nts.gov, Aviation Database Query, Michigan, report generated January 31, 2012.

August 16, 1987, killing 6 crew members and 149 passengers, except for a 4 year-old girl who sustained serious injuries. The crash killed 2 others on the ground.

In September 2009, a plane was forced to make an emergency landing in a store parking lot resulting in minor injuries to the pilot.

Frequency & Probability

As shown on Figure 13, there are 3 public airports within Oakland County. In addition, there are 20 private heliports, 3 private airports and a private seaplane base within Oakland County. The airports provide facilities for smaller, private aircraft such as corporate jets and charter planes.

All 3 of the public airports (Oakland County International, Oakland Troy, and Oakland Southwest Airports) are owned by Oakland County. The 3 private airports within the County are Ed Schultes Place Airport and Willie Run Airport in Ortonville and Handleman Sky Ranch Airport in Oxford. Of the 20 heliports, 3 are owned by hospitals (William Beaumont, Huron Valley Sinai, and Providence Hospitals), 8 are owned by private corporations and 9 are owned by private citizens. The seaplane base is located in Pontiac. Since 2001, 5 reportable air transportation incidents have occurred in the County.¹⁹⁴ The aircraft involved in these incidents were all small aircraft with a limited number of passengers.

To date, there have been no air incidents involving large, commercial passenger aircraft in Oakland County. Commercial passenger air transportation is available through airports in Wayne and Genesee Counties and at Oakland County International Airport in Waterford.

Air transportation accidents in Oakland County will continue to occur in the future. It is anticipated that the probability for air transportation accidents to occur will fluctuate with air traffic volume.

Health & Safety

Aircraft accidents can be deadly to passengers. However, given the type of aircraft most common in Oakland County, death and injury are limited. Since 2001, there have been no deaths and 1 minor injury from air transportation incidents in Oakland County.¹⁹⁵

Area Impacted

Due to the fact that the majority of aircraft accidents occur during landing or takeoff, the area most at risk for impact is the airport (or heliport) and immediately adjacent areas.

Economic Impact

Economic impact would result from damage to the aircraft and to any structures or improvements on the ground at the site of the accident. Damages to aircraft would typically be the responsibility of the private owner. Because the airports are owned by Oakland County, any damages to the airport infrastructure may be the responsibility of the County. Additional economic impact to the County may result if an accident causes disruption of services at the airport.

¹⁹⁴ Ibid.

¹⁹⁵ Ibid.

There have been 5 reportable airplane crashes since 2001. The reportable airplane crashes resulted in substantial damage to the aircraft including damage to the prop, nose, wings, fuselage, landing gear, tail and engine.

Critical Facilities/Services

Response to air transportation accidents is provided by local fire and police departments. Emergency response assistance is available through mutual aid agreements.

Airports within Oakland County provide an important service to area businesses. A significant accident at an airport could temporarily impede the County's ability to provide this service.

4.20.2 Highway

Historical Events

Vehicle accidents are common to 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 driver of the car and injured 1 car passenger and 10 bus passengers.¹⁹⁶

Frequency & Probability

Automobile accidents occur several times daily in Oakland County. In 2010, there were 282,075 reported crashes in Michigan, of those 868 were fatal and 51,672 resulted in injuries.¹⁹⁷ Alcohol was involved in 30.4% of the fatal crashes. However, the impact to the public from private automobile accidents is limited. Therefore, the analysis of highway hazards is limited to public highway transportation such as mass transit buses and school buses.

From 2001 through 2003, there were 469 school bus accidents in Oakland County according to the Michigan State Police.¹⁹⁸

Bus accidents will continue to occur in Oakland County. The frequency of this hazard will likely increase with increased motor traffic.

1. Southfield Road at 11 Mile Road W
2. 12 Mile Road W at Orchard Lake Road
3. 12 Mile Road at Telegraph Road
4. 12 Mile Road at Dequindre Road
5. Maple Road W at Orchard Lake Road
6. 12 Mile Road at Southfield Road
7. Haggerty Highway at Pontiac Trail
8. I-75 S/N M-24 Ramp at Lapeer
9. Highland Road at Airport
10. Dequindre Road at 11 Mile E

Source: Southeast Michigan Council of Government, High Crash Intersections in Oakland County, www.semco.org 2011

¹⁹⁶ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 258-259.

¹⁹⁷ State of Michigan, Office of Highway Safety Planning, 2010 Michigan Traffic accident Facts, Reported Statewide Traffic Crashes In Michigan.

¹⁹⁸ Ibid.

Health & Safety

Passengers aboard buses during an accident are at risk for injury or death. From 2001 through 2003, 1 death and 118 injuries resulted from school bus accidents in Oakland County.¹⁹⁹

Economic Impact

The National Highway Traffic Safety Administration estimated the total economic cost of traffic accidents in Michigan at \$8 billion for the year 2000.²⁰⁰ This total includes all types of accidents and accounts for costs associated with lost productivity, medical costs, legal costs, emergency services costs, insurance costs, travel delays, property damage, workplace losses and human capital losses.

The average cost of a traffic accident in 2010 was \$26,745 per accident.²⁰¹ It is anticipated that this rate of economic loss would be higher for public passenger transportation given that more passengers are present and the higher cost of a bus versus a private automobile.

Critical Facilities/Service

The highway transportation system in Oakland County plays a vital part in the County's ability to provide services to the public. Traffic accidents are notorious for causing temporary traffic delays which complicate the County's ability to maintain a well operating transportation network.

4.20.3 Rail

Historical Events

Passenger rail accidents are typically associated with derailments or collision 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 attempted to cross the tracks. An approaching passenger train struck the school bus at a speed of 22 miles per hour causing injury to the driver of the bus.

Frequency & Probability

As shown on Figure 13, there are 109 miles of freight rail lines and 62 miles of passenger rail lines in Oakland County. Passenger rail service is provided by Amtrak with service between Pontiac and Detroit.

From 2002 through November 2011, there were 24 railroad transportation accidents in Oakland County, an average of 2 accidents each year.²⁰² Twenty-three (23) of these incidents occurred at public railroad crossings.

It is anticipated that the likelihood of occurrence for this hazard will fluctuate with the rate of rail traffic within the County.

¹⁹⁹ Michigan State Police, *Michigan School Bus Accidents*, report date April 2006.

²⁰⁰ U.S. Department of Transportation, National Highway Traffic Safety Administration, www.nhtsa.dot.gov, *The Economic Impact of Motor Vehicle Crashes 2000*, State Costs, viewed January 5, 2012.

²⁰¹ Michigan Office of Highway Safety Planning, Summary of County Statistics, viewed January 5, 2012.

²⁰² Federal Railroad Administration, <http://safetydata.fra.dot.gov>, all reports for all railroads in Oakland County, 2002 through November 2011, reports generated on January 25, 2012.

Health & Safety

Death and injury to passengers involved in railroad accidents are rare in Oakland County. From 2002 through 2011, there were no deaths and 3 injuries as a result of train accidents in Oakland County.²⁰³ There were 2 highway railroad deaths and 2 highway railroad injuries in Oakland County during that same time frame.

Area Impacted

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. Secondary impact 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 hazardous materials, the area may need to be evacuated for an extended period of time while environmental cleanup is performed.

Economic Impact

The greatest economic loss is property damage to the train equipment and railroad tracks. This loss is the responsibility of the owner/operator of the equipment and railroad.

Critical Facilities/Services

Given the frequency of this event, it is not anticipated that County services or facilities will be greatly impacted. Impact to County services may result if an accident blocks a railroad crossing, thus causing traffic problems. If the train is transporting hazardous materials, an evacuation area may need to be implemented. Police and fire services would be required to direct traffic and establish an exclusion zone.

4.20.4 Marine

Historical Events

Nineteen (19) commercial marine passenger ferries operate from Michigan shorelines. Public marine passenger ferries are heavily regulated and inspected by the U.S. Coast Guard to ensure public safety. To date, no significant accidents involving public marine transportation have been recorded in Michigan. Response to marine accidents differ significantly from air and land transportation accidents in that they can require an underwater search and rescue. There is no marine transportation service operating in Oakland County. As such, marine transportation accidents do not present a hazard to the County.

4.21. Winter Hazards

4.21.1 Ice and Sleet Storms

Definition

Freezing rain is rain that freezes on contact with surfaces causing a coating of ice on exposed surfaces.

²⁰³ Ibid.

Historical Events

From January 1, 1950 through 2011, 6 ice storm/freezing rain events have been recorded in Oakland County.²⁰⁴

In 2011, Oakland County had 1 blizzard warning, which included ice storms, freezing rain, sleet, hail and snow.²⁰⁵

On February 24, 2001, a wintry mix of precipitation broke out north of a warm front, with freezing rain being the dominant precipitation type. One power line in Waterford was damaged.²⁰⁶

An arctic front boundary moved south of the state on the morning of April 3, 2003. Locations across north Oakland County, northern Macomb County and throughout Lapeer, St. Clair, Sanilac and Huron Counties were the hardest hit, with approximately an inch of ice reported on trees. Dozens of roads were blocked by trees and damage occurred to hundreds of homes, businesses and automobiles as tree limbs, or in many cases, large trees were brought to the ground under the weight of the ice. It was estimated that 450,000 homes and businesses lost power. Nearly 50,000 people were without power for up to a week. Crews came from 4 different states to help local utility companies restore power and remove hundreds of broken tree branches away from power lines. A 74-year old man was killed in Troy when he was struck in the head by a falling tree branch. An estimated 2 dozen people were injured in traffic accidents. Several others were killed or injured by accidents related to the ice storm.²⁰⁷

On February 20, 2011, a winter storm impacted southeast Michigan, with 5 to 10 inches of snow falling across the majority of the area. Snow turned to ice leading to downed trees and power lines (most of which occurred over Lenawee and Monroe Counties). Power outages lasted 4 to 5 days. The resulting damage was estimated at \$1.5 million.²⁰⁸

Frequency & Probability

Michigan averages 1 major Ice and sleet event per year. The majority of sleet and ice storms occur during the months of December through March.²⁰⁹ The probability for ice and sleet storms to occur in Oakland County is high.

Health & Safety

Deaths and injury caused directly from an ice or sleet storm are difficult to determine. Deaths and injury are usually caused by secondary effects such as auto accidents, downed power lines and heart attacks from overexertion. According to the National Weather Service, 1 death and 2 injuries have been attributed to ice storms in Oakland County since 1993. These occurred during a storm in 2003 and were the result of falling tree limbs.

²⁰⁴ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

²⁰⁵ Oakland County Homeland Security Division Tone Alert Broadcast Log 2011 and weather events records, January 20, 2012.

²⁰⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

²⁰⁷ Ibid.

²⁰⁸ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

²⁰⁹ Ibid.

Area Impacted

Due to the widespread nature of ice and sleet storms, the entire population could be impacted either directly or secondarily (i.e. power outages, etc.). According to 2010 Land Use Data, Oakland County has approximately 60,623 acres of transportation, communication and utility land use.²¹⁰

Economic Impact

Economic loss would include property damage and costs of response (clearing roadways, downed power lines or trees, etc.).

From 1993 through July 2011, ice and sleet storms have caused approximately \$184 million in property damage (not all damage is exclusive to Oakland County).

Critical Facilities/Services

Response to an ice and/or sleet storm related emergency would primarily be localized. Initial response activities due to emergencies from ice and sleet would primarily be associated with local response from police, fire and medical emergency services.

Utilities (power lines, telephone lines, cable, etc.) may require repair and maintenance resulting from ice and sleet. As in the event that occurred on April 3, 2003, regional or out-of-state services may be required to assist in cleanup and repair activities. Also, private or governmental tree removal services are often involved following ice and sleet incidents in order to remove trees from roadways, yards and away from power lines.

The National Weather Service and local media can alert the public of severe storms capable of producing ice and sleet.

4.21.2 Snow Storms

Definition

A period of rapid accumulation of snow accompanied by high winds and cold temperatures.

Historical Events

Oakland County has had 50 significant winter snow storm events since 1993.²¹¹ In 2011, Oakland County had 1 blizzard warning.²¹²

From 1993 through 2011, 23 heavy snow events, 6 snow events and 20 winter storms were reported in Oakland County.²¹³

On January 26, 1977, a Presidential Disaster Declaration was issued for 15 counties in the southern part of the state. Many residents were isolated in rural residences or stranded in public shelters.²¹⁴

²¹⁰ SEMCOG, *Land Use in Southeast Michigan 2010*, Specific to Oakland County, December 20, 2011.

²¹¹ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

²¹² Oakland County Homeland Security Division Tone Alert Broadcast Log 2011 and weather event records, January 20, 2012.

²¹³ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

On March 12 through 14, 1993, a snowstorm, now called “The Storm of the Century,” struck the Eastern U.S. dumping 56 inches of snow in some areas and causing \$2 billion in property damage. The storm impacted 26 states and approximately 50% on the nation’s population. A total of 270 deaths and over 600 injuries were attributed to the storm.²¹⁵

On January 2 and 3, 1999, heavy snow produced 15 inches in Royal Oak; 14 inches in Ferndale; 13 inches in South Lyon; 12 inches in Milford, Clarkston and White Lake; 11 inches in West Bloomfield; 10 inches in Rochester Hills, Farmington and Waterford and 8 inches in Holly and Oxford.²¹⁶ The weight of the snow tore a gash in the roof of the Pontiac Silverdome. Full operations at Detroit Metropolitan Airport did not resume until January 6, 1999.

On December 11, 2000, a heavy snow event over several counties produced 12 inches in Royal Oak; 12 to 14 inches in Oxford; 14 inches in White Lake; 11 to 12 inches in Farmington and Farmington Hills; 11 inches in West Bloomfield, 8.8 inches in Milford and 11 to 12 inches in South Lyon.²¹⁷

Frequency & Probability

Oakland County has had 50 significant winter snow storm events since 1993. The annual average snowfall in Michigan is 60.58 inches of snow per year. The annual average snowfall in Oakland County is 35.60 inches.²¹⁸ It is probable that snow storms will occur in the future in Oakland County.

Health & Safety

Deaths caused directly from the event are difficult to determine. Deaths related to snowstorms are usually caused by secondary effects such as delays in emergency vehicle response, auto accidents, downed power lines and heart attacks from overexertion. The direct risk to human life from snowstorms is low.²¹⁹

Area Impacted

Blizzards are the most dramatic of all snowstorms, bearing strong winds and an enormous amount of snowfall. Snowstorms can impact a large area of a community, especially if it results in heavy accumulations of snow. Due to the widespread nature of snow storms, the entire population could be impacted either directly or indirectly (i.e. power outages, etc.). Oakland County has approximately 7,343 miles of roadway that could be affected.²²⁰

²¹⁴ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 277.

²¹⁵ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 231.

²¹⁶ National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, *Standard Query for Severe Weather*, January 5, 2012.

²¹⁷ Ibid.

²¹⁸ USA Travel Website Oakland County Data, <http://www.usa.com/oakland-county-mi-weather.htm>, viewed January 31, 2012.

²¹⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, page 280.

²²⁰ SEMCOG, *Land Use in Southeast Michigan 2010*, Specific to Oakland County, December 20, 2011.

Economic Impact

Primary costs would include property damage and snow removal. Economic losses are dependent upon the degree of storm severity. Schools and businesses may be closed if snowfall is heavy, deep or if a snow emergency is declared that prohibits traffic on roadways. From 1993 through 2011, Oakland County has recorded \$6.4 million in damages as a result of snow storms.

Critical Facilities/Services

Response to a snow related emergency would primarily be localized. Initial response activities due to emergencies from snow storms would primarily be associated with local response from emergency medical services, public works departments and facilities such as MDOT. Municipalities would have increased costs in snow removal activities.

Transportation would be effected as roads and airports could see delays or short-term to long-term closures. Schools and businesses may be closed for a day to several days.

The National Weather Service and local media are critical in alerting the public of severe storms capable of producing snow storms and blizzard conditions.

4.22. Terrorism and Sabotage

Definition

An 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.

Historical Events

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 been greatly impacted for many years by acts of terrorism and sabotage. In more recent years, the United States has been victim to acts of terrorism.

Of increasing concern, is sabotage of computer systems also known as hacking. 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.

Unfortunately, Oakland County has experienced acts of terrorism. 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 carried out in response to court actions requiring a busing plan to integrate local schools.²²¹

²²¹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 196-200.

Frequency & Probability

It is difficult to establish a frequency for terrorist activity in Oakland County based on historical events. Acts of terrorism in Oakland County history include a bombing, an attempted bombing and 2 instances of pre-meditated workplace violence.²²² Therefore, including acts of pre-meditated workplace violence, there have been 4 acts of terrorism in Oakland County since the 1971 bus bombings. There have been 18 significant terrorist attacks in the State of Michigan. Despite a lack of an established frequency for this hazard, it is likely to occur in the future.

Sabotage of computer systems is a growing trend in the world. Governmental sites and private corporations have been targeted. The increased use and dependency on computer systems, technology and networks will lead to an increase in these types of crimes.

Health & Safety

Due to the nature of terrorist of attacks, it is difficult to establish a death or injury rate from historical events. Not all acts of terrorism are intended to cause death or injury, as demonstrated in the 1971 bus bombings. However, 2 instances of pre-meditated workplace violence have resulted in 9 deaths and 5 injuries.²²³

While sabotage to computer systems normally would not lead to harm to health and safety, it is possible. As technology becomes more integrated into society, the more access hackers will have to sensitive systems. Integration of systems such as electrical grids, nuclear power plants, air traffic control centers, traffic lights, etc., can leave these systems vulnerable to attack. If these systems are compromised, it is possible that people may be injured or killed.

Area Impacted

Terrorism can take many forms and the aim of terrorist attacks can vary from destruction of property to harming people to disrupting quality of life. Depending on the type of terrorist attack, property damage can be extensive.

Any information on this matter is law enforcement and homeland security sensitive and, therefore, is not available to the general public.

Economic Impact

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 great economic damage.

Critical Facilities/Services

Terrorist acts carried out on public infrastructure can directly impact the County's ability to operate essential facilities and provide services. Significant terrorist acts would require large-scale response from all levels of government.

Special Consideration

Homeland security is addressed under a separate needs and threat assessment, therefore, terrorist acts are not considered in this Plan.

²²² Ibid.

²²³ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 196-200.

4.23. Weapons of Mass Destruction

Definition

Weapons intended to cause widespread damage and high number of casualties.

Historical Events

Weapons of mass destruction typically fall into 4 categories: 1) missiles, 2) biological weapons, 3) nuclear weapons or 4) chemical weapons. In 2000, 33 countries were known to possess, or be able to obtain, 1 or more types of weapons of mass destruction.²²⁴ There are 9 countries known to have nuclear weapons as of June 2011.

Frequency & Probability

Weapons of mass destruction have never been used to carry out an attack in Oakland County. Globally, there have been 18 attacks since 1985.²²⁵ Although Oakland County does not have a history of attacks from weapons of mass destruction, the possibility of such an event does exist.

Although the actual number of nuclear weapons a country has is classified, there are estimates based on leaked information. It is estimated that there are currently approximately 20,500 nuclear weapons in the world. Of those, 4,830 are operational strategic missiles (ready to fire). This number does not include retired warheads waiting to be dismantled.²²⁶

Health & Safety

Given the nature of weapons of mass destruction, a successful use of these weapons would cause great loss of life and injury. Death and injury rates are highly variable with each attack and the form of weapon used. The greatest loss of life from such an attack occurred in Iraq on February 16, 1988, when Iraqi warplanes attacked a Kurdish city with mustard gas and nerve agents, killing up to 5,000 people, mostly civilians.²²⁷

In March 1995, a Japanese cult released sarin nerve gas within the Tokyo subway system during morning rush hour, killing 12 and injuring over 5,000 people.²²⁸

Depending on the type of weapon used, the effects on human health can linger for years, continuing to present a hazard.

Area Impacted

Any information on this matter is law enforcement and homeland security sensitive and, therefore, not available to the general public.

²²⁴ Federation of American Scientists, www.fas.org, Intelligence Resource Program, Countries With Weapons of Mass Destruction, January 2012.

²²⁵ Nuclear Threat Initiative, www.nti.org, Weapons of Mass Destruction Chronology 1985 through 2003, January 30, 2004.

²²⁶ Federation of American Scientists, <http://www.fas.org/programs/ssp/nukes/nuclearweapons/nukestatus.html>, February 1, 2012.

²²⁷ Nuclear Threat Initiative, www.nti.org, Weapons of Mass Destruction Chronology 1988, January 30, 2004.

²²⁸ Michigan State Police, *Michigan Hazard Analysis*, March 2006, page199.

Economic Impact

It is difficult to estimate the economic impact of a successful attack using weapons of mass destruction. It is anticipated that such an event would be incredibly damaging to life, property and infrastructure, as well as the local, state and possibly federal economy.

Critical Facilities/Services

An attack using weapons of mass destruction against public infrastructure can directly impact the County's ability to operate essential facilities and provide services. Successful attacks would require large-scale response from all levels of government. As stated above, the County has identified and evaluated locations within the County which are potential targets for weapons of mass destruction.

Special Consideration

Homeland security is addressed under a separate needs and threat assessment. Therefore, weapons of mass destruction are not considered in this Plan.

Table 20. Oakland County Hazard History Summary

Hazard	Hazard Impact				Hazard Rank	Consequence	Data Source	Notes
	Annual Frequency	Probability	Health & Safety	Area (sq miles)				
Civil Disturbances	0.1	Low	High	<1	32	Medium	Statewide	
Criminal Acts - Vandalism	10.011	Very High	Low	<1	1	Low	Oakland County	
Criminal Acts - Arson	252	Very High	Medium	<1	3	Medium	Oakland County	
Criminal Acts - Mass Shooting	0.35	Low	High	1	21	Medium	Statewide	
Drought	0.1	Low	Low	70	32	Medium	Oakland, NOAA, NIDMIC	
Earthquakes	0.09	Low	Low	907	35	Low	Oakland County	
Extreme Temperatures	1	High	Medium	907	11	Medium	Oakland County	
Fire Hazards - Wildfire	2.2	High	Low	<1	9	Low	Oakland County	
Fire Hazards - Scrap Tire Fires	0.33	Low	Low	<1	25	Low	Statewide	
Fire Hazards - Structural Fires	544	Very High	High	<1	2	Medium	Oakland County	
Flooding - Dam Failure	18	High	Low	5	5	Medium	Oakland County	23 High or significant dam hazards, 18 dam failures
Flooding-Riverine Flooding	0.6	Low	Low	5	17	Medium	Statewide	
Flood-Urban Flooding	1	Medium	Low	5		Medium	Oakland County	The frequency is dependent on seasonal weather patterns. Urban flooding is more likely to occur in the Spring. Assumes one per year.
Flood-Shoreline and Erosion	NA	NA	NA	NA	11			
Fog	0.5	Low	Medium	10	36	Medium	Not applicable	
Gas/Oil Shortages or Supply	0.16	Low	Low	907	26	High	Statewide	
Hazard Incidents - Fixed Sites	20	High	Medium	3	4	High	Oakland County	
HazMat Incidents - Transportation	0.12	Low	Low	3	30	Medium	Oakland County	
Infrastructure Failure - Water System	0.17	Low	Low	<1	31	Low	Oakland County	Significant events
Infrastructure Failure - Electrical System	1	Medium	Medium	5	10	High	Oakland County	Significant events
Infrastructure Failure - Storm Sewer System	0.5	Low	Low	<1	23	Low	Oakland County	
Infrastructure Failure - Sanitary Sewer System	0.05	Low	High	1-5	34	High	Oakland County	
Infrastructure Failure - Communications	0.5	Low	Medium	<1		Medium	Oakland County	Significant events - rating based on lack of communication with emergency response
Infrastructure Failure - Bridges, Roads, and Overpasses	0.5	Low	High	1	18	Medium	Federal Highway Administration	Significant events in the US
Invasive Species	0.35	Low	Low	907	21	Medium		
Nuclear Power Plant Accidents	0	Low	Medium	425	36	Medium	No established frequency	No established frequency
Oil and Gas Well Incidents	0.32	Low	Low	<1	26	Low	Statewide	
Petroleum and Natural Gas Pipeline Accidents	1	Medium	Medium	<1	11	Medium	Oakland County	
Public Health Emergencies - Pandemics and Epidemics	0.13	Low	High	907	28	Medium-High	Statewide	
Public Health Emergencies - Contaminated Food Supply and/or Water Supply	0.13	Low	High	907		High	Statewide	
Subsidence	0.33	Low	Low	<1	28	Low	Statewide	Statewide annual frequency based on non-mining subsidence
Terrorism and Sabotage	0.21	Low	High	<1	36	High	Statewide	
Thunderstorm	6	High	Low	907	7	Medium	Oakland County	
Tornadoes	0.51	Low	High	16	15	High	Oakland County and NOAA	
Transportation Accidents - Air	3	High	Medium	5	8	Low	Oakland County	
Transportation Accidents - Highway	10	High	Medium	<1-5	6	Medium	Oakland County	
Transportation Accidents - Rail	1	Medium	Low	<1.5	16	Low	Oakland County	
Transportation Accidents - Marine	0	Low	Low	<1	36	Low	Oakland County	
Weapons of Mass Destruction	0	Low	Very High	907	36	Very High	No established frequency	
Winter Hazards	1	Medium	Medium	907	11	Medium	Statewide	

5. Hazard Assessment

Assessment of the individual hazards was completed in 3 parts: First, an initial hazard ranking was conducting based on the results of the survey described in Section 5.1.1. Second, a workshop was completed to review the survey results, identify critical assets and evaluate the impact to the critical assets from the top hazards as described in Section 5.1.2. Third, meetings were conducted with representatives from each community to identify and rank locally significant hazards as described in Section 5.2. The final selection of the top 10 hazards, provided in Section 5.3, combined input from the Advisory Committee and the community meetings.

5.1. Hazard Assessment

5.1.1 Survey

The first survey was provided to the Advisory Committee members and the community representatives. Of the possible 273 survey participants (48 invited Advisory Committee members and 225 community representatives), 68 responded (25%). The results are summarized in Tables 21 and 22.

5.1.2 Risk Analysis Workshop

The first workshop evaluated specific hazards and critical assets. First, using a paired comparison methodology, workshop participants determined the most important criterion for evaluating hazards and evaluated each on a scale from 1 to 3 with 1 being low (<30) and 3 being high (>42). The same criteria as those used during development of the 2005 HMP were again selected. These criteria are provided below.

- Population impacted
- Economic impact
- Environment/services impacted including quality of life, environmental, community services and community confidence

Second, individual assets were evaluated for their vulnerability to the hazards. Each of the asset categories was ranked by the 3 criteria above.

Workshop participants then evaluated the likelihood of occurrence (considering frequencies) for the hazardous events. The results represent an aggregate measure of how susceptible the asset is to suffering from a hazardous event.

In the 2005 Plan, utilities, schools and churches were rated as having the highest event sums (most likely to suffer a hazardous event). Roads, railroads and bridges; commercial sites; residential areas; sports and entertainment centers and hospitals were ranked as less susceptible to impacts from hazards based upon the criteria above.

The 2012 Oakland County HMP Update identified roads, railroads and bridges and industrial sites as having the highest event sums (most likely to suffer a hazardous event). Lower ranking assets, in order of priority, were utility facilities and central business districts, commercial sites, residential areas, schools and churches, hospitals, sports and entertainment centers and public facilities and open space.

Table 21.
First Survey: Hazard Ranking
Oakland County Hazard Mitigation Plan Update

Hazard	Advisory Committee				Community Responses				
	Total	Rank	Average	Rank	Total	Rank	Average	Rank	
Natural Hazards	Drought	1	37	2.00	30	1	28	1.84	30
	Earthquakes	0	40	1.72	31	0	30	1.60	31
	Erosion - Shoreline	4	27	0.00	0	0	30	0.00	0
	Extreme Temperatures: Extreme Cold	7	22	3.89	14	5	21	2.98	19
	Extreme Temperatures: Extreme Heat	4	27	3.76	16	5	21	2.96	20
	Fires - Forest and Field	3	30	2.39	27	0	30	2.24	27
	Flooding - Riverine	4	27	3.20	22	2	26	2.73	22
	Flooding - Shoreline	2	32	0.00	0	2	26	0.00	0
	Subsidence - Natural	11	17	2.12	29	0	30	2.33	26
	Thunderstorms - Hail	23	3	3.53	18	17	4	2.84	21
	Thunderstorms - Lightning	26	1	3.65	17	17	4	3.27	17
	Thunderstorms - Severe Wind	24	2	4.41	3	23	2	3.95	2
	Tornadoes	16	8	4.11	10	26	1	4.18	1
	Winter Hazards - Ice and Sleet	10	19	4.50	1	16	6	3.75	8
	Winter Hazards - Snowstorms	5	25	4.47	2	15	11	3.80	6
Technological Hazards	Fires - Scrap Tire	7	22	2.61	26	0	30	1.96	28
	Fires - Structural	7	22	3.50	19	5	21	3.29	16
	Flooding - Dam Failure	2	32	2.29	28	0	30	1.84	29
	Flooding - Urban	10	19	0.00	0	0	30	0.00	0
	Hazmat Incidents - Transportation	18	7	4.41	3	16	6	3.76	7
	Hazmat Incidents - Fixed	16	8	4.06	12	15	11	3.57	11
	Infrastructure Failure - Communications	15	10	4.41	3	16	6	3.89	3
	Infrastructure Failure - Electrical System	15	10	0.00	0	20	3	0.00	0
	Infrastructure Failure - Sanitary Sewer System	14	12	0.00	0	15	11	0.00	0
	Infrastructure Failure - Storm Sewer System	14	12	0.00	0	15	11	0.00	0
	Infrastructure Failure - Water System	8	21	0.00	0	16	6	0.00	0
	Nuclear Power Plants	2	32	2.94	24	1	28	2.47	24
	Oil and Gas Well Accidents	3	30	2.87	25	0	30	2.44	25
	Petroleum and Natural Gas Pipeline Accidents	2	32	3.87	15	7	20	3.38	14
Subsidence - Mining	1	37	0.00	0	0	30	0.00	0	
Subsidence - Technical	2	32	3.20	22	0	30	2.67	23	
Human Related Hazard	Civil Disturbance	5	25	3.25	21	3	25	3.16	18
	Criminal Acts (Vandalism and Arson)	14	12	3.35	20	8	19	3.44	13
	Public Health Emergencies	14	12	4.29	6	16	6	3.87	4
	Terrorism	14	12	4.18	8	5	21	3.80	5
	Transportation Acc. - Highway	20	4	4.24	7	14	15	3.66	9
	Transportation Acc. - Rail	20	4	4.06	11	13	16	3.47	12
	Transportation Acc.-Air	20	4	4.13	9	13	16	3.33	15
	Transportation Accidents - Rail/Highway Crossings	11	17	0.00	0	13	16	0.00	0
Weapons of Mass Destruction	1	37	3.93	13	0	30	3.58	10	

After consideration of the likelihood that events would impact critical operations, the workshop considered the relative criticality of each asset class with the following results: The 2005 Plan identified industrial sites and utility facilities as most critical, followed by commercial sites and sports and entertainment arenas; hospitals and central business districts; schools and churches; open space; public facilities; residential areas and roads, railroads and bridges.

The 2012 Oakland County HMP Update identified commercial sites; roads, railroads and bridges and central business districts as most vulnerable (Table 22). Industrial sites, utility facilities, public facilities and sports and entertainment arenas were rated as having moderate vulnerability to hazards. Hospitals and response facilities, open space, residential areas and schools and churches were considered least vulnerable. Schools and hospitals were rated as being less vulnerable due to existing back-up systems that mitigate impacts from some hazards.

Table 22. Hazard, Risk, and Vulnerability Assessment as Ranked by Advisory Committee

Hazard Event	Workshop Rank	Hazard Risk Rank	Action Plan Needed
High Winds and Tornadoes	5	1	1
Infrastructure Failure All	1	2	1
Winter Hazards - Ice and Sleet	2	3	1
Winter Hazards - Snowstorms	4	4	1
Petroleum and Natural Gas Pipeline Accidents	7	5	2
Public Health Emergencies	2	10	3
Hazmat Incidents - Transportation	7	6	4
Flooding	6	7	4
Hazmat Incidents - Fixed	10	8	4
Transportation Acc. All	7	9	4

Action Plan Assessment		
	Rank	
Risk	1-5	6-10
1-5	1	2
6-10	3	4

Critical Asset	Criticality Rank	Asset Risk Rank	Vulnerability
Roads, Railroads, Bridges	4	1	1
Central Business Dist.	5	3	1
Commercial Sites	1	5	1
Industrial Sites	6	2	2
Utility Facilities	10	3	2
Public Facilities	3	9	3
Sports/Entertainment Arenas	2	9	3
Residential Areas	8	6	4
Schools, Churches	9	7	4
Hospitals/Response Facilities	11	8	4
Open Space	7	11	4

Vulnerability Assessment		
	Criticality	
Risk	1-5	6-11
1-5	1	2
6-11	3	4

The top 10 hazards were evaluated to determine their impact on critical assets. For conducting scenario based planning, it was worthwhile to note the hazard sums as well, since hazard impact was determined from those sums.

The 2005 Plan results:

- Infrastructure Failure (electrical, communications and sewer) (Hazard Sum: 33)
- Infrastructure Failure (water) (Hazard Sum: 30)
- Public Health Emergencies (Hazard Sum: 25)
- Tornadoes (Hazard Sum: 24)
- Transportation Accidents (Hazard Sum: 18)
- Weapons of Mass Destruction, Terrorism and Nuclear Power Accidents (Hazard Sum: 11)

The 2012 Oakland County HMP Update results:

- High Winds and Tornadoes (Hazard Sum: 33)
- Winter Hazards - Ice and Sleet (Hazard Sum: 33)
- Winter Hazards - Snowstorms (Hazard Sum: 33)
- Infrastructure Failure All (Hazard Sum: 21)
- Hazmat Incidents - Transportation (Hazard Sum: 17)
- Transportation Accident All (Hazard Sum: 16)
- Flooding (Hazard Sum: 16)
- Petroleum and Natural Gas Pipeline Accident (Hazard Sum: 16)

- Hazmat Incident - Fixed (Hazard Sum: 14)
- Public Health Emergencies (Hazard Sum: 11)

After determining the community-wide impacts of hazard events, risk values were calculated, including: (1) the probability of a hazard event, (2) the consequences to the community, (3) the probability of event success and (4) the risk to the community. This analysis resulted in the rankings shown in Table 22.

The lower half of this table, or set of tables, show assets first sorted by rank, then sorted by the base-line risk sums. Both show the associated vulnerability quadrant. The vulnerability quadrant is determined by the site's rank and the risk sum associated with disruptive events to the asset and the community. In other words, an asset that is highly ranked (ranks of 1 to 4) and is at high, or moderately high, risk (risk sums greater than 1.3), are the most vulnerable and should receive high priority for receiving mitigation strategies. Whereas, sites that are ranked low, and not at significant risk, are least vulnerable and considered low priority sites.

Some assets (roads and related infrastructure, central business districts and commercial sites) were rated as having high vulnerability levels for the base-line analysis. Industrial sites and utilities are in quadrant 1 (low rank but high risk) followed by public facilities and sports arenas in quadrant 3 (high rank but low risk). It is up to the community to prioritize these sites (either by risk or rank). Finally, the remaining 4 assets are in quadrant 4 (low rank and low risk) and should be at lowest priority for receiving mitigation strategies. A quadrant 4 site should not be construed as "safe" and neglected; it simply means that they are lower in priority when strategies are implemented.

During the workshop, it was pointed out that the outcome of the process is a "decision assisting tool" and not a decision making tool. Mitigation planning is done by the community with the aid and assistance of various planning tools and the Risk Vulnerability Analysis is just simply one tool to help guide decision makers in hazard mitigation implementation.

5.2. Community Input

The overall goals of a community, with respect to hazard mitigation, are to protect the local population from natural, technological and human health hazards that may occur and to reduce the potential impact of these disasters on vulnerable areas within the community. Representatives from each community in Oakland County were interviewed to identify hazards of particular concern to that community and specific hazard vulnerabilities within the community.

A ranking of community hazards identified during the interviews is provided in Table 23. A value of 1 represents the highest ranking. Most communities provided the top 3 ranked hazards, however, each community was asked to rank all significant hazards, resulting in some communities providing up to 5 of their highest ranked hazards.

Table 23. Hazard Rankings from Interviews with Oakland County Communities

Hazard (Responses)	Responses	Meeting Results		Avg.	Rank (by Average)
		Rank (by No. of Responses)	Mode (Priority)		
Tornadoes	39	1	1	1.5	1
Hazmat Incidents - Transportation	18	2	1	1.8	4
Terrorism	17	3	2	2.6	14
Flooding (Non-Dam)	13	4	1	1.9	5
Transportation Acc.-Highway	11	5	3	2.5	11
Hazmat Incidents -Fixed	10	6	3	3.4	19
Transportation Acc. - Rail	10	6	2	1.8	3
Fires (Structural)	9	8	2	2.0	6
Winter Hazards	8	9	1	1.6	2
Pipeline Acc.	5	10	4	2.8	15
Civil Disturbance	5	10	4	2.6	13
Transportation Acc.-Air	5	10	2	2.2	10
Infrastructure Failure - Communications	4	13	3	3.0	16
Thunderstorms	3	14	1	2.0	6
Infrastructure Failure - Electrical	3	14	2	2.0	6
Infrastructure Failure - Water System	3	14	2	2.0	6
Criminal Acts	3	14		3.0	16
Fires (Nat)	2	18		2.5	12
Infrastructure Failure - Sewer System	1	19		3.0	16
Nuclear Power Plants	1	19		5.0	20
Drought	0	21			
Earthquakes	0	21			
Extreme Temperatures	0	21			
Fires (Scrap Tire)	0	21			
Infrastructure Failure - Storm System	0	21			
Subsidence (Tech)	0	21			
Public Health Emergencies	0	21			

All 62 communities participated in the interviews. The 3 most frequently mentioned hazards were tornadoes, hazmat incidents - transportation and terrorism. The 5 hazards that were most frequently listed as the number 1 concern were tornadoes, hazmat incidents - transportation, non-dam flooding, winter hazards and thunderstorms.

Each community emphasized the hazards in different ways providing specific examples of community vulnerability and/or listing other hazards that were not included in their top rankings. The following describes the results of each of the interviews regarding potential hazards and the critical assets that could be affected.

5.2.1 Addison Township

Tornadoes, winter weather hazards and the potential for a leak or explosion at a natural gas pumping station are of concern for the citizens of Addison Township.

The hazard of greatest concern is the potential for a gas leak or explosion at the CMS pumping station and the community's preparedness to react to this situation.

Secondarily, the large number of trucks that travel on Lakeville and Rochester Roads, specifically those carrying hazardous materials, create the potential for a hazmat emergency.

The likelihood of a civil disturbance or mass casualties at large gatherings is a concern to the Township.

Two major pipelines go through Addison Township, a 36-inch crude oil pipeline and a 24-inch natural gas pipeline.

5.2.2 City of Auburn Hills

Due to the large number of people attending events at The Palace of Auburn Hills, tornadoes are a particular hazard of concern. Hazmat incidents, both fixed locations and transportation related, were also of concern in the City of Auburn Hills.

A large volume of trucks traveling on M-59 and I-75 present a hazmat threat. According to Auburn Hills representatives, emergency response teams need additional training and sufficient equipment to respond properly to potential emergencies involving hazardous materials.

Auburn Hills is home to 18-20 corporate world headquarters and; therefore, is at an increased risk for a civil disturbance or terrorist hazard.

With the downturn in the regional economy and the changes in state welfare policies, there is renewed concern that there may be a negative impact in the crime rates in Auburn Hills. The crime rate in Pontiac, an adjoining community, has increased and Auburn Hills is experiencing some overflow from the state-wide changes.

There are 2 large landfill sites in the City. One of these sites is older and is under frequent monitoring by MDEQ for higher than acceptable methane levels that may put it at an increased risk for fire and/or explosion.

5.2.3 City of Berkley

The possibility of a fire or a tornado touching down at an 8-story senior citizen living facility is a significant concern to the residents of the City. The combination of the physical limitations of some of the residents and the request for special equipment needed to face such emergencies makes this location vulnerable to fire and tornado hazards.

Woodward Avenue and Greenfield Road are busy roads and are frequently used by trucks carrying hazardous materials. A traffic accident involving 1 of these trucks presents the potential of a hazmat emergency.

High winds are a concern to the residents as these winds knock down trees and power lines. The last storm that caused major damage was in August 2011.

Heavy rains on September 11, 2011, dropped 3 inches of rain in 1 hour causing flooding throughout the City.

An underground petroleum pipeline parallels Greenfield Road. Leaks or breaks within the pipeline are a potential hazard.

A pool supply company on Twelve Mile Road stores large amounts of hazardous material.

5.2.4 Village of Beverly Hills

Winter weather and its effect on the community's roads, most notably Southfield and Fourteen Mile Roads, is a top hazard in the Village. These roads are also the daily route for large numbers of trucks carrying hazardous materials. The need exists for up-to-date hazmat equipment as well as continued training.

The area where the Rouge River intersects the Village, primarily west of Greenfield Road and south of Village Drive, has a history of flooding.

The threat of tornadoes and the community's ability to respond to them is an area of concern.

Power outages caused by trees and branches downed by high winds are a major concern for the Village.

The potential for a hazmat accident(s) related to a natural gas pipeline along Fourteen Mile Road which is also of concern.

5.2.5 Village of Bingham Farms

Flooding of the tributaries of the Rouge River is a concern at many locations in the Village. The area most susceptible to this hazard is on the Franklin Branch of the Rouge River, located north of Thirteen Mile Road and south of Woodlyne Road.

Telegraph Road, with its large volume of truck traffic, creates a risk of traffic accidents as well as hazmat emergencies.

Ice storms are a significant threat with residents being without power for several days.

Tornadoes are a significant threat to the residents of the Village of Bingham Farms. High winds knocking over trees and power lines have become a major concern with residents.

The potential for a hazmat accident(s) related to a 12" pipeline running along Thirteen Mile Road is also of concern.

The Village's existing ladder fire truck cannot reach all points on the high school roof if there happens to be a fire. A longer ladder would benefit the safety of the residents, students and firemen.

5.2.6 City of Birmingham

Potential for the Rouge River to flood and cause damage to businesses in the downtown area makes river/urban flooding a top hazard for the City of Birmingham. Floodgates have been installed at many structures and have proven successful in mitigating the damages caused by flooding.

High winds and winter storms have become major concern for the residents of Birmingham.

Woodward Avenue, a heavily traveled north-south route through the City, has a history of numerous vehicular accidents. The traffic on Woodard includes trucks that carry hazardous materials. In addition, trains traveling along the Grand Trunk Western Railroad tracks, located near the eastern border of the City, also carry hazardous materials. A truck accident or a train derailment resulting in a chemical spill is a significant risk to the City and its residents. A need exists to provide hazmat training to all public service employees that will better prepare them to meet such.

5.2.7 Village of Bloomfield

The Village of Bloomfield is not a separate political jurisdiction, but is a subdivision located entirely within the borders of Bloomfield Township. It does have its own police force that is made up of Township employees and fire fighters that are residents. As such, it was described separately in the 2005 Oakland County HMP and is treated separately again. However, all disaster related emergencies within the Village of Bloomfield are handled by the Township's public safety department. The Village is covered, like all other subdivisions in the Township, under the Township's single-jurisdiction Hazard Mitigation Plan approved by FEMA in 2011.

Tornadoes are the major concern for the residents of Bloomfield Village because the community is mostly residential.

5.2.8 City of Bloomfield Hills

Woodward Avenue and Long Lake Road are the most traveled streets in the City and are known for having numerous traffic accidents.

There is a concern regarding hazardous materials that travel through the City via railroad causing a potential hazmat hazard.

High winds and thunderstorms have caused several power outages and other damage from the winds.

5.2.9 Bloomfield Township

Bloomfield Township has developed its own Hazard Mitigation Plan to maintain eligibility for pre- and post-disaster FEMA grant monies. They have developed both a Flood Mitigation Project Plan and a Hazard Mitigation Plan, dated July 2010 and August 2011, respectively. Flooding is a particular concern for Bloomfield Township.

5.2.10 Brandon Township

Tornadoes are a significant threat to the residents of the mobile home park located south of Seymour Lake Road between Dartmouth and Sashabaw Roads. According to Brandon Township personnel, additional sirens that would serve this area are needed.

M-15, a heavily traveled two-lane road, has a history of numerous traffic accidents.

Flooding of Paint Creek results in the closing of Poli Road between Lockwood and Sashabaw Roads.

Ice storms are a significant threat with residents being without power for several days to a week. High winds knocking over trees and power lines have become a major concern with residents.

A switching station with battery back-up on the corner of M-15 and Narrin Road is a possible hazard.

A crude oil pipeline runs just south of M-15 and Grange Hall Road.

A propane supplier has 2-30,000-gallon tanks that could present a hazard to the community.

5.2.11 City of Clarkston

Tornadoes, ice storms and thunderstorms that are accompanied by high winds, create a threat to the historical downtown area of Clarkston and to its residents. Resulting power outages have a significant effect on the population, especially on the elderly and those who depend on private wells for their water supply.

Older buildings located on Main Street between Clarkston and Waldon Roads are, in many cases, not equipped with modern fire preventive systems. According to personnel with the fire department, if a fire was to occur in the downtown area, assistance from neighboring communities would be needed (Figure 14).

Tornadoes are also a hazard of concern to the City.

Transportation accidents on M-15 have become a major concern for the residents of Clarkston.

5.2.12 City of Clawson

A 15-story senior citizens complex presents a specific risk in the event of structural fire, tornadoes and high winds.

Trucks carrying hazardous materials along Fourteen Mile Road create a potential hazmat hazard that could endanger the lives of the citizens of Clawson.

A local elementary school is in the direct flight path of Oakland Troy Airport. Although the potential of an airplane accident at this site is remote, the consequence could be devastating.

Additional emergency response, manpower and training are needed.

The potential for a pipeline rupture is also a specific hazard identified.

High winds running parallel to Fourteen Mile Road cause major damage to property in that area.

Sewer and water main lines in the City are over 30-years old. As such, they are at risk for breakage and infrastructure failure. The water main is located directly underneath the high school. There is currently no contingency plan identifying evacuation plans nor a means for providing classes to high school students should the water main break.

5.2.13 Commerce Township

A tornado touching down in the Township would be a significant threat to all citizens. The residents of the mobile home park located west of Wixom Road, between Loon Lake and Glengary Roads, are most vulnerable.

There are 3 companies in the Township that are identified as potential hazmat risks to the community.

The likelihood of multi-vehicle accidents on M-5, Union Lake Road or Haggerty Road are identified as hazards.

Several buildings are located in a flood plain area. There has been increased flooding of Hayes Creek recently.

Securing police and fire station with cameras and fencing to protect from vandalism or theft is a priority.

Mobile command vehicles for emergencies, missing children, power outages, floods, tornadoes, etc. are needed.

Radio dead zones are present in some areas, even after changing over to the OakWin Radio System. Most of the dead zones are in the 3 high schools. Installation of bi-directional antennas is a top priority.

5.2.14 City of Farmington Hills

A history of flooding problems exists in the City. The areas of greatest concern are locations near Fourteen Mile and Halsted Roads and Grand River Avenue at Ten Mile Road.

Weather hazards such as tornadoes could affect the entire City.

Snow and ice storms present significant problems to drivers on I-696, M-5 and I-275. Adding to the risks is the difficulty the fire department has experienced in responding to emergencies on major highways because of limited access.

Farmington Hills representatives also addressed concerns regarding numerous dead spots of communication from the OakWin Radio System inside and outside of buildings.

The City has numerous gas and oil pipelines running through it that could be a potential hazmat hazard.

There are several buildings containing hazardous materials located within the City which could be a potential for a hazmat incident.

5.2.15 City of Farmington

The possibility of a fire or tornado hitting the high rise senior citizen facility located on School Street off Grand River Avenue create specific concerns, especially for the fire department.

Two (2) companies located within the City present a hazmat risk to the community. Specific training with other communities in large scale emergencies is requested by the City of Farmington.

Radio dead zones are still present in some areas, even after changing over to OakWin Radio System. Most of the dead zones are in the 2 high schools and a senior facility. The need for bi-directional antennas is top priority.

5.2.16 City of Ferndale

The potential for hazmat accidents involving trucks, trains or local businesses exist.

Woodward Avenue and Eight Mile Road, both heavily traveled state trunk lines, are the primary routes for many large trucks carrying hazardous materials through the City.

A train derailment with the potential of a chemical spill is a risk for the neighborhoods along the tracks in the north-central to southwest sections of the City.

There is a rail yard that has significant storage of hazardous material.

Multiple local businesses have been identified as potential risks due to the nature of products that are stored at the facilities. According to City representatives, in many cases, the fire department would not be adequately equipped to respond to hazmat accidents.

The loss of electrical power, either due to severe weather or infrastructure failure, is also a concern, along with the threat of a tornado.

The City's preparedness to respond to a potential hazmat emergency places a risk on all citizens of the community.

5.2.17 Village of Franklin

The Village has experienced significant damage from natural hazards such as tornadoes and high winds. The results of which require significant debris removal.

Ice storms are a significant threat with residents being without power for several days to a week.

High winds are a major concern with residents due to fallen trees and power lines.

Flooding that exists in the area of Fourteen Mile and Franklin Roads is a concern for the Village of Franklin.

A major fire in the downtown district is of particular concern due to the fact there are no fire hydrants located in the Village of Franklin.

The potential for a rupture in the 12-inch pipeline along Thirteen Mile Road is also noted as a local concern.

Village officials also noted that the entire community receives water from individual, private wells and that approximately half of community residents depend upon a grinder pump system for wastewater collection and disposal. Both water supply and wastewater disposal are at risk in the event of electrical power failure.

5.2.18 Groveland Township

A tornado or other high wind incident is a significant threat to the entire community and especially at risk are the residents of the mobile home park located off Dixie Highway and Oak Hill Road.

The Township has numerous areas that are vulnerable to flooding, many of which frequently result in road closings. The roads that are most significantly impacted by these floods are McGinnis, Perryville, Jossman and Tripp Roads.

There are over 4,800 acres of grasses and shrub land in the Township. Emergency vehicles cannot easily access many of these remote locations.

Community leaders also addressed the potential of a hazmat incident involving trucks traveling along I-75, M-15 and Dixie Highway.

There is a potential of a civil disturbance or other emergencies at the annual Renaissance Festival which is held along Dixie Highway.

5.2.19 City of Hazel Park

The City has a number of companies that store hazardous materials. In addition, trucks traveling through the City, especially on I-75, often carry hazardous materials. The danger of an accident involving hazardous materials presents the need for additional equipment to respond to hazmat accidents, as well as additional training for staff.

Hazel Park has 2 older structures that are considered significant fire hazards. The lack of high angle rescue equipment would contribute to the difficulty of fighting a fire at these locations.

Additional hazards of concern are traffic accidents on I-75 due to the S-curve through the City and the increase of traffic flow.

Another concern is power outages resulting from thunderstorms and high winds.

5.2.20 Highland Township

Highland Township is a rural area consisting of over 2,600 acres of forest land. This area is especially susceptible to power outages as a result of limbs and trees falling across lines during ice or wind storms. These outages, many lasting a number of days, create a hardship for citizens and local businesses.

At greatest risk in the event of a tornado are the residents of the Highland Hills Mobile Home Park located on North Milford Road. Additionally, there is a need for a tornado siren in the northeast section of the Township.

There is a risk of a train derailment resulting in a hazardous material spill.

5.2.21 Holly Township

A tornado is a danger to all residents of the Township. At greatest risk are the residents of the mobile home park located on East Holly Road between Flak and Tucker Roads. Holly Township representatives indicated concern regarding their ability to alert all citizens in the event of a tornado. Township officials expressed a desire for additional warning sirens within the Township.

With over 4,300 acres of wetlands in the Township, flooding can become a problem.

The annual Renaissance Festival may attract as many as 25,000 people. Although the festival is usually without incident, civil disturbance or a mass casualty event are possible.

The potential for an increase in vehicle accidents on Grange Hall Road due to the construction of a new development northwest of the Township was also a concern for Holly Township.

The 36" and 18" natural gas pipelines and pumping station are potential hazard.

High voltage tension wires are a potential hazard.

A communication tower is a potential target to disrupt communications.

Aging and inadequate culverts are a major concern to residents. A washout around a culvert resulted in a train derailment.

Grange Hall Road has been designated as a truck route from I-75 to US-23 which creates a potential for hazmat accidents.

5.2.22 Village Of Holly

There are 2 railroad lines that run through the Village of Holly. The CSX Railroad runs north and south, and The Grand Trunk Railroad runs east and west. The 2 tracks cross in the area of Gram and Sherman Streets, just south of downtown. A train derailment, especially involving a chemical spill, could have a devastating impact on the Village of Holly.

Damage from high winds, tornadoes and thunderstorms continue to be a hazard for the Village.

There is a local utility company that utilizes a large number of batteries on site for backup purposes. There is a risk of a hazmat incident should there be a fire at this location.

5.2.23 City of Huntington Woods

Because of the high number of large trees and older homes, thunderstorms accompanied by high winds can cause large scale damage as well as power outages in this community. A tornado touching down in the City could be most devastating, especially at risk is a local elementary school.

The Detroit Zoo, located in the southeast corner of the City, attracts hundreds of thousands of people every year. Because of the necessity to store certain hazardous materials needed to run the zoo, an emergency that would require immediate evacuation of the zoo may occur.

High winds have become a major concern with residents by knocking over trees and power lines. The last storm that caused major damage was in August 2011.

Woodard Avenue is a potential hotspot for traffic accidents, especially during the Woodward Dream Cruise in August.

5.2.24 Independence Township

Power outages adversely affect the entire community. Residents most vulnerable are the elderly and those dependent on private wells. The need for a system to be devised that would provide assistance and needed supplies to these affected individuals was expressed by representatives of Independence Township. Of particular concern would be the residents of a senior citizen assisted living facility.

The DTE Energy Music Theatre, located at Clarkston and Sashabaw Roads, is a popular area attraction that often brings crowds of 15,000 people. On most concert evenings, there are very few problems at the Music Theatre; however, due to the large number of people attending these

events, there is the potential for a civil disturbance. A training program set up with neighboring public safety departments, to specifically deal with a civil disturbance at the Music Theatre was addressed by the Township representatives.

A tornado could be devastating to the entire Township. At particular risk is the mobile home park located on Mann Road at I-75 and senior citizen facilities.

5.2.25 City of Keego Harbor

There are many streets in Keego Harbor that are located in designated flood plain areas. During heavy rainstorms many of these streets are vulnerable to flooding. In addition, local sewers have a tendency to back up.

Years ago Keego Harbor was a vacation community that consisted of many small cottages. Many of these cottages still exist, however, due to their age and construction, they are not as structurally sound as modern construction codes mandate. In the event of a tornado or very high winds, these older homes may not provide sufficient shelter for residents.

The Police Department Headquarters is an older structure that is susceptible to flooding and power outages. An immediate need to supply the department with an emergency generator that would alleviate these problems was expressed by City of Keego Harbor representatives.

The potential for vehicle accidents due to the heavy traffic volumes on Orchard Lake and Cass Lake Roads was noted as a concern for local officials.

5.2.26 City of Lake Angelus

This small community located in Northern Oakland County identified 2 fuel storage tanks as their primary concern. The tanks have a capacity of approximately 300 gallons.

Due to the number of larger trees and older homes, the risk of damage caused by a tornado is most significant to the area of Lake Angelus.

Ice storms are a significant threat with residents because of larger older trees that are present in the area.

The City is responsible for one-half mile of Baldwin Road near Great Lakes Crossing Outlets where there is a potential for a hazmat incident.

5.2.27 Village of Lake Orion

Natural Hazards such as tornadoes, thunderstorms, and winter weather hazards are concerns for this community. Ice storms have had the most significant impact on the Village of Lake Orion. M-24, the main route through the community, is especially treacherous during these storms.

Infrastructure failure of the dam for Lake Orion which controls the flow of water under M-24 is of concern to the Village representatives. If there is a breach in the dam there would be significant flooding that would impact residents and businesses south of the lake.

5.2.28 City of Lathrup Village

The threat of a tornado and other weather emergencies is a concern to the residents of the City. Although tornado warning sirens seem to be adequate, the lack of a public shelter for emergencies was a concern.

Heavy rains can result in flooding and sewer backups. Areas significantly affected are the streets of Eleven Mile and Red River.

A natural gas pipeline through the City, and the potential for breaks or spills, are a potential hazard.

5.2.29 Village of Leonard

The Village of Leonard is a rural community located in the northeastern corner of Oakland County. Because it is located away from more populated areas, there are times that the Village does not receive the assistance requested in emergency situations. An example of this was a recent ice storm that caused significant damage to many trees in the Village. It took a period of 6 days for citizens of the community to open the roads. The elderly and others who may need immediate medical attention are at particular risk.

There is a 100-year old grist mill that is being considered for designation as an historical building. Due to the age and construction materials used on the building, the risk of a fire is high. Currently there is no fire prevention equipment such as sprinklers in the building.

Traffic accidents in the area of Forest and Elmwood Streets were also of concern to the Village of Leonard.

The Strawberry Festival attracts a large crowd of people every year with a potential of civil disturbance or mass casualties in a hazardous situation.

Currently there is no sewer system to handle heavy rain fall or melting snow. There are no storm drains to handle storm water runoff and flooding.

5.2.30 Lyon Township

Tornadoes are a danger to all people living in the Township. Residents who live in mobile home parks are most vulnerable to injuries and property damage from these storms. Mobile home parks in Lyon Township are located off Eight Mile Road, east of Griswold and off Grand River Avenue between Kent Lake Road and Martindale Road. A need for additional outdoor warning sirens in the community was expressed by Lyon Township representatives as well as the concern of potential multi-vehicle accidents on I-96 near Milford Road.

5.2.31 City of Madison Heights

Building fires are a concern to the residents of Madison Heights. Madison Heights has 5 high-rise senior citizens apartment complexes within the City. Due to the height of these buildings, and the physical limitations of some of their residents, these buildings are more vulnerable to a fire hazard. A need to train fire department personnel in regard to responding to emergencies in high rise buildings was addressed by the City of Madison Heights representatives.

I-75 and I-696 are major highways that run through the City of Madison Heights. Because of the large volume of traffic, both of these highways have numerous traffic accidents. Most critical of these are multi-vehicle accidents.

Tornadoes were also a significant hazard identified.

High winds have become a major concern with residents by knocking over trees and power lines. The last storm that caused damage was in August 2011.

Eight industrial businesses have hazardous materials on site which have the potential for hazmat emergency.

Due to the tighter restrictions and changes to state and federal aid programs, large volumes of residents on governmental assistance are no longer eligible to receive these benefits. This has the potential of causing an increase in criminal activity.

5.2.32 Milford Township

Tornadoes are a concern to Milford Township. At greatest risk in Milford Township are the residents living in the Childs Lake Mobile Home Park. According to representatives with Milford Township, the lack of a sufficient number of outdoor warning sirens increases the risks to the people of the community.

Milford Township also identified the potential for a train derailment, especially involving a release of hazardous materials, as a chief concern within the community.

The potential of health emergencies on the aged population of the community is of concern.

5.2.33 Village of Milford

Although civil disturbances are rare in the Village of Milford the potential does exist at the Milford Memories Festival, as well as the Christmas and Memorial Day Parades, which attract many people to the area.

The potential of a train derailment exists in the Village of Milford. Railroad tracks running north and south through the Village present a threat to the community. A railroad accident, especially one involving the release of hazardous materials, could be devastating to the citizens of the Village.

The potential damage caused by a tornado is also a concern to the community.

5.2.34 City of Northville

The potential of a structural fire in the downtown area is a concern to the City of Northville. The advanced age of many buildings, and the fact that some of these are interconnected, make the downtown area vulnerable to structural fires.

The threat of a train derailment, especially involving a hazardous material spill, presents an additional hazard to the City.

5.2.35 Novi Township

The community consists of 6 roads which are located in 1 subdivision plat. Road repair and replacement are a concern to Novi Township.

Extreme temperatures and winter hazards are a major concern for the residents of Novi Township. Road erosion is a major concern to residents because poor roads make traveling a safety hazard.

5.2.36 City of Novi

The potential of an accident involving the release of hazardous materials is a concern to the City of Novi. Personnel need to be equipped to handle a potential derailment of a train carrying hazardous materials on the railroad running north to south through the City.

Tornadoes are a risk to all communities in Oakland County. Areas most vulnerable to tornadoes in the community are manufactured home communities. These communities take up 313 acres of land in Novi and are located at 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 and resulting power-outages are of concern to the City.

Traffic accidents especially on I-96, M-5, I-275 and Novi Road are a hazard.

The potential of a structural fire at one of the senior citizen facilities located in the City would be of particular concern because of the residence limited mobility, health conditions and age.

Road construction can lead to accidents and traffic congestion causing difficulties for emergency personnel. Frequent gas line ruptures at construction sites are of concern.

The City would like to eliminate radio dead zones and provide continuous coverage of the OakWin Radio System in all buildings located in the City.

5.2.37 City of Oak Park

Hazards such as structure fires, thunderstorms, and tornadoes are a concern for the City of Oak Park.

At particular risk, during any one of these occurrences, are the multi-story residential apartment buildings, including a senior citizen complex.

Transportation related hazards are a concern due to the highly travelled trunk lines in Oak Park including I-696 and Eight Mile Road.

5.2.38 Oakland Township

The threat of thunderstorms accompanied by high winds and heavy rains are a concern to the residents of Oakland Township: specifically, trees or branches falling on power lines or blocking Township roads.

In addition, flooding as a result of heavy rains is a recurring problem. Roads that are particularly vulnerable to flooding include Canyon, Gallagher, Collins, and Orion Roads.

The potential of a hazardous material emergency exists in the Township. Specific training and proper equipment needed to respond to these and all hazmat emergencies is a concern to the Township representatives.

Natural gas pipelines and chemicals stored by farmers could be a potential hazard.

5.2.39 City of Orchard Lake

The potential for hazardous material emergencies exists in the City of Orchard Lake. Trucks carrying hazardous materials through the community present a potential danger to the citizens of the community. Roads most frequently traveled by these vehicles are Orchard Lake Road, Pontiac Trail, and Commerce Road.

In addition, fuel storage at local facilities presents an additional hazard. This area is especially at risk due the close proximity to a school.

Response to major emergencies is an area of concern to the City of Orchard Lake representatives, especially with regard to hazmat training and manpower.

Thunderstorms are a major concern to citizens of Orchard Lake because of power outages.

5.2.40 Orion Township

Structural and natural fires are potential dangers to the people and property of Orion Township.

The occurrence of a tornado could be devastating to the people and property of Orion Township. At greatest danger are the residents who live in the mobile home park located off of Brown Road, west of Lapeer Road.

Another natural hazard that presents a risk to the community is winter weather, especially ice storms. The people most affected by these storms are drivers on M-24. This heavily traveled road has been the scene of numerous accidents as a result of winter weather hazards.

A natural gas pipeline runs through a small portion of the Township that could be a potential for a hazmat incident.

5.2.41 Village of Ortonville

Insufficient warning of a tornado, or the resources to properly respond to emergencies caused by tornadoes, is a concern to the Village of Ortonville representatives.

Because of the advanced age of many buildings in the Village, a building fire in the downtown area could be devastating.

M-15 is the major road in the community and experiences numerous vehicle accidents.

Ice storms are a significant threat with residents being without power for several days to a week. High winds have become a major concern with residents by knocking over trees and power lines.

Frontier (Verizon) switching station is a possible hazard because of battery back-up on the corner of M-15 and Narrin Road.

A crude oil pipeline runs just south of M-15 and Grange Hall Road.

A propane supplier has two 30,000-gallon tanks that may represent a risk to the community.

5.2.42 Oxford Township

A tornado in Oxford Township was identified as a primary hazard of concern. Mobile home parks cover over two hundred acres of Township land. These parks and their residents are the most vulnerable to damage and injury by a tornado. The parks are located off Lakeville Road, east of the Village of Oxford, and at 1540 Lapeer Road.

Generator based power for the 2 senior living facilities would be at risk if the power was out for an extended period of time.

M-24 is a heavily traveled road that runs north and south through the Township. Because of large number of trucks traveling this route, the potential for traffic accidents is significant. In addition, many of these trucks transport hazardous materials. The potential for a hazardous material emergency exists at local industrial facilities as well as on M-24.

An energy pipeline that runs through the Township has required repairs at several locations. Township representatives consider this pipeline to be a potential hazard to the community. Should there be a malfunction in the pipeline, the damage to the environment and residents of the Township would be significant.

5.2.43 Village of Oxford

M-24 is a heavily traveled road that runs north and south through the Village. Because of large number of trucks traveling this route, the potential for traffic accidents is significant. In addition, many of these trucks transport hazardous materials increasing the risk to the community. The potential for a hazardous material emergency exists at local industrial facilities as well as on M-24.

5.2.44 City of Pleasant Ridge

The primary area of concern in the City includes vulnerability to electrical disruptions due to infrastructure system failures or severe weather. The City has had several power outages that have severely impacted their community. The City has not been satisfied with the response time from the local utility company.

5.2.45 City of Pontiac

Hazards such as tornadoes, winter weather hazards, hazmat incidents, and traffic accidents are all concerns to the residents of the City of Pontiac. Fire services in the City of Pontiac are provided by the Waterford Regional Fire Department.

A major concern that presents a significant risk to the community 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. A rail yard within the city limits increases its potential for a hazardous materials incident or terrorist attack.

The high frequency of crime, as in many large cities, is a significant issue in the City of Pontiac. The practice of assigning inmates released from the Oakland County Jail to half-way houses

and other facilities in Pontiac, rather than requiring them to return to their own communities is a concern to City of Pontiac representatives.

5.2.46 City of Rochester Hills

Areas of the community 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 the flooding include the large amounts of water originating in other communities and overflowing the rivers and streams of this City. In addition, citizens who build private bridges on their property contribute to the problem as these bridges will many times get blocked by debris causing subsequent flooding.

Emergencies such as fires or tornadoes at senior citizen facilities present significant risks. The fact that there are currently 15 of these facilities in the community presents even greater challenges to the City's public safety departments. One area of concern is the lack of a specific plan to transport the residents of these communities to a safe area. Contributing to this problem is the physical limitations of some of the residents.

City leaders addressed the potential of a hazmat emergency at an area industrial facility as a concern.

High winds have become a major concern with residents by knocking over trees and power lines. The last storm that caused major damage was in August 2011.

Electrical grid failures have become a major concern with the community because of the larger number of senior citizens living in the area.

M-59 is a potential hazard because of the high traffic volume along with the transportation of hazmat material.

5.2.47 City of Rochester

The risk of damage caused by a tornado is most significant in the downtown historical area of the City. Because of the age of the structures, this area is also vulnerable to structural fires.

The potential of a fire at the a local senior citizen residential complex is a specific vulnerability.

Flooding of the Clinton River exists in the southern portion of the City, specifically along South Street.

The City of Rochester is confident, that with the continuance of the current level of cooperation from Oakland County, that they have sufficient resources to respond and mitigate these and other potential hazards.

High winds have become a major concern with residents by knocking over trees and power lines. The last storm that caused major damage was in August 2011.

Electrical grid from the local service provider has poor power quality which is causing damage to equipment due the fluctuations of voltage through the power lines.

Ice storms have become a major concern with residents by making traveling a major hazard with senior citizens.

Hazmat accidents are a major concern with residents because there are 12 companies around the City that carry or possess hazardous materials.

Increased traffic on Rochester Road has become a potential hazard because of the hazardous material being transported and the potential of multi-car accidents.

5.2.48 Rose Township

This rural community situated in the northern section of Oakland County is home for over 6,000 people so tornadoes and winter storms are a major concern for residents.

Township officials specifically addressed concerns regarding emergency access to mobile homes in the northern part of the Township. There have been instances where trains have stopped in front of the Holly Shores Mobile Home Park, blocking both entrances for a significant period of time. This is not only an inconvenience for the residents, but also makes responding to emergency situations difficult.

Concerns regarding trains and railroads were mentioned due to the possibility of chemical spills or fires in remote and environmentally sensitive areas.

The 36" and 18" natural gas pipelines, a crude oil pipeline, and a pumping station are potential hazards to the Township.

High voltage tension wires are a potential hazard.

A communication tower is a potential target to disrupt communications.

Aging and inadequate culverts are a major concern to residents because a washout around a culvert has led to a train derailment.

5.2.49 Royal Oak Township

There are many structures in this community that are especially vulnerable to fires and tornadoes. Most vulnerable are the older wood houses in the area of Wyoming and Pasadena Street, and the senior citizen high rise located at Wyoming and Eight Mile Road.

The potential exists in the Township for accidents involving trucks carrying hazardous materials

5.2.50 City of Royal Oak

The potential for a hazardous material emergency exists in the City of Royal Oak. An accident involving a train derailment, especially in the downtown area, or a chemical spill on I-75 or I-696, could be devastating for the community.

In addition, the occurrence of a gas leak or explosion at a local industrial facility is an additional concern. City of Royal Oak officials are concerned that they lack sufficient personnel and appropriate emergency equipment to handle a hazmat incident of this type.

City officials addressed the need for additional emergency shelters.

Downtown Royal Oak has become a popular night spot that attracts large numbers of people. On certain occasions, such as the winning of a championship by a local professional team, a

larger crowd tends to gather downtown. This creates risk in other parts of the City not having a sufficient number of public safety personnel to perform their duties since they are needed to respond to the celebrations.

A nuclear research center in the City is a potential hazard.

5.2.51 City of South Lyon

Tornadoes are a top hazard identified. Residents of the mobile home park located in the midtown area are highly vulnerable to tornadoes. In addition, the residents of the assisted living and nursing home facilities located on Reynolds Sweet Street are also highly vulnerable.

Due to insufficient drainage, flooding has become a recurring problem at the Colonial Acres Subdivision, located south of Eleven Mile Road and west of Lafayette Street. Most vulnerable to flooding in this area are the residents of Colonial Acres Adult Community, located at 25015 Potomac Court.

There are several companies that store hazardous materials at their facilities. In addition, trains traveling through the center of the City carry hazardous materials.

A natural gas pipeline that runs through the City and a pumping station at Nine Mile Road are potential hazmat hazards.

5.2.52 City of Southfield

Tornadoes, severe thunderstorms and ice storms in the City of Southfield were identified as a primary hazard of concern.

Power outages due to high winds and falling trees are another major concern for residents.

Flooding of the tributaries of the Rouge River is a recurring problem for the City of Southfield. Erosion of the riverbanks and the loss of trees have been the result of flooding events. Areas that are most vulnerable include Tamarack Creek and the Evans Branch of the Rouge River, which are both located near Ten Mile Road between Evergreen and Lahser Roads. Many floods in these areas are the result of insufficient detention for storm water runoff.

There are many heavily traveled roads in the City of Southfield. As a result, highway accidents are a frequent occurrence.

A large number of trucks carry hazardous material on many of the roads; therefore, there is a potential risk of a hazmat emergency. Roads that would be most vulnerable to this type of emergency include I-696, Northwestern Highway, Southfield Road, and Telegraph Road.

Criminal activities, especially in the area of Twelve Mile and Telegraph Roads, are of concern to the City of Southfield representatives.

5.2.53 Southfield Township

Southfield Township consists primarily of 3 Villages: Beverly Hills, Bingham Farms, and Franklin. All decisions regarding hazards and mitigations for Southfield Township are addressed individually by the 3 Villages.

5.2.54 Springfield Township

The occurrence of a tornado in Springfield Township is a hazard of concern to the Township. Those individuals who would be most vulnerable to injury and damage caused by a tornado are the residents in the mobile home parks located at Dixie Highway north of East. Holly Road.

I-75 is a major expressway that runs through a large portion of Springfield Township. Because of the large volume of traffic, there is a high frequency of traffic accidents. Many of these accidents are multi-vehicle. The Township does not have procedures in place for transporting individuals with disabled vehicles that are not taken to a medical facility.

There is a potential of a train derailment in Springfield Township. Also, a derailment resulting in a hazmat incident was identified as an additional concern.

Blue Water pumping station is a potential concern to the public.

Springfield Oaks has events that bring in large crowds which could be a potential for a civil disturbance or mass casualties.

There are three 36-inch pipelines that run through Springfield which could lead to a potential hazmat incident.

A large electric substation, serving Springfield Township and nearby communities, is located in the southeastern portion of the Township. It is at risk for criminal activity or natural hazards that may lead to loss of electrical power for area residents.

Six schools are located in Springfield Township. Schools house large numbers of children, who are more vulnerable to hazards.

5.2.55 City of Sylvan Lake

Flooding is a recurring problem in the City of Sylvan Lake. The areas of most frequent flooding are on Avondale and Garland Streets.

The sanitary sewers on Cheltingham and Avondale Streets have a history of backing up after heavy rains.

Deficiencies still exist with the OakWin Radio System; therefore, there is a need for portable repeaters to be used for fire emergencies.

Deficiencies exist with regard to water rescues on the lakes within the City of Sylvan Lake.

5.2.56 City of Troy

Tornadoes were identified as a primary hazard of concern for the City of Troy. In addition, structural fires in high rise buildings are also a primary concern to the City.

Multi-vehicle traffic accidents and traffic accidents resulting in a hazardous material release create a potential danger to the citizens of City of Troy. Crooks Road, Fourteen Mile Road, Rochester Road, and I-75 are the most heavily traveled roads in the City and as a result are the locations for the majority of traffic accidents. Snow and ice storms contribute to the frequency of these accidents. Hazmat emergencies on I-75 and at industrial facilities were also a concern to the representatives for the City of Troy.

There are three 36" pipelines running through the City of Troy that could be a potential hazard. Two large malls and many high rise buildings could be a potential hazard with large crowds, especially during the holiday season, for a mass shooting incident. A mass shooting incident occurred a couple of years ago at an office building.

5.2.57 City of Walled Lake

Tornadoes and ice storms were identified as primary hazards of concern for the City of Walled Lake. Most vulnerable to the consequences of a tornado are the Fawn Lake Mobile Home Park, located off of Pontiac Trail and the Walled Lake Villa Senior Complex.

A number of downtown buildings are inter-connected and very old, creating the risk of structural fires that could impact the entire downtown area.

West Maple and Pontiac Trail are the main routes through the City. These roads have a history of traffic accidents, some involving serious injuries.

Trucks carrying hazardous materials use West Maple and Pontiac Trail to access M-5 or I-96 which may lead to a hazmat incident.

A local industrial facility presents a fixed hazmat hazard.

A natural gas pipeline is a major concern to the public.

5.2.58 Waterford Township

There are 31 lakes covering 2,923 acres within Waterford Township. These lakes, along with the Clinton River running through many areas of the Township, contribute to area flooding. A specific area of flooding that has caused property damage is the area around the eastern side of Scott Lake.

Areas of particular concern to the Township is the risk of a hazardous material accident, either on a highway (such as the heavily traveled M-59) or at an industrial facility that may use or store hazardous materials. Because of the proximity and number of area lakes, hazardous material releases to the ground are a significant concern for Waterford Township officials.

In addition, a plane crash at The Oakland County International Airport is an identified hazard for the Township.

Waterford Township has nearly 6 miles of rail lines including 6 highway crossings.

Structural fires inside vacant buildings are of particular concern because there may be a lag time in contacting emergency services.

Thirteen water treatment plants could result in a hazmat incident or be a target in a potential terrorist attack.

Eighteen groundwater wells that feed the water treatment plants could also be a potential hazard.

A 36-inch crude oil pipeline on the west side of William Lake Road represents a potential for a hazmat incident which could affect the surrounding lakes and rivers

5.2.59 West Bloomfield Township

The Township has experienced significant damage from natural hazards such as tornadoes and high winds. The results of which require significant debris removal.

Lightning strikes have caused structural fires.

There is only 1 road in and out of the primary medical facility located in the Township. If that route is blocked there is a potential that emergency personnel may not be able to access the medical facility or evacuate patients if necessary. There is a need to widen Maple Road to accommodate emergency personnel access to the primary medical facility in the Township.

Storm water management within the Township remains a priority working with the neighboring communities to improve the infrastructure to protect the waterways from raw sewage release when the sewer system is at capacity.

In the event of a traffic accident, the transportation of radio isotopes between medical facilities in the Township produces a hazard to the Township.

The OakWin Radio System used by police and fire has some deficient areas in the Township that can cause difficulties with communication

Local high profile individuals that have allegedly been identified as people of concern may be a terrorist hazard.

Lack of resources to handle underwater rescue situations is a concern. Currently, all underwater rescues are handled by the Oakland County Sheriff's Office.

Township officials addressed the need to maintain a timely and adequate supply of salt during the winter months to maintain safe roadways.

5.2.60 White Lake Township

A tornado in White Lake Township was identified as a primary hazard of concern. According to representatives for the Township of White Lake, advanced warning measures are needed. There are currently 5 mobile home parks with no specific shelter identified.

There is a concern of flooding due to a failure of the dams in the Township. There are 3 dams and the one located at Lake Neva is of particular concern.

The Oakland County International Airport is located directly east of White Lake Township. Many airplanes use the air space directly above areas of the Township for approach and take off. A plane crash, especially in a heavily populated area, is a concern to the Township.

5.2.61 City of Wixom

I-96 is a heavily traveled highway that stretches the entire width of the City of Wixom. Because of the large number of trucks and vehicles that travel this route, the potential of multi-vehicle and/or hazardous material accidents exists.

The OakWin Radio System has some deficient areas within the City of Wixom that produce can cause difficulties with communication.

5.2.62 Village of Wolverine Lake

Potential failure of the Wolverine Lake Dam, located just north of Glengary Road, and resulting flooding downstream were identified as the primary hazard of concern to the community.

The threats of a tornado or winter weather and power outages that disable local drinking water wells are also concerns in the Village.

5.3. School District & University Hazard Priorities

Schools districts were not included in the 2005 Oakland County Hazard Mitigation Plan. The hazard priorities identified for each school district in the following section are new to the 2012 Oakland County HMP update.

5.3.1 Avondale Schools

Avondale Schools provide services to residents of Auburn Hills, Rochester Hills and portions of Troy and Bloomfield Township. There are 11 schools and approximately 3,800 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day.

One upper elementary school was built in the 1950s and has a large brick smokestack that is a potential hazard in the event of high winds or a tornado. There is also a large radio antenna on the roof of the high school that could fall resulting in damage or injury in the event of high winds or a tornado.

The area is prone to power outages during the year and the District lacks generator power to operate the schools or prevent food losses beyond 2 days.

The high school campus backs up to I-75. As such the potential need to evacuate students should there be a large accident or hazmat on the freeway is a concern.

5.3.2 Berkley Schools

Berkley Schools provide services to residents of Berkley, Huntington Woods, and portions of Royal Oak. There are 9 schools and approximately 4,700 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day.

All the school buildings are 70-80 years old and, as such, aging infrastructure is a concern, particularly regarding the electrical and boiler systems.

All the schools are located in neighborhoods and the district is considered a “walking district”. Bus transportation is only used for students who have an Individual Education Plan (IEP) requiring busing services and for school field trips.

The school district provides ongoing training to address hazards stemming from student disturbances and/or parental custody issues and how they may impact the student body.

5.3.3 Birmingham Public Schools

Birmingham Public Schools provide services to residents of Birmingham, Troy, Beverly Hills, Southfield, Franklin, Bloomfield Township, and Bingham Farms. There are 15 buildings and approximately 8,200 students within the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events. The community does experience occasional power outages due to wind and storm activity. Currently, 11 school buildings have sufficient generator power to finish the school day normally.

The school district provides ongoing training to address hazards stemming from student disturbances and/or parental custody issues and how they impact the student body.

5.3.4 Bloomfield Hills Schools

Bloomfield Hills Schools provide services to residents of Bloomfield Hills. There are 8 schools in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address hazards stemming from tornadoes, heavy snow/ice storms, and/or public health concerns.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.5 Brandon School District

Brandon School District provides services at 7 schools for approximately 3,400 students. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

There are currently generators at 3 of the school buildings in the event of an emergency or power failure. Approximately 15-20 cameras have been installed on the high school campus for surveillance and safety.

5.3.6 Clarenceville School District

Clarenceville Schools provide services to residents of Livonia. There are 4 schools and approximately 1,800 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and/or public health issues. The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.7 Clarkston Community Schools

Clarkston Public Schools provide services to residents of Clarkston. There are 6 schools and approximately 2,700 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

Train routes near one of the schools present the potential for a hazmat incident and the need to evacuate students. An underground gas pipeline near one of the schools also has the potential for a hazmat incident due to leak or rupture.

The school district provides ongoing training to address hazards tornadoes, heavy snow/ice storms, and/or public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.8 Clawson Public Schools

Clawson Schools provide services to the residents of Clawson. There are 4 school buildings: 1 early child care center, 1 elementary school, 1 middle school, and 1 high school. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

A local elementary school is in the direct flight path of the Oakland Troy Airport. Although the potential of an airplane accident at this site may be remote, the consequence could be devastating. The need for additional emergency response manpower and training were mentioned by the City's representatives.

Sewer and water main lines are over 30 years old, and there is a potential hazard of breaks and infrastructure failure. A water main passes directly underneath the high school. A break in the water main may require evacuating students and, at present, there is no plan in place for doing so. A broken water main also has the potential to cause property damage to the school.

5.3.9 Farmington Public Schools

Farmington Public Schools provide services to residents of Farmington, Farmington Hills and a small portion of West Bloomfield. They have 27 buildings and approximately 12,200 students. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

Currently all buses are equipped with GPS systems so their locations can be tracked by the central transportation office. Cell phones, a private fiber network, and a dedicated backup line provide adequate communication within and between District buildings in the event of emergencies.

The community does experience occasional power outages due to wind and storm activity. However, most buildings have generators on site or available for emergency power generation.

There is surveillance cameras located at the 3 high schools in the District.

5.3.10 Ferndale Public Schools

Ferndale Public Schools provide services to the residents of Ferndale. There are 11 schools and approximately 3,900 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home or athletic events.

Older buildings in the District could represent potential hazards associated with asbestos and lead based paint.

A natural gas plant is located within the District. It presents a potential for fixed site hazmat incident and trains carrying hazardous materials present the potential for transportation related hazmat incidents near school buildings.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard. Ferndale Schools have cleaning strategies in place to avoid the spreading of any infectious diseases.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, mass shootings, and public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies. Ferndale Schools have developed a plan in conjunction with local authorities to deal with the threat of anthrax.

5.3.11 Hazel Park Schools

Hazel Park Schools provide services to residents of Hazel Park and some residents of Ferndale. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home, athletic events, and other extra-curricular events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.12 Holly Area Schools

Holly Public Schools provide services to residents of Holly, Holly Township, Groveland Township, Rose Township, Springfield, and White Lake Township. There are 7 schools and approximately 3,600 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

Railroads and trains carrying hazardous materials close to some schools pose a potential hazard for transportation related hazmat incidents, derailment, and for evacuating students.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

A mass shooting is a major concern for school representatives.

5.3.13 Huron Valley Schools

Huron Valley Schools provide services to residents of Milford, Highland, White Lake, and Commerce Townships. There are 15 school buildings and approximately 10,100 students. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The school district provides ongoing training to address hazards stemming from student disturbances and/or parental custody issues and how they impact the student body.

5.3.14 Lake Orion Community Schools

Lake Orion Schools provide services to residents of Orion Township. There are 11 schools and approximately 8,200 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.15 The Lamphere Schools

The Lamphere Schools provide services to residents of Madison Heights. There are 7 schools and approximately 2,800 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

Student disturbances are a potential hazard, as the school District has had several “lock downs.”

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The high school is used as a shelter for local emergencies and as a distribution point for the American Red Cross and Oakland County agencies.

5.3.16 Madison District Public Schools

Madison District Schools provide services to residents of southern Madison Heights. There are 5 schools and approximately 1,300 students in the district. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

Older buildings in the District could represent potential hazards associated with asbestos and lead-based paint.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

5.3.17 Oak Park Schools

Oak Park Schools provide services to residents of Oak Park, Southfield, and Royal Oak Township. There are 6 schools with approximately 4,200 students. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

5.3.18 Oakland Community College

Oakland Community College (OCC) provides services to the residents of Oakland County. There are 5 campuses in Oakland County with approximately 19,000 students. Like most public school districts, OCC representatives identified concerns related to protecting their student body day and night.

OCC provides ongoing training to address student disturbances, health emergencies, fire, and tornadoes.

OCC is very concerned about the safety and health of the campus community, including students, employees, contractors, and visitors, as well as the surrounding communities. To this end, they have developed an Emergency Response Plan (ERP) for each campus and administrative facility.

Each ERP is periodically reviewed to ensure that the information contained therein is accurate, appropriate, and complete. Additional topics can also be added as the need arises. The written ERPs are available on-line for all employees along with an instructional video. A written student version of the ERP is also available in printed form or on-line.

OCC has a Memorandum of Understanding with the Oakland County Health Division to make their facilities available in the event of a community-wide emergency. This community support function could be extended to other community health and emergency response agencies as needed.

Oakland Community College representatives identified Human Hazards (e.g., active shooter incidents, health emergencies, civil disturbances, and criminal acts) as their chief concern for the campus. Technological hazards, such as hazardous material incidents, and natural hazards were ranked 2nd and 3rd, respectively.

5.3.19 Oakland University

Oakland University provides services to the residents of Oakland County. There are 48 major buildings on campus at Oakland University with approximately 19,000 students. The primary hazards identified were related to protecting their student body day and night.

A priority concern is power outages from severe weather which shut down the entire campus. Their secondary concern is the central heating plant and the potential for infrastructure failure. If anything happens to the plant it shuts down the entire campus.

Additional concerns include tornadoes, fire, or a hazmat accident in the vicinity of campus.

Oakland University provides ongoing training for hazmat incidents, health emergencies, fire, and tornadoes.

Oakland University is a shelter for the Avondale Schools students in case of emergencies.

5.3.20 Oxford Community Schools

Oxford Schools provide services to residents of Oxford. There are 7 schools and approximately 3,800 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

Tornadoes, high winds, and ice storms were identified by Oxford Schools representatives as priority natural hazards.

5.3.21 Pontiac School District

Pontiac Schools provide service to about 6,000 students in 24 schools, although 13 of those are currently closed. School representatives identified their primary hazards as concerns related to

protecting their student body during the school day and while transporting the students to and from home and athletic events.

Asbestos and lead-based paint exist in many of the buildings and could pose a risk to the students and District staff.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides training to staff on how to properly clean buildings and how to identify infectious situations like bed bugs etc. Fire and tornado drills are held on a regular basis.

Five elementary schools and 1 high school in the District are used as community shelters in the event of emergencies.

5.3.22 Rochester Community Schools

Rochester Public Schools provide services to residents of Rochester and Rochester Hills. There are 21 schools and approximately 15,000 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

There is a natural gas pumping station close to one of the schools which has the potential to be a hazard as a fixed site hazmat incident.

Flooding was identified as a major concern for the school district. Ice storms and concerns regarding bus transportation safety were also identified as high priority hazards.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes and health issues like colds and the flu.

Two high schools are used as shelters for local emergencies and as distribution points for the American Red Cross and Oakland County agencies.

5.3.23 Royal Oak School District

Royal Oak Schools provide services to residents of Royal Oak and Royal Oak Township. There are 8 schools and approximately 5,500 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The schools are used as shelters for local emergencies and as distribution points for the American Red Cross and Oakland County agencies.

5.3.24 South Lyon Community Schools

South Lyon Schools provides service to portions of 3 counties (Oakland, Washtenaw, and Livingston) and areas of 8 municipalities (City of South Lyon, Lyon Township, City of Novi, City of Wixom, Milford Township, Northfield Township, Salem Township, and Green Oak Township). There are 12 schools and approximately 7,000 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

The school district provides ongoing training to address tornadoes and public health issues.

Two District schools are used as a shelter for local emergencies and as distribution points for the American Red Cross and Oakland County agencies.

5.3.25 Southfield Public Schools

Southfield Schools provide services to residents of Southfield. There are 14 schools and approximately 7,700 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

Older buildings in the school district present a potential hazard for asbestos and lead-based paint.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard. Southfield Public Schools have cleaning strategies in place to avoid the spreading of any infectious diseases.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, mass shootings, and public health issues.

The 2 high schools are used as shelters for local emergencies and as distribution points for the American Red Cross and Oakland County agencies.

5.3.26 Troy School District

Troy Schools provide services to residents of the City of Troy. There are 19 schools and approximately 12,000 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard. The school district provides ongoing training to address tornadoes and public health issues.

5.3.27 Walled Lake Consolidated Schools

Walled Lake Schools provide services to residents of Wixom, Commerce Township, White Lake, Waterford Township, Walled Lake, Wolverine Lake, and portions of West Bloomfield Township. There are 21 schools and approximately 15,000 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

A railroad and trains carrying hazardous materials near 1 of the schools present a potential hazard for derailment and transportation related hazmat incidents.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard. The school district provides ongoing training to address tornadoes and public health issues.

5.3.28 Waterford School District

Waterford Schools provide services to residents of Waterford Township. There are 18 schools and approximately 10,800 students in the District. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

The Oakland County Airport is located in the middle of the District, presenting the potential for hazards related to a plane crash.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard. Biohazards, food contamination (outside source) and pool chemicals are also potential health hazards for students.

The school district provides ongoing training to address tornadoes, heavy snow/ice storms, and public health issues.

The potential for a mass shooting is a major concern for the Waterford School District.

The schools are used as shelters for local emergencies and as distribution points for the American Red Cross and Oakland County agencies. The schools participate in the Cities Readiness Initiative plan and the WSD staff is certified by the National Institute of Emergency Medical Services (NIEMS).

5.3.29 West Bloomfield School District

West Bloomfield Schools provide services to residents West Bloomfield, Orchard Lake, Sylvan Lake and Keego Harbor. There are 9 school buildings and approximately 6,800 students. School representatives identified their primary hazards as concerns related to protecting their student body during the school day and while transporting the students to and from home and athletic events.

Two schools are within one-half mile of a commercial business that stores large amounts of fertilizer. The site holds the potential for fixed site hazmat incidents or fire.

The transmission of communicable diseases from student to student on buses and in classrooms was identified as a potential hazard.

5.4. Hazard Evaluation

Based on the survey results, community input, and results of the workshop evaluations, the top hazards to evaluate during the mitigation portion of the planning process were identified. In selecting the top hazards, special consideration was given to those hazards that are being evaluated and mitigated by other programs.

Specifically, terrorism and weapons of mass destruction are being evaluated under the State Homeland Security Grant Program. Due to homeland security considerations, information from that program is not available for consideration in this Plan. Therefore these 2 hazards were not considered when selecting hazards for mitigation. Hazards from nuclear power plant accidents have also been evaluated under other County planning initiatives, and due to security considerations, are not considered in this Plan.

5.4.1 Hazard Selection

The hazards selected for consideration when developing mitigation strategies, combined the top hazards identified in the survey, the top hazards identified by the communities, and the hazard ranking conducted during the workshop.

Specifically, the top 3 hazards identified in the survey (excluding the hazards eliminated above) and the top 3 hazards identified by the communities were selected. High winds were ranked number 3 with communities and were grouped with tornadoes. All of the 2005 hazards were kept for the updated plan as they were viewed as still posing a significant hazard. The Advisory Committee added 5 additional hazards, that given current conditions, were viewed as significant.

5.5. Vulnerability Assessment

The following section describes hazards and incidents in Oakland County's hazard history and demonstrates the vulnerability of specific critical assets and venues in the County.

5.5.1 Current Assessment

Civil Disturbance

A civil disturbance in Michigan occurs, on average, once every 10 years.²²⁹ The most likely causes for a civil disturbance in the County are labor disputes, sporting events, viewed inequality, or demonstration at a college, government facility, detention facility, or military facility.

In 2008, approximately 100 people started rioting with police at what is now McLaren Oakland Hospital in Pontiac, following a police investigation into the shooting of a local man. The Pontiac Police Department called for assistance from the Michigan State Police and Oakland County Sheriff's Office to bring the crowd under control. No serious injuries or fatalities were reported.²³⁰

²²⁹ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 7 and 16-22.

²³⁰ Oakland County Sheriff Report, July 2, 2008.

Oakland County features numerous places of public gathering 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
- DTE Energy Music Theatre
- Great Lakes Crossing Outlets
- Hazel Park Raceway
- Meadowbrook Hall & Theater
- Oakland Community College
- Oakland University
- Palace of Auburn Hills
- Royal Oak Arts, Beats, & Eats
- Ryder Cup
- Woodward Dream Cruise

Table 24. Communities with the Most Acreage in Institutions Vulnerable to Vandalism

Community	Acres
Waterford	1,488
Troy	1,788
Farmington Hills	1,217
Pontiac	1,609
Rochester Hills	1,686

Source: SEMCOG, *Land Use in Southeast Michigan, 2008, Specific to Oakland County, January 2012*

Police stations are vulnerable in response to a civil disturbance event. Figure 15 displays the locations/events listed, as well as those of specific concern to communities. Locations of police stations in the County are also shown in Figure 15.

Criminal Acts - Vandalism

Oakland County averages 9,421 vandalism offenses each year.²³¹ The entire County area is susceptible to vandalism. Facilities that have the highest vulnerability to an act of vandalism are government facilities, educational institutions, and registered historic sites. Police stations are a vulnerable asset in response to acts of vandalism.

Educational facilities, municipal buildings, court facilities, registered historic sites, and police station locations are included on Figure 16. Oakland County has over 26,000 land use acres of institutional establishments.²³²

Criminal Acts – Arson

Oakland County averaged 229 arson fires each year for the period 1997 through 2010.

Any property is a potential arson target. However, residential areas and historic sites are most vulnerable to acts of arson. Fire departments are a vulnerable asset in response to acts of arson. There are 43 departments which respond to fires within Oakland County. Residential land use is shown on Figure 17, along with the locations of the County’s registered historic sites and fire stations.

²³¹ Michigan State Police, Uniform Crime Reports, Crime Statistics, Oakland County, 1997-1996, Requested on November 4, 2011.

²³² SEMCOG, *Land Use in Oakland County 2008, January 5, 2012.*

Criminal Acts – Mass Shootings

There have been approximately 2 attempted mass shootings in Michigan since 1991, but the act has been on the rise in the United States over the past decade.

Mass shooting acts tend to occur in the place of (former) employment or at schools and universities; although they can occur in other crowded venues such as shopping centers and arenas. Mass shootings that occur in residential neighborhoods are normally centered around individuals the gunmen knows. The most vulnerable targets would be the following:

- K-12 Schools
- Government buildings including courthouses
- DTE Energy Music Theatre
- Great Lakes Crossing Outlets
- Hazel Park Raceway
- Meadowbrook Hall & Theater
- Oakland Community College
- Oakland University
- Palace of Auburn Hills
- Royal Oak Arts, Beats, & Eats
- Ryder Cup
- Woodward Dream Cruise
- Somerset Collection Mall
- Private corporations and corporate headquarters

Drought

Four drought events have been recorded in Oakland County since 1950.²³³ The entire County's active agricultural lands are vulnerable to drought. Oakland County contains approximately 21,005 acres of active agricultural land.

Figure 18, shows the location of active agricultural lands in Oakland County. Agricultural land in Oakland County has been decreasing as development moves in. The vulnerability to drought will continue to decrease as active agriculture decreases.

Natural Resources such as lakes, waters, streams, and other bodies of water could be affected by decreases in water levels. Water features are also shown on Figure 18. Waterford Township, West Bloomfield, and White Lake Township contain the most acreage for water land use in the County.²³⁴

Table 25. Communities with the Greatest Acreage in Drought - Vulnerable Active Agriculture and Cropland

Community	2000 (acres)	2008(acres)
Holly Township	5,639	3,380
Lyon Township	5,151	999
Oakland Township	4,712	257
Rose Township	3,495	6,505
Highland Township	3,473	649

Source: SEMCOG, *Land Use in Southeast Michigan, 2008, Specific to Oakland County, January 2012*

²³³National Climatic Data Sponsored Website, www.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storm, Standard Query for Severe Weather, November 2011.

²³⁴ SEMCOG, *Land Use in Southeast Michigan, 2000-2010, Specific to Oakland County, November 2011.*

Earthquakes

Most earthquakes that occur in Michigan are minor tremors resulting in little damage. Several mildly damaging earthquakes have been felt since the early 1800s. The primary vulnerable assets to an earthquake occurrence are the County's water, sewer, and natural gas services and natural gas/petroleum pipelines. The entire County has gas service available either through Consumers Energy or DTE/MichCon. Municipal, community and County operated water and sanitary services are vulnerable, as well as all storm water drains. The Oakland County Water Resources Commissioner's Office water and sanitary sewer serviced areas are shown on Figure 19, along with natural gas and petroleum pipeline locations. There are approximately 120 miles of natural gas distribution pipelines, 363 miles of natural gas transmission lines, and 107 miles of petroleum gas pipelines in the County.

Hydraulic fracturing (fracking) is believed to increase the frequency of earthquakes by disturbing the bedrock. Currently, the EPA and MDEQ are reviewing the hydraulic fracturing techniques and determining proper regulations.

Extreme Temperatures

Extreme temperature periods occur every year in the state and impact the entire County. Underground utilities, primarily water and gas service areas, are vulnerable to extreme cold. The entire County has natural gas services available through Consumers Energy or DTE/MichCon. Pontiac, Rochester Hills, Novi and Troy have the highest utility land use acreage in the County.²³⁵

Also vulnerable to extreme temperatures are the elderly, young, disabled, and impoverished persons. Hospitals are vulnerable due to increase cases of heat stroke, heat exhaustion, frost bite, hypothermia, and other extreme temperature health-related illness cases. Almost 19% of the Oakland County population is vulnerable to extreme temperature based on age alone.²³⁶ There are 39 nursing homes in Oakland County. Figure 20 displays the locations of the Oakland County Water Resources Commissioner's Office water and sanitary sewer service areas, adult care facilities, day care facilities, and hospitals in the County.

Wildfire

Michigan has between 8,000 and 10,000 wildfires per year, most of which are small in size burning between 5 and 50 acres. A total of 23 significant wildfires have occurred in Michigan between 1995 and 2011.²³⁷ Most wildfires occur between March and May. Woodlands, wetlands, grassland, shrub land, and areas near railroad right-of-ways are vulnerable to wildfires. Oakland County contains approximately 66,314 acres of park, recreation, and open space.²³⁸ Addison Township, Rose Township, and Springfield Township have the highest

Table 26. Communities with the Greatest Acreage in Extreme Temperature-Vulnerable Utilities

Community	Acres
Pontiac	2,697
Rochester Hills	3,107
Troy	3,839
Novi	3,206
Springfield Township	2,004

Source: SEMCOG, *Land Use in Southeast Michigan, 2008, Specific to Oakland County, January 2012.*

²³⁵ SEMCOG, *Land Use in Southeast Michigan, 2000-2010*, Specific to Oakland County, November 2011.

²³⁶ U.S. Census Bureau, *Profile of General Demographic Characteristics: 2010*, Oakland County, Michigan.

²³⁷ National Climatic Data Center, www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwevent~storms, viewed December 20, 2011.

²³⁸ SEMCOG, *Land Use in Southeast Michigan, 2000-2010*, Specific to Oakland County, December 20, 2011.

acreage of forest land use in the County. Addison Township, Rose Township and Groveland Township have the highest total acreage in the County for grassland and shrub land use.

The 40 fire departments in the County are a vulnerable critical asset in response to wildfires. Figure 21 indicates the coverage of forest woodland, grassland, and shrub land, railroad locations, and the location of fire stations in the County.

Scrap Tire Fire

In 2004, the EPA Region 5 put together a program to reduce the number of scrap collection sites. The MDEQ put together additional programs and grant funding to encourage the reduction of scrap tires. This initiative has significantly reduced the number of scrap tire facilities within Oakland County. Currently, the MDEQ has record of 2 registered and no unregistered scrap tire facilities. In the past 20 years, there has been 1 tire fire in Oakland County which was at a retail tire store in Farmington.

Due to the toxic smoke produced by tire fires and potential environmental impact, residents living near these facilities are considered vulnerable for impact. Figure 23 shows the location of the registered scrap tire facility with a 1 mile radius of census block groups. Also shown on Figure 23 are the locations of fire stations and air transportation facilities in the County.

Air transportation facilities are considered to be vulnerable, as the smoke produced by a fire may interrupt flight patterns. As shown on Figure 23, the Oakland County International Airport is approximately 2 miles from the registered scrap tire facility located in Waterford.

Structural Fire

Structural hazards are commonly known as the “universal hazard” because they can occur anywhere. There is an average of 544 structural fires per year in Oakland County.²³⁹ Structures most vulnerable to a structural fire are registered historic sites and hi-rise structures. Structural development in Oakland County is more concentrated in the southern portion of the County. The 40 fire stations in the County are a vulnerable asset in response to a structural fire. Almost 57% of all firefighter injuries in Oakland County result from responding to structural fires. The location of registered historic sites and fire stations are provided on Figure 24. Also shown are the areas of multiple-family residential development, industrial development, and commercial development.

Flooding

Oakland County has had 18 reported dam failures, the highest reported dam failure in the state.²⁴⁰ Oakland County currently has 8 high and 15 significant dam hazards. Urban flooding and riverine flooding are dependent on seasonal weather patterns. There is 1 major riverine flooding event in Michigan every 2 years.

Vulnerable areas to flooding are those locations and populations within floodplains and flood prone areas, primarily those downstream of an event. Vulnerabilities include Infrastructure (bridges and structures) and populated areas. Approximately 5,784 structures are located

²³⁹ NFIRS 5.0 National Reporting, Tally by Incident Type, January 1, 1998 through December 31, 2003, report generated on June 24, 2004, filtered for Oakland County reporting only.

²⁴⁰ Michigan Department of Environmental Quality, Geological and Land Management Division, *List of Dams in Oakland County and Dams Upstream of Oakland County*, January 5, 2012.

within the FEMA 100-year floodplain in Oakland County. Figure 21 shows specific areas in the County which have a high occurrence of flooding.

Repetitive loss properties are those that have reported a certain number and amount of flood damages to the National Flood Insurance Program (NFIP), and therefore have been prioritized for flood mitigation activities because of the greater needs and cost-effectiveness that those properties seem to exhibit for potential flood mitigation projects. According to the March 31, 2010 list, there are 17 repetitive loss properties in Oakland County that have been identified by FEMA. The identified repetitive-loss properties are located in multiple communities across the County, rather than being clustered into 1 particular geographic area. Communities that were listed as containing repetitive loss properties include, City of Birmingham (2 properties), City of Farmington Hills (11 properties), City of Troy (1 property), and Waterford Township (3 properties).

Urban flooding is normally restricted to areas with high volumes impervious materials. These would include major cities, industrial parks, and downtown districts.

Fog

Michigan has approximately 1 major event every 2 years. NOAA had 2 major fog events listed for Oakland County since 1995. Fog is normally limited to the early morning hours and would therefore, be constrained to the early morning commute. The most dangerous accidents tend to be on highways/freeways, high traffic roads, airports, and railroad crossings. Heavy fog can lengthen the time it takes for emergency response vehicles to respond to an emergency. Heavy fog also puts school buses and other public buses at increased chance of accident.

Gas/Oil Shortages or Supply Disruptions

Since 1965, there have been 7 major gas/oil shortages that impacted Oakland County. Gas and oil shortages cover a wide range of fuels used for different purposes from fueling vehicles to heating homes or making plastics. The type of gas/oil shortage will dictate what/who is most vulnerable. For example, gasoline shortages will affect commuters, which in turn will affect the businesses where they work (increase in absenteeism). Oakland County has limited public transportation available, without gasoline many residents would find it difficult to make it into work. If there was a shortage of propane or natural gas, that would affect the ability to heat homes, hospitals, and nursing homes. It would also affect some ability to cook. Shortages in diesel would affect commercial and industrial facilities, places with generators, emergency response, and schools.

Hazmat Incidents – Fixed Site

The majority of hazmat releases in Oakland County are releases to water, followed by land and air.²⁴¹ Vulnerable locations are the Superfund Amendments and Reauthorization Act (SARA) Title III sites (sites that store hazardous substances) in the County and those areas within an approximate 1 mile radius of these sites. In 2010, there were 195 Extremely Hazardous Substance (EHS) facilities and 502 Active Hazardous Substance facilities within the County.²⁴²

²⁴¹ U.S. Coast Guard National Response Center Website, www.nrc.uscg.mil/foia.html, Standard Query Report for Oakland County, Fixed Incidents, January 11, 2012.

²⁴² Oakland County LEPC, January 20, 2012.

Between 1999 and 2011, Pontiac, Troy, and Rochester had the highest number of releases from fixed site hazmat locations.²⁴³ Thirty-one of the County's 62 municipalities have had at least 1 fixed site hazmat release between 1999 and 2011. Police and fire stations are vulnerable assets in response to a hazmat fixed site release. Areas with greater population are more at risk for secondary health-related incidents resulting from a fixed site hazmat release. The location of the listed SARA Title III sites, which include SARA Section 302 and Section 312 facilities, is shown on Figure 25, along with the locations of police and fire stations in the County. Also displayed on Figure 25 are the census blocks within a 1 mile radius of the listed sites. Approximately 1,442,426 people are located within 1 mile of at least 1 SARA Section 302 or Section 312 facility.

Hazmat Incidents – Transportation Incident

There have been 5 significant hazmat transportation incidents in Oakland County since 1978. There were a total of 111 automobile/truck accidents and 43 railroad accidents. Pontiac, Lake Orion, Novi, and Milford had the highest number of releases in the County; however, 16 communities had at least 1 incident reported.

Vulnerable locations to a transportation hazmat incident are the areas within a 1 mile radius of the railroads and major roadways, particularly I-75, I-696, I-96, I-275, and M-59. Areas of greater population are more vulnerable to these incidents. Police and fire stations are vulnerable assets in response to a hazmat fixed site release including activities such as evacuation assistant and cleanup assistance. The locations of the railroads, major highways, and police and fire station locations are included on Figure 26. Census block groups within a 1 mile radius of major highways and freight rail are also included on Figure 26. Approximately 767,222 people are located in these census blocks within 1 mile of the selected highways.

Infrastructure Failures – Water System, Sanitary Sewer, Storm Sewer, Electrical, Communications, and Bridges, Roads, and Overpasses

The Oakland County Water Resources Commissioner's Office (OCWRC) operates and maintains storm drains throughout the County. As shown on Figure 27, the OCWRC operates and/or maintains portions of the water and sanitary sewer systems within the County. Minor problems with the sanitary and storm sewers are somewhat common with major rain or snowmelt events. Interruptions in the water system are also common; in 2003 there were 257 water line breaks. The primary consequence of this hazard is potential public health impacts. As a result, schools, hospitals and elderly care facilities have been identified as the most vulnerable. The communities of Beverly Hills and Franklin Village have been identified as having the greatest maintenance needs for the sanitary sewer system. Therefore, schools, hospitals, and elderly care facilities in these communities are at increased vulnerability.

Electrical service is provided to Oakland County by Consumers Energy and DTE Energy. Private communications services are provided by a number of companies. Oakland County also operates a 9-1-1/communications center. Failures of the electrical and communications systems are also more likely to occur during severe storm events. Populations in schools, hospitals and elderly care facilities have been identified as being at increased vulnerability to this hazard. Locations of these facilities are shown on Figure 28.

²⁴³ U.S. Coast Guard National Response Center Website, www.nrc.uscg.mil/foia.html, Standard Query Report for Oakland County, Fixed Incidents, January 11, 2012.

The public safety radio system formerly in place in the County lacked adequate back-up in the event of a system disruption. As a result, the County has implemented a new public safety radio system (OakWin Radio System) which incorporates system redundancies and back-up generators to improve the reliability of the system.

There have been 37 significant bridge failures in the U.S. since 1940, 1 occurred in Michigan. According to the Federal Highway Administration, Oakland County has 444 bridges of those 39 are structurally deficient and 82 are functionally obsolete.

Invasive Species

New invasive species are introduced into the State of Michigan on average every 2 to 5 years. Invasive species threaten biodiversity, cause disease and death, diminish food supplies, and may alter the macro-climate and hydrology of an area. Parks, recreational lands, open spaces, area lakes and streams, and agricultural lands are the most vulnerable to invasive species. According to SEMCOG's 2008 land use/land cover maps, Oakland County has 66,314 acres of parks, recreational land, and open space; 28,895 acres of water; and 21,005 acres of agricultural land.

Nuclear Power Plant Accidents

There are 3 nuclear power plants in Michigan. One active plant, Enrico Fermi-2 was opened in Monroe County in 1998, next to the Enrico Fermi-1 plant that was shut down in 1972. The southern portion of Oakland County is within the 50 mile radius Secondary Emergency Planning Zone of the Enrico Fermi-2 plant.

The primary vulnerability to a nuclear power plant incident is radiological contamination of food sources. Restaurants and grocery stores are most vulnerable, as well as active agricultural lands. Approximately 460 square miles in the southern portion of Oakland County is located within the Secondary Emergency Planning Zone and is shown on Figure 29. Also shown on Figure 29 are areas of active agriculture land use in the County that are within the planning zone.

Oil and Gas Well Accidents / Petroleum and Natural Gas Pipeline Accidents

There have been 6 natural gas explosions in Oakland County. From 1990 through 2011, there have been 33 pipeline incidents in Oakland County, an average of over 1 event per year in Oakland County. Consumers Energy provides natural gas service to the majority of the County and DTE/MichCon provides service to approximately 36 square miles.

Pipelines can pose a significant threat to the public due to the threat of fires, explosions, and ruptures. Residential areas, schools, churches, and hospitals are the most vulnerable areas for this type of event. Local fire and police departments would respond to a pipeline incident. Gas leaks are a frequent call for service for Oakland County fire departments. Populations located within a 1 mile radius of a well or pipeline are most vulnerable and urbanized areas are more vulnerable than rural areas based solely on population densities.

The locations of natural gas distribution pipelines, natural gas transmission lines, petroleum gas pipelines, oil/gas bottom wells, and oil/gas surface wells are shown on Figure 30. There are approximately 120 miles of natural gas distribution pipelines, 363 miles of natural gas transmission lines, and 107 miles of petroleum gas pipelines in the County. Census block groups within a 1 mile radius of the pipelines and wells are included on Figure 30. Approximately 1,028,514 people are located within the census blocks identified. Also on Figure 30 are the locations of schools, hospitals, police stations, and fire stations in the County.

Public Health Emergencies, Pandemics and Epidemics, and Contaminated Food and/or Water

Public Health Emergencies can arise from a wide range of causes and can result in varying levels of severity. Persons most susceptible to public health emergencies are those persons with weakened or undeveloped immune systems. Almost 19% of the Oakland County population is highly vulnerable to a public health emergency, based solely on age. Therefore, adult care and day care are most vulnerable, as well as schools. The locations of public safety facilities, adult/child care facilities, day care facilities, and schools are shown on Figure 31.

Vulnerable assets involved with public health emergencies are medical service facilities and include the County's Health Division facilities, clinics, and hospitals. The Oakland County Health Division operates 2 locations within the County. The County's health facilities and hospitals are also shown on Figure 31.

Subsidence

The only known potential for natural subsidence in the County is from sink holes, most likely caused from water main breaks. The probability of this occurrence increases with older water systems. The water system and sanitary sewer services areas are shown on Figure 27.

Thunderstorm Hazards and Tornadoes

Oakland County receives 30-40 thunderstorm events per year.²⁴⁴ Vulnerabilities associated with thunderstorm hazards (hail, lightning, and severe wind) and tornadoes are the warning siren systems, communications/electrical infrastructure, police and fire facilities, manufactured home sites, and people. Also, private or public urban tree removal services are also vulnerable to wind hazards.

Oakland County has approximately 60,623 acres of transportation, communication, and utility land use. There is also over 63,732 manufactured homes. Southfield, Pontiac, and Orion Township are most vulnerable to communication, utility, and electrical transmission line failure based on total acreage for land use, respectively. Novi has the highest total acreage for manufactured home park land use. Communication/utility land use and manufactured home park land use are shown on Figure 32, which also includes the locations of the County's outdoor warning sirens and police and fire stations. Communications and electrical companies within the County include local utility companies, cable and satellite providers, local television networks, local radio networks and communication towers, including local emergency and cell phone towers.

Oakland County has a funded program in place to replace outdoor warning sirens which are in disrepair or outdated. All of the old outdoor warning sirens in the County were recently replaced. Although the County has the most warning sirens of any county in Michigan, there is still a need to expand the outdoor warning siren coverage.

Transportation Accidents – Air, Highway, and Rail

There are 3 public airports, 3 private airports, a sea plane base, and 20 private heliports within Oakland County. Since 2001, there have been 5 reportable air transportation incidents in the County.²⁴⁵ The majority of transportation accidents occur during takeoff or landing, and

²⁴⁴ Michigan Department of State Police Emergency Management and Homeland Security Division, *Michigan Hazard Analysis*, March 2006, pages 217-225.

²⁴⁵ National Transportation Safety Board, www.nts.gov, Aviation Database Query, Michigan, report generated on January 31, 2012.

therefore, impacted areas are typically those areas located near the airports or runways. The locations of the airports within the County are provided on Figure 33, along with census blocks within a 5 mile radius of the airports. There are approximately 362,749 people located within 5 miles of at least 1 airport in the County.

Automobile accidents occur several times daily in the County and can occur anywhere in the County. The impact to the public from private automobile accidents is limited; therefore, vulnerabilities were assessed based on analysis of public highway transportation.

From 2001 through 2003, there were 469 school bus accidents in Oakland County.²⁴⁶ Therefore, bus stations and bus routes, such as the SMART bus routes are vulnerabilities to highway transportation accidents. Also vulnerable are those locations identified as having frequent accidents, which are also provided on Figure 33, along with SMART bus routes and schools.

On average there are over 2 railroad accidents each year in Oakland County.²⁴⁷ The majority of railroad accidents occur at public railroad crossings. Areas adjacent to railroads are most vulnerable to a railroad accident. The locations of railroads, police stations, fire stations, and critical vulnerable assets in the County are included in Figure 33.

Winter Hazards Ice, Sleet, and Snow

Oakland County has had 49 significant winter snow storm and 6 major ice storm events since 1993. Communications and utilities are vulnerable to winter hazard events. Bridges and major roadways are vulnerable in that most incidents related to winter hazards are secondary effects such as auto accidents. Public facilities such as road yards (road commission and MDOT) are vulnerable assets in snow removal and road salt services. During major events, schools are likely to close and hospitals are likely to see an increase in patients with ailments such as heart attacks from overexertion and auto accident injuries. Over 85% of deaths related to ice storms are traffic related.²⁴⁸ Police and fire stations are vulnerable to emergency response activities related to winter hazard incidents. Private or governmental tree removal services are also vulnerable to winter hazards. The locations of major highways, schools, hospitals, and police and fire stations, are included on Figure 34, along with transportation, communication, and utility land use locations.

Terrorism, Sabotage, and Weapons of Mass Destruction

These hazards and vulnerabilities thereof are confidential in nature and are addressed in a separate plan that is available to view for those that are deemed necessary.

5.5.2 Future Assessment

Whereas the majority of this report concerns current hazards, and the locations and populations within Oakland County vulnerable to those hazards, anticipated changes in regional population and land use also allow some prediction of how these hazards and vulnerabilities may change over time. Review of growth trends and predictions for Oakland County and southeast Michigan

²⁴⁶ State of Michigan, Michigan School Bus Accidents, report date April 2006.

²⁴⁷ Federal Railroad Administration, <http://safetydata.fra.dot.gov>, all reports for all railroads in Oakland County, 2002 through November 2011, reports generated on January 25, 2012.

²⁴⁸ Oakland County Michigan Emergency Management, *Hazard Study*, August 1998, page 24.

identify the following 4 hazard categories as particular concerns to be considered by County officials.

Transportation Accidents

Commuting traffic and road congestion continue to grow in Oakland County. Among southeast Michigan counties, Oakland County had the second highest number of jobs (only Wayne County had more). The majority of Oakland County residents work in the County (71.1%), followed by Wayne County (17.6%), and Macomb (6.9%). The majority of commuters in Oakland County are commuting from other parts of Oakland County (59.6%) followed by Wayne (17.3%) and Macomb (13.1%).²⁴⁹

As a result, Oakland County leads the region in road congestion. Three hundred one (301) miles of roadway in Oakland County were classified by the Southeast Michigan Council of Governments (SEMCOG) as congested in 2000. This accounted for 18% of the County's roads and 42% of the region's total congested roadways.²⁵⁰ Twenty-three percent (23%) of southeast Michigan's roadways exhibited congested traffic conditions in 2000. That value is projected to grow to 33% by the year 2025. Meanwhile, transportation funds for road and bridge maintenance and improvements, and for maintaining existing transit services, are expected to fall \$17 billion short of projected needs.²⁵¹

The County anticipates continued growth in both population and job creation. Increasing road congestion presumably exacerbates the potential for transportation accidents, including accidents involving the transport of hazardous materials. As County officials review and plan improvements for those areas currently identified as problem intersections and roads, as well as areas in outlying communities expected to receive the greatest increases in population, hazard mitigation should be included in the Planning Process.

Flooding – Urban/Riverine

Oakland County experienced modest population growth during the last census period, increasing from 1,194,156 to 1,202,362 (2000-2010). SEMCOG forecasts that Oakland County's population will increase to 1,336,761 by the year 2035.²⁵² The region as a whole grew by 5%. During the same period, however, developed land in southeast Michigan increased by 17%. Thirty-seven percent (37%) of the region is now developed.²⁵³

Residential development accounts for the greatest change in acreage of developed land. Population growth drives this increase in developed land, but other factors include a reduction in the number of people per household, thereby requiring more homes to house a given number of people, job growth, and lower densities for new development. SEMCOG's data show that land in the region is being developed at a rate greater than three times that of population growth.

This change in land use has the potential to create additional flooding problems within Oakland County. Studies compiled from across the country have demonstrated that the chemical,

²⁴⁹ SEMCOG, *Land Use in Southeast Michigan 2000-2010*, January 5, 2012

²⁵⁰ SEMCOG, *Land Use in Southeast Michigan 2000-2010*, January 5, 2012

²⁵¹ SEMCOG, *Land use Change in Southeast Michigan: Causes and Consequences*, March 2003, <http://www.semco.org/products/pdfs/LandUseChange.pdf> (newest edition available checked 2012).

²⁵² SEMCOG, *Land Use in Southeast Michigan 2010*, January 5, 2012.

²⁵³ SEMCOG, *Land use Change in Southeast Michigan: Causes and Consequences*, March 2003, <http://www.semco.org/products/pdfs/LandUseChange.pdf> (current version)

biological, and physical integrity of lakes and streams decline as the amount of area covered by impervious surfaces (i.e. roads, parking lots, driveways, and rooftops) increases.²⁵⁴ SEMCOG predicts an increase in the impervious surface coverage from 14% (2000) to 24% in the future as communities build-out according to existing master plans. Exacerbating this increase in imperviousness is the corresponding loss of existing “natural infrastructure” of woodlands and wetlands, which serve to intercept, store, and return storm water to the atmosphere.

In an undeveloped landscape, most of the water falling as rain or snow is intercepted by the forest canopy, or other vegetation. This water is returned to the atmosphere through the processes of evaporation or transpiration without ever reaching the ground surface. Water that does reach the ground is able to percolate through the soil surface. Some of this water is utilized by plants and some continues to flow downward through the soil until it reaches the water table and recharges local groundwater supplies. As the landscape is developed, the protective layer of trees, shrubs, and grasses are stripped away and replaced by hardened surfaces. When it rains, much more water reaches the ground surface than previously and this water is then unable to infiltrate through the soil surface. Instead it runs off of roofs and roads, often carried more quickly through piped drainage systems, to local stream, rivers, and lakes. The result is an expected increase in both the frequency and the magnitude of area flooding.

Studies show that the magnitude of peak-stream flows increase by a factor of 2 to 3 with low-level suburban development (10-20% impervious area). In highly urbanized areas, not only are the major peak flows amplified, but smaller storms, which previously produced no runoff under pre-development conditions, also generate substantial stream flows. Under these conditions, moderate to large storms also result in storm discharge lasting 30 to 100 times longer than under pre-development conditions.²⁵⁵ Hydrologic modeling of these changes also shows that the frequency of flood producing storms increases, with the five-year (20% probability of occurring in any 1 year) flood peak increasing in frequency from 9 to 29 fold, so that the “five-year” storm becomes much more commonplace, occurring from 2 to 6 times per year.²⁵⁶ The loss of forest cover in a watershed exacerbates these changes so that even low-density development, with minor increases in impervious cover, result in altered stream hydrology.²⁵⁷

Oakland County, therefore, can anticipate increased occurrence and severity of flooding as municipalities continue to grow. Additional flooding will likely occur not only in areas currently identified as problem flood zones but, because much of the County’s population growth is expected to occur in outlying headwater areas, it may also be expected to occur in areas that currently exhibit no problem flooding.

²⁵⁴ Schueler, T.R., 1994. The Importance of Imperviousness. *Watershed Protection Techniques* 1(3):100-111.

²⁵⁵ Booth, D.B. 1990. Stream-Channel Incision Following Drainage-Basin Urbanization. *Water Resources Bulletin* 26(3): 407-417.

²⁵⁶ SEMCOG, *Land Use in Southeast Michigan 2010, January 5, 2012.*

²⁵⁷ Booth, D.B., Hartley, D., and R. Jackson. 2002. Forest Cover, Impervious Surface Area, and the Mitigation of Storm water Impacts. *J. Am. Water Res. Assoc.* 38(3): 835-845.

Infrastructure Failure

A growing population will likely continue to strain existing infrastructure as well as create the need for major expansions to current infrastructure. Similar to the issues of funding or transportation infrastructure described above, an estimated shortfall of \$14 billion to \$26 billion is expected over the next 30 years for maintaining and improving sewers.²⁵⁸ Changes in the County's hydrology, as described above, will further exacerbate problem areas in both storm and combined sewer systems.

Extreme Temperatures

In addition to growing in size, Oakland County's population is also aging. By 2035, the number of people in Oakland County over 65 years of age will be more than double that recorded in the 2010 census, as the baby-boomers reach retirement age.²⁵⁹ Longevity is also increasing, and the oldest segment of this population across the region – those 85 years of age or older– will also double in size during this period. Whereas those areas with the highest concentrations (>20%) of people over 65 years in age are currently in the more urbanized southeast corner of the County and a few outlying cities and villages, by 2035 those individuals 65 years of age or older will account for more than 20% of the population in approximately half of the communities across the County. Oakland County will need to prepare for the needs of a substantially older population.

Among the list of hazards considered in this Planning Process, extreme temperatures may be the hazard that has the greatest implications for the elderly. Specific vulnerabilities would include heating and cooling shelters where older individuals, without access to air conditioning or sufficient heating, may be brought for care. The County's aging population may have additional planning implications for emergency response agencies in cases of structural fires and other hazards requiring evacuation.

²⁵⁸ SEMCOG, *Land Use in Southeast Michigan 2010, January 5, 2012*

²⁵⁹ *Ibid.*

6. Hazardous Mitigation

6.1. Goals and Objectives

The following 3 goals, with objectives listed for each, were selected by the 2005 Advisory Committee to focus mitigation activities under the 2005 Plan.²⁶⁰

1. Improve public and private organizational preparedness:
 - Eliminate or reduce injuries and loss of life from hazards.
 - Identify infrastructure, land use and population vulnerabilities.
 - Establish a continuous improvement program.

2. Improve public and private organizational response capabilities.
 - Identify funding opportunities to implement response activities.
 - Inventory and identify deficiencies of existing response capabilities for all emergency responders.
 - Correct deficiencies for training, coordination and distribution of equipment.
 - Implement mutual aid pacts with all responders (public and private) through researching mutual aid laws.
 - Develop an Oakland County search and rescue team.
 - Identify, train and equip volunteers to serve on the search and rescue team.
 - Seek methods of addressing vulnerabilities.
 - Establish a continuous improvement program.
 - Support public and private response organizations.

3. Improve public education and awareness.
 - Improve the public's hazard response awareness.
 - Establish a continuous improvement program.
 - Support public and private response organizations.

For the 2012 Oakland County HMP Update, the Advisory Committee voted to revise the 2005 goals to reflect the current needs of the County and provide a more concise set of parameters to guide the hazard mitigation process. The Advisory Committee chose the following goals.

- Protection of public health and safety and prevention and reduction of loss of life and injury.
- Improve and support public and private organizational response capabilities.
- Prevention and reduction of damage to public and private property and infrastructure.
- Protect critical assets - hospitals, nursing homes, schools.
- Increase awareness and preparedness of public, business, non-profit, government, etc. about hazards.
- Encourage personal responsibility.

6.1.1 Mitigation Selection Criteria

Evaluation criteria used in the 2005 Plan for the review of mitigation alternatives, including weights for the individual assessment criteria provided in parentheses, are listed below. These

²⁶⁰ Goals and objectives presented here represent revisions made during the third workshop, held September 1, 2004 at the Palace of Auburn Hills

criteria, and the relative weights, were identified during the second Advisory Committee workshop (August 16, 2004) described above.

- Community & Public Acceptance (17)
- Protection of Critical Response Resources (17)
- Ability to Accomplish (11)
- Cost Effectiveness (10)
- Technically Feasibility (5)

The Advisory Committee reviewed the 2005 Plan evaluation criteria and decided that the evaluation criteria were still applicable as stated above with slight rewording of 2 criteria. The rewording was used to focus the criteria. The criteria were then evaluated to determine the weight for mitigation evaluation. Weighting factors changed rather significantly for Technical Feasibility and Community and Public Acceptance from the previous Plan. In order to determine the weight, the Advisory Committee ranked the importance of each criterion versus the others. The ranking system used was a number system from 1 to 5 with 1 being much less important and 5 being much more important. The following criteria and their scoring weights were used for the 2011 HMP update.

- Technical Feasibility (12)
- Cost Effectiveness (10)
- Ability to Accomplish, Fund, Measure, and Sustain (13)
- Protection of Critical Resources (15)
- Community and Public Acceptance - environmentally sound, socially equitable, etc. (10)

6.2. Survey Results

The mitigation survey presented 310 mitigation alternatives organized by the hazard addressed. Following the survey, mitigation strategies that addressed more than 1 hazard were combined. The results of the survey were used to divide the strategies into the following groups (number of strategies in each group is provided).

- Strategies for Consideration (9 strategies)
Average ≥ 4.0 ²⁶¹
- Optional Strategies (16 strategies)
- Other Strategies (106 strategies)
Not in categories above

Twelve strategies for the top hazards and an additional 9 mitigation strategies for other hazards were presented to the Advisory Committee for consideration in the development of Action Plans (21 total). An additional 32 optional and other strategies were also presented to provide alternatives for discussion. Discussion during the workshop eliminated 4 of the top 12 strategies, providing 8 survey strategies for Action Plan consideration. These strategies are listed below in Section 7.

²⁶¹ As indicated in Section 2.4.1, the highest ranking for mitigation strategy selection was 5.

6.3. Community Input

Each community identified potential mitigation strategies to address hazards within the community. 8 mitigation strategies were mentioned by 5 or more communities and these mitigation strategies were included among those reviewed by the Advisory Committee in the second workshop. Twenty percent (20%) or more of the communities identified the following 3 mitigation strategies as top priorities.

- Obtain communication boosters to address deficient areas of the OakWin Radio System.
- Assure training, planning, and preparedness for hazardous material incidents along roads and railways.
- Improve and continue training for emergency responders and the provide adequate equipment.

6.3.1 Community Identified Mitigation Strategies

Each community addressed the selection of hazard mitigation strategies in different terms to address specific local needs. The following describes the individual mitigation strategies identified by each community and the hazard(s) addressed by that strategy. Strategies are listed in the priority assigned during community meetings.

Addison Township

Mitigation Strategies 2005

- 1) Provide hazmat training for the public safety departments.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site (particularly hydrogen sulfide)
 - Progress: ONGOING
- 2) Supply the public safety departments with testing equipment to detect hydrogen sulfide.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site
 - Progress: COMPLETED - purchased necessary testing equipment

Mitigation Strategies 2012

- 1) Seek funding to purchase a new tanker to fight building and hazmat accident fires.
 - Hazard(s) Addressed: Fire - Structural, Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation
- 2) Implement additional training for pipeline (gas and oil) hazmat accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Petroleum and Natural Gas Pipeline Accidents
- 3) 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.
 - Hazard(s) Addressed: All
- 4) Provide additional resources to the Mutual Aid Box Alarm System (MABAS) to handle any hazmat incidents or major traffic accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Surface Roads

The City of Auburn Hills

Mitigation Strategies 2005

- 1) Provide funding for additional training and equipment to be used for hazmat and mass casualty accidents.
 - Hazard(s) Addressed: Civil Disturbance, Criminal Acts, Fire - Structural, Hazard Materials Incidents - Fixed, Hazard Materials Incidents - Transportation, Terrorism, Tornadoes
 - Progress: ONGOING - Emergency response personnel coordination through MABAS 3201 Group has reduced some of the risks identified previously.
- 2) Stockpile bottled water to be distributed during power outages. Provide emergency generators as needed to senior citizen facilities during power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure -Electrical Systems, Infrastructure Failure - Water System, Winter Hazards
 - Progress: (1) COMPLETED, (2) ONGOING - Agreements have been reached with local retailers to supply bottled water to the City's first responders when needed. There continues to be a lack of generators at area senior housing facilities.
- 3) Re-engineer community roads that are susceptible to flooding around the Clinton River.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: COMPLETE - Infrastructure improvements raised the height of the bridge, reducing flooding.

Mitigation Strategies 2012

- 1) Continue to coordinate training for hazmat and mass casualty incidents.
 - Hazard(s) Addressed: Fire - Structural, Hazmat Incidents - Transportation, High Winds and Tornadoes
- 2) Continue to seek funding for backup generator power for senior citizen housing facilities during power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure -Electrical Systems, Winter Hazards

The City of Berkley

Mitigation Strategies 2005

- 1) Assist in the purchase of new fire equipment including a foam capable pump.
 - Hazard(s) Addressed: Fire – Structural (particularly high-rise buildings), Hazmat Incidents - Transportation, High Winds and Tornadoes
 - Progress: COMPLETE
- 2) Upgrade current respiration equipment.
 - Hazard(s) Addressed: Fire – Structural, Hazmat Incidents- Transportation
 - Progress: COMPLETE
- 3) Provide funding to hire and train a sufficient number of people to assist the public safety department.
 - Hazard(s) Addressed: Fire – Structural, Hazmat Incidents- Transportation
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) 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.
 - Hazard(s) Addressed: All, but particularly Flooding – Riverine, Hazmat Incidents – Transportation, High Winds and Tornadoes, Infrastructure Failure – Electrical Systems, Petroleum and Natural Gas Pipeline Accidents, Terrorism, Winter Hazards
- 2) Continue to seek funding to increase staffing levels in public safety.
 - Hazard(s) Addressed: All, but particularly Flooding – Riverine, Hazmat Incidents – Transportation, High Winds and Tornadoes, Infrastructure Failure – Electrical Systems, Petroleum and Natural Gas Pipeline Accidents, Terrorism, Winter Hazards

The Village of Beverly Hills

Mitigation Strategies - 2005

- 1) Provide additional training and equipment to better prepare the public safety departments in responding to hazardous materials accidents.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation
 - Progress: ONGOING
- 2) Schedule regular inspections of the City's sewer system.
 - Hazard(s) Addressed: Flooding – Riverine (particularly the Rouge River west of Evergreen and south of Village Drive)
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Implement funding from fire grant to upgrade existing generators in the fire hall and police stations to provide power to entire buildings.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical Systems, High Winds and Tornadoes, Winter Hazards
- 2) Implement funding from fire grant to purchase a new fire pumping engine.
 - Hazard(s) Addressed: Fire - Structural
- 3) Provide continuous training for hazmat emergencies.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Petroleum and Natural Gas Pipeline Accidents
- 4) Implement funding from fire grant to purchase a new ladder fire truck.
 - Hazard(s) Addressed: Fire - Structural
- 5) 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.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical Systems, High Winds and Tornadoes, Winter Hazards

The Village of Bingham Farms

Mitigation Strategies 2005

- 1) Hire an engineering firm to evaluate and correct the flooding concerns of the Village.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation

- Progress: NOT COMPLETED DUE TO FUNDING SHORTFALL

Mitigation Strategies 2012

- 1) Acquire equipment to assist in debris removal following tornado and/or high wind storms.
 - Hazard(s) Addressed: High Winds and Tornadoes, Winter Hazards
- 2) Acquisition of equipment to assist in the removal of dead and live trees around power lines.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical Systems, Winter Hazards
- 3) Acquire equipment to boost radio communication in all buildings (including schools) in the Village to assist public safety.
 - Hazard(s) Addressed: All

The City of Birmingham

Mitigation Strategies 2005

- 1) Provide hazmat training to all members of the public safety departments.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Surface Roads, Transportation Accidents – Rail
 - Progress: ONGOING
- 2) Establish better communication between the City and the railroad companies to determine what is being transported through the City.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation, Transportation Accidents – Rail
 - Progress: ONGOING
- 3) Install additional floodgates on older buildings located along the river.
 - Hazard(s) Addressed: Flooding – Riverine (particularly the Rouge River from Woodward Avenue southwest to the City’s border)
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Continue hazmat training for all public safety personnel.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation

The City of Bloomfield Hills

Mitigation Strategies 2005

- 1) Hire additional public safety officers to assist in all emergency needs of the City, especially building fires.
 - Hazard(s) Addressed: All (particularly Fire – Structural)
 - Progress: ONGOING
- 2) Address flooding problems along Opdyke Road.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) The City and County are working together to coordinate installation of a new cell tower to increase coverage of the OakWin Radio System.
 - Hazard(s) Addressed: All
- 2) Continue to provide training for public safety officers to assist in all emergency needs of the City.
 - Hazard(s) Addressed: All

Bloomfield Township

Mitigation Strategies 2005

- 1) Provide funding to rebuild drains and eliminate recurring flooding problems in the Township, particularly in sections 13 and 14.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: ONGOING – The Township has developed a separate flood mitigation project plan and is implementing measures noted in that plan.
- 2) Provide the members of the public safety departments with additional hazmat equipment.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation (particularly along Woodward Avenue).
 - Progress: ONGOING

Mitigation Strategies 2012

Bloomfield Township has developed a Flood Mitigation Project Plan and a community specific Hazard Mitigation Plan to maintain eligibility for pre- and post-disaster FEMA grant monies. These plans are dated July 2010 and August 2011, respectively.

Bloomfield Township's HMP identifies the following 5 priority mitigation strategies.

- 1) Install additional outdoor warning sirens within the community.
 - Hazard(s) Addressed: High Winds and Tornadoes
- 2) Continue additional hazmat training.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Petroleum and Natural Gas Pipeline Accidents
- 3) Follow the recommendations outlined in the Flood Mitigation Action Plan.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
- 4) Participate in mutual aid assistance with surrounding communities (including 9-1-1).
 - Hazard(s) Addressed: All
- 5) Encourage tree trimming and maintenance to prevent limb breakage and protect nearby utility lines.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards

The Township's Flood Mitigation Project Plan identifies 39 areas, roads or properties with either known histories of flooding, or that are at risk of flooding, during large rain events. The Township's Flood Mitigation Project Plan identifies a series of mitigation strategies for reducing

the vulnerability of sanitary sewer, water main, storm sewer and road infrastructure and for protecting 40 residential properties in the Township. Recommendations in Bloomfield Township's Flood Mitigation Project Plan and a Hazard Mitigation Plan are included within the 2012 Oakland County Hazard Mitigation Plan Update by reference.

- Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban

The Village of Bloomfield

Mitigation Strategies 2005

- 1) Address the problem of flooding in the western portion of the Village.
 - Hazard(s) Addressed: Flooding – Riverine, Flooding - Urban
 - Progress: NOT COMPLETED, no longer an issue

Mitigation Strategies 2012

- 1) Provide continuing education to residents on what to do in case of a tornado or other major emergency.
 - Hazard(s) Addressed: All

Brandon Township

Mitigation strategies 2005

- 1) Provide additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING
- 2) Provide confined space rescue equipment.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Infrastructure Failure – Sanitary Sewer System, Infrastructure Failure – Storm Sewer System, Subsidence
 - Progress: COMPLETED
- 3) Address flooding issues on Poli Road.
 - Hazard(s) Addressed: Flooding- Riverine
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Install a fire suppression well in downtown Ortonville to help with possible fire in the downtown area.
 - Hazard(s) Addressed: Fire - Structural
- 2) Implement the Brandon-Oxford-Addison narrow band grant to purchase narrow band radios for the respective townships by 2013.
 - Hazard(s) Addressed: All

The City of Clarkston

Mitigation Strategies 2005

- 1) Create a program that would provide water, oxygen and medication to senior citizens in cases of power outages due to weather or infrastructure failures.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Infrastructure Failure – Water, Winter Hazards
 - Progress: INTEND TO START

- 2) Coordinate programs with neighboring communities to improve mutual assistance in times of power outages and other emergencies.
 - Hazard(s) Addressed: All
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Create a program that would provide water, oxygen and medication to senior citizens in cases of power outages due to weather or infrastructure failures.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Infrastructure Failure – Water, Winter Hazards
- 2) Continue to advocate for 100% outdoor warning siren coverage for Oakland County.
 - Hazard(s) Addressed: High Winds and Tornadoes

The City of Clawson

Mitigation Strategies 2005

- 1) Hire additional manpower so that there is a sufficient level of preparedness to respond to major emergencies.
 - Hazard(s) Addressed: All, particularly Fire – Structural, Hazmat – Transportation, High Winds and Tornadoes, Infrastructure Failure – Sanitary Sewer, Infrastructure Failure – Storm Sewer, Infrastructure Failure – Water, Petroleum and Natural Gas Pipeline Accidents, Transportation Accidents – Air
 - Progress: ONGOING
- 2) Provide additional hazmat equipment to be made available to area communities in situations where mutual aid is needed.
 - Hazard(s) Addressed: Hazmat – Fixed Site, Hazmat – Transportation
 - Progress: ONGOING
- 3) Provide specific training, additional manpower and equipment to be used in the event of a plane crash in the vicinity of local elementary school.
 - Hazard(s) Addressed: Transportation Accidents – Air
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Include the department of public works in the OakWin Radio System.
 - Hazard(s) Addressed: All
- 2) Upgrade generators in the city hall and fire hall, the 2 named command posts for emergencies.
 - Hazard(s) Addressed: Infrastructure Failure – Communications, Infrastructure Failure – Electrical System

Commerce Township

Mitigation Strategies 2005

- 1) Install additional tornado sirens and implement an educational program that increases the public's awareness of their vulnerability to tornadoes.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED

- 2) Supply the fire department with necessary hazmat equipment.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Acquire equipment to allow radio communication in all buildings in the Township (including schools) to improve public safety.
 - Hazard(s) Addressed: All
- 2) Advocate for widening Union Lake and Haggerty Roads to 5 lanes for improved public safety and emergency vehicle access.
 - Hazard(s) Addressed Transportation Accidents – Surface Roads, Infrastructure Failure – Bridges, Roads, Overpasses

The City of Farmington

Mitigation Strategies 2005

- 1) Provide additional training for responding to mass emergencies.
 - Hazard(s) Addressed: All
 - Progress: ONGOING
- 2) Provide regular hazmat training to members of the fire department.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Sites
 - Progress: COMPLETED – Fire department personnel receive ongoing training in specialized equipment

Mitigation Strategies 2012

- 1) 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.
 - Hazard(s) Addressed: All

The City of Farmington Hills

Mitigation Strategies 2005

- 1) Upgrade or replace the current communication equipment used by the public safety departments and community alert system.
 - Hazard(s) Addressed: All
 - Progress: COMPLETED – Implementation of the OakWin Radio System has improved emergency communications
- 2) Address flooding problems caused by choke points in the Rouge River or the failure of the sewer system and flooding that result in road closures or residential/business damage.
 - Hazard(s) Addressed: Flooding – Riverine, Flooding - Urban
 - Progress: ONGOING
- 3) 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.

- Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban, Infrastructure Failure – Bridges, Roads, and Overpasses, Infrastructure Failure - Electrical System, Infrastructure Failure - Sanitary Sewer System
 - Progress: NOT COMPLETED
- 4) Study the feasibility of installing additional entrances and exits to/from I-696 to improve emergency vehicle access to accident sites.
- Hazard(s) Addressed: Transportation Accidents – Surface Roads, Transportation Accidents - Highway
 - Progress: NOT COMPLETED

Mitigation Strategies 2012

- 1) Seek funding to provide boosters to the OakWin Radio System to eliminate or reduce dead spots inside and outside of buildings.
- Hazard(s) Addressed: All

The City of Ferndale

Mitigation Strategies 2005

- 1) Equip the fire department with bio-chemical suit.
- Hazard(s) Addressed: All
 - Progress: COMPLETE - Implementation of the Oakway hazmat team has resulted in improved hazmat response time. Mutual aid agreements and coordination are in place in the event of a disaster or emergency.
- 2) 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 wind storms.
- Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure - Electrical System, Infrastructure Failure - Water, Winter Hazards
 - Progress: COMPLETED - The community has an adequate supply of water that will last until bottled water can be obtained from local retailers

Mitigation Strategies 2012

- 1) Obtain backup generators for the police headquarters and city hall.
- Hazard(s) Addressed: High Winds and Tornadoes, Winter Hazards
- 2) Conduct ongoing training for public safety personnel to be prepared for hazmat incidents or civil disturbance in the community.
- Hazard(s) Addressed: Civil Disturbance, Hazmat incidents – Fixed Sites, Hazmat Incidents – Transportation, Transportation Accidents – Highways, Transportation Accidents – Rail, Transportation Accidents – Surface Roads

The Village of Franklin

Mitigation strategies 2005

- 1) Provide hazmat detection equipment to the police and fire departments.
- Hazard(s) Addressed: Hazmat Incidents – Transportation
 - Progress: COMPLETED
- 2) Upgrade existing, or purchase new, equipment that will provide better communication within the departments and between communities.

- Hazard(s) Addressed: All
 - Progress: COMPLETED
- 3) Maintain an emergency supply of water that can be distributed to those residents who lose electric power and are unable to use their wells.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System
 - Progress: REMOVE - NO LONGER VALID

Mitigation strategies 2012

- 1) Acquire equipment to assist in debris removal following tornado and/or high wind storms.
 - Hazard(s) Addressed: High Winds and Tornadoes, Winter Hazards
- 2) Acquire equipment to assist in dead and live tree removal around power lines.
 - Hazard(s) Addressed: High Winds and Tornadoes, Winter Hazards
- 3) Acquire equipment to boost radio communication in all buildings.
 - Hazard(s) Addressed: All
- 4) Seek funding for purchase of a generator for use/installation in local church or school shelter.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards

Groveland Township

Mitigation Strategies 2005

- 1) Provide adequate equipment and training necessary to deal with hazmat accidents, particularly on I-75, M-15 and Dixie Highway.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation
 - Progress: COMPLETED – Cooperation through mutual aid agreements and the North Oakland Hazmat Team have reduced the risk
- 2) 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.
 - Hazard(s) Addressed: Fire - Wildfires
 - Progress: COMPLETED- The Township has purchased 2 additional trucks and due to mutual aid availability, this risk has been reduced.
- 3) Install at least 1 additional tornado siren.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED - Additional sirens were obtained and installed and coverage is now sufficient.
- 4) Raise and improve roads that are susceptible to flooding.
 - Hazard(s) Addressed: Flooding – Riverine, Flooding - Urban
 - Progress: NO LONGER AN ISSUE

Mitigation Strategies 2012

- 1) Provide ongoing training to assure the highest quality response to Township residents.
 - Hazard(s) Addressed: All

The City of Hazel Park

Mitigation Strategies 2005

- 1) Provide the fire department with additional training and rescue equipment to deal with hazmat accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation
 - Progress: ONGOING

- 2) Equip the fire department with high angle rescue equipment to assist in the fighting of building fires.
 - Hazard(s) Addressed: Fire - Structural
 - Progress: ONGOING

- 3) Hire additional fire inspectors.
 - Hazard(s) Addressed: Fire - Structural
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) The City of Hazel Park will continue to implement the same mitigation strategies identified in 2005.
 - Hazard(s) Addressed: Fire – Structural, Hazmat Incidents - Transportation

Highland Township

Mitigation Strategies 2005

- 1) Create an emergency back-up communication system to be used during ice and wind storms and the resulting power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards
 - Progress: COMPLETED – Conversion to the OakWin Radio System has reduced this risk.

- 2) Increase manpower available to respond in the event of an emergency in the Township.
 - Hazard(s) Addressed: All
 - Progress: ONGOING

- 3) Install 1 additional tornado siren in the northeast section of the Township.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) CERT (Citizen Emergency Response Team) training/recruitment to assist in the event of a local or regional emergency.
 - Hazard(s) Addressed: All

Holly Township

Mitigation Strategies 2005

- 1) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING

- 2) Raise and improve sections of Township roads that are susceptible to flooding.
 - Hazard(s) Addressed: Flooding - Riverine (particularly affecting Tinsman and Halsey Roads)
 - Progress: COMPLETED
- 3) Implement additional hazmat training for members of the fire department.
 - Hazard(s) Addressed: Hazmat Incidents – Transportation, Transportation Accidents - Rail
 - Progress: ONGOING
- 4) Provide the public safety department and Township officials with training regarding a potential mass casualty event.
 - Hazard(s) Addressed: Civil Disturbance (particularly at the annual Renaissance Festival), High Winds and Tornadoes
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) 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.
 - Hazard(s) Addressed: Transportation Accidents - Rail
- 2) Obtain funding to improve Grange Hall Road, Holly Road and other roads in Holly Township.
 - Hazard(s) Addressed: Infrastructure Failures – Bridges, Roads and Overpasses
- 3) 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.
 - Hazard(s) Addressed: All

The Village of Holly

Mitigation Strategies 2005

- 1) Provide additional tornado sirens to serve all areas of the Village.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED - Additional outdoor warning sirens have been installed in the Village.
- 2) 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.
 - Hazard(s) Addressed: All (particularly High Winds and Tornadoes, Fire – Structural, Transportation – Rail)
 - Progress: COMPLETED – Mutual aid agreements are in place and risk has been reduced.

Mitigation Strategies 2012

- 1) Provide increased community awareness of the risk of a train vs. motor vehicle accident on the railroad tracks in the Village.
 - Hazard(s) Addressed: Transportation – Rail, Transportation – Surface Roads

The City of Huntington Woods

Mitigation Strategies 2005

- 1) Provide training specifically for the evacuation of the Detroit Zoo.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site
 - Progress: COMPLETED

- 2) Supply the public safety departments with the necessary decontamination equipment to be used in hazmat accidents.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
 - Progress: COMPLETED

- 3) Continue to provide the community with educational material regarding the dangers of tornadoes.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Coordinate with the County for improvements in the OakWin Radio System to eliminate or reduce dead zones.
 - Hazard(s) Addressed: All

Independence Township

Mitigation Strategies 2005

- 1) Create a program that would provide needed supplies to senior citizens in times of power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards
 - Progress: ONGOING

- 2) Coordinate programs with neighboring communities to improve mutual assistance in times of mass emergencies.
 - Hazard(s) Addressed: All
 - Progress: COMPLETE

- 3) Implement additional training to address potential civil disturbances at the DTE Energy Music Theatre.
 - Hazard(s) Addressed: Civil Disturbance
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Create a program to provide needed supplies to senior citizens during power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards.

- 2) Implement additional training to deal with potential civil disturbances at the DTE Energy Music Theatre.
 - Hazard(s) Addressed: Civil Disturbance

- 3) Continue to advocate for 100% outdoor warning siren coverage for Oakland County.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards

The City of Keego Harbor

Mitigation Strategies 2005

- 1) Assist in funding the construction of a community center that could serve as an emergency shelter.
 - Hazard(s) Addressed: Earthquakes, Extreme Temperatures, High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards
 - Progress: COMPLETED
- 2) Supply the police station with an emergency generator.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
 - Progress: COMPLETED
- 3) Address area flooding concerns.
 - Hazard(s) Addressed: Flooding – Riverine, Flooding - Urban
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Seek funding for additional repeaters for the OakWin Radio System to boost signal in certain areas.
 - Hazard(s) Addressed: All
- 2) Seek funding for water rescue training (summer/winter) on Keego Harbor lakes.
 - Hazard(s) Addressed: Transportation - Marine

The City of Lake Angelus

Mitigation Strategies 2005

- 1) Assess the City's preparedness to respond to a hazardous material emergency.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Advocate for County-wide road improvements, especially to high traffic roads.
 - Hazard(s) Addressed: Transportation – Surface Roads, Transportation - Highway

The Village of Lake Orion

Mitigation Strategies 2005

- 1) 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.
 - Hazard(s) Addressed: Infrastructure Failure - Water System
 - Progress: COMPLETED/NO LONGER NEEDED - Since 2005, water tower improvements have improved water pressure. Water pressure is now adequate for the Village's needs.

- 2) Continue the Village's awareness and preparations for the potential of a tornado.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Prepare a plan addressing damage to, or failure of, the Lake Orion dam.
 - Hazard(s) Addressed: Flooding - Dam Failure

The City of Lathrup Village

Mitigation Strategies 2005

- 1) Provide additional shelters for citizens to use in emergency situations.
 - Hazard(s) Addressed: Earthquakes, High Winds and Tornadoes, Infrastructure Failure - Electrical System. Winter Hazards
 - Progress: INTEND TO COMPLETE
- 2) Issue a loudspeaker to be used for crowd control.
 - Hazard(s) Addressed: Civil Disturbance
 - Progress: INTEND TO COMPLETE
- 3) Address changes needed in areas that experience flooding from sewer back-ups, particularly near Eleven Mile Road and Red River Street.
 - Hazard(s) Addressed: Flooding - Urban
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Provide additional shelters for citizens to use in emergency situations.
 - Hazard(s) Addressed: Earthquakes, High Winds and Tornadoes, Infrastructure Failure - Electrical System. Winter Hazards
- 2) Issue a loudspeaker to be used for crowd control.
 - Hazard(s) Addressed: Civil Disturbance
- 3) Address changes needed in areas of flooding due to sewer back-ups.
 - Hazard(s) Addressed: Flooding - Urban
- 4) Provide funding to train public safety personnel in the event of a hazmat accident involving the pipeline.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Petroleum and natural Gas Pipeline Accidents

The Village of Leonard

Mitigation Strategies 2005

- 1) Provide funding to assist in the clean-up of the community following ice and wind storms.
 - Hazard(s) Addressed: High Winds and tornadoes, Winter hazards - Ice and Sleet
 - Progress: ONGOING
- 2) Determine the feasibility of equipping the one hundred year old grist mill with fire prevention equipment.
 - Hazard(s) Addressed: Fire - Structural
 - Progress: NO LONGER NECESSARY - grist mill is closed to the public.

Mitigation Strategies 2012

- 1) Find/allocate funding to provide sewers and storm drains for the Village of Leonard.
 - Hazard(s) Addressed: Flooding - Urban, Infrastructure Failure - Storm Sewer System
- 2) Provide funding for communication boosters for the OakWin Radio System.
 - Hazard(s) Addressed: All

Lyon Township

Mitigation Strategies 2005

- 1) Install additional tornado sirens for the mobile home park.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING - this task is half completed

Mitigation Strategies 2012

- 1) Install additional outdoor warning sirens for the mobile home park located off Eight Mile Road, east of Griswold.
 - Hazard(s) Addressed: High Winds and Tornadoes
- 2) Seek funding to find a suitable emergency shelter for residents.
 - Hazard(s) Addressed: Earthquake, Extreme Temperatures - Extreme Cold, Extreme Temperatures - Extreme Heat, High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards
- 3) 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.
 - Hazard(s) Addressed: Earthquake, Extreme Temperatures - Extreme Cold, Extreme Temperatures - Extreme Heat, High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards

The City of Madison Heights

Mitigation Strategies 2005

- 1) 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.
 - Hazard(s) Addressed: Transportation Accidents - Highway
 - Progress: ONGOING
- 2) Provide additional training in dealing with emergencies at high-rise buildings.
 - Hazard(s) Addressed: Fire - Structural, other hazards that require building evacuation
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Seek a grant for S.C.B.A. (Self-Contained Breathing Apparatus) to replace existing outdated equipment.
 - Hazard(s) Addressed: Fire - Structural, Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation

- 2) Pursue a regional grant to acquire video conferencing to 14 surrounding fire departments.
 - Hazard(s) Addressed: All
- 3) Investigate funding to provide a single point dispatch system for surrounding area police and fire departments for better communication between municipalities.
 - Hazard(s) Addressed: All
- 4) Seek funding to provide 1 common alerting station system.
 - Hazard(s) Addressed: All
- 5) Investigate funding sources to replace all of the firefighters' personal protective equipment. Current equipment is outdated and worn out.
 - Hazard(s) Addressed: Fire - Structural, Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation
- 6) Provide increased training for the Incident Management Team (IMT) to provide consistent and comprehensive support for long term, large scale and/or complex emergencies.
 - Hazard(s) Addressed: All

Milford Township

Mitigation Strategies 2005

- 1) Redesign culverts in areas of frequent flooding along the Huron River.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: COMPLETED
- 2) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Continue to advocate for additional outdoor warning sirens so all residents of the Township can be warned of a weather emergency.
 - Hazard(s) Addressed: High Winds and Tornadoes

The Village of Milford

Mitigation Strategies 2005

- 1) Provide ongoing training to prepare for a train derailment that may involve hazardous materials.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Rail
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue to advocate for training regarding the transportation of hazardous materials and the response to any spill or hazmat incident.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Rail

The City of Northville

Mitigation Strategies 2005

- 1) Implement additional hazmat training.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Rail
 - Progress: COMPLETE - Involvement with MEMAC and the Western Wayne Hazmat Team have reduced the risk.
- 2) Update the tornado warning system.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETE - Additional outdoor warning sirens have been installed.
- 3) 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.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
 - Progress: ONGOING - This has been less of a problem recently.

Mitigation Strategies 2012

- 1) Conduct ongoing training and coordination with mutual aid partners in fire and hazmat response.
 - Hazard(s) Addressed: Fire - Structural, Hazmat incidents - Fixed Site, Hazmat incidents - Transportation

Novi Township

Mitigation Strategies 2005

- 1) Provide assistance in funding necessary repairs to the Township's roads.
 - Hazard(s) Addressed: Transportation Accidents - Surface Roads, Infrastructure Failure - Bridges, Roads, Overpasses
 - Progress: ONGOING - The Township has replaced about one-half of the worst parts of the roads.

Mitigation Strategies 2012

- 1) Provide funding to replace the rest of the roads in the Township.
 - Hazard(s) Addressed: Transportation Accidents - Surface Roads, Infrastructure Failure - Bridges, Roads, Overpasses
- 2) Provide additional funding for maintaining Township roads.
 - Hazard(s) Addressed: Transportation Accidents - Surface Roads, Infrastructure Failure - Bridges, Roads, Overpasses

The City of Novi

Mitigation Strategies 2005

- 1) Provide additional hazmat training and equipment for the public safety departments.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation
 - Progress: ONGOING - Participation in MABAS and the Western Wayne County Hazmat Team has reduced the risk

- 2) Increase public awareness of the dangers of tornadoes.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED - Additional outdoor warning sirens were installed and the City now has adequate siren coverage

Mitigation Strategies 2012

- 1) Additional training to address the potential civil disturbance/terrorist target at the Twelve Oaks Shopping Center.
 - Hazard(s) Addressed: Civil Disturbance, Terrorism

Oakland Township

Mitigation Strategies 2005

- 1) Provide needed assistance in preventing flooding of area roads flood during heavy rain.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: ONGOING

- 2) Implement additional hazmat training.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue to seek and provide training for hazmat incidents.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Petroleum and Natural Gas Pipeline Accident

The City of Oak Park

Mitigation Strategies 2005

- 1) 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 .
 - Hazard(s) Addressed: Fire - Structural, Infrastructure Failure - Electrical System, Infrastructure Failure - Water System
 - Progress: COMPLETED - Tanker task force in place through MABAS

- 2) Replace the older backup generators at the City's public safety department.
 - Hazard(s) Addressed: Infrastructure Failure - Communications, Infrastructure Failure - Electrical System
 - Progress: COMPLETED

- 3) Provide backup electrical power for the community center to provide shelter during power failures and other emergency sheltering needs.
 - Hazard(s) Addressed: Extreme Temperatures - Extreme Cold, Extreme Temperatures - Extreme Heat, High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards
 - Progress: COMPLETED - Portable generators are now available, but would prefer automatic/dedicated generator.

- 4) Provide a new aerial ladder for firefighting due to the age of existing equipment and the acquisition of new properties containing multi-story residences.
 - Hazard(s) Addressed: Fire -Structural
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) 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.
 - Hazard(s) Addressed: Civil Disturbance, Infrastructure Failure - Electrical System, Infrastructure Failure - Communications
- 2) 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.
 - Hazard(s) Addressed: Extreme Temperatures - Extreme Cold, Extreme Temperatures - Extreme Heat, High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards

The City of Orchard Lake Village

Mitigation Strategies 2005

- 1) Provide joint hazmat training with police and fire departments and neighboring police departments.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation
 - Progress: COMPLETED - Establishment of mutual aid agreements have reduced this risk.
- 2) Provide additional manpower for emergencies as needed per mutual aid agreements.
 - Hazard(s) Addressed: All
 - Progress: COMPLETED - Establishment of mutual aid agreements have reduced this risk.
- 3) Provide for emergency electrical power for certain flood pumps.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding -Urban
 - Progress: NO LONGER A PRIORITY

Mitigation Strategies 2012

- 1) Pursue improvements to the OakWin Radio System such as portable repeaters to be used for fire emergencies.
 - Hazard(s) Addressed: All, particularly Fire - Structural
- 2) Seek training opportunities to address the deficiencies with regard to water rescues on the City's lakes.
 - Hazard(s) Addressed: Transportation - Marine

Orion Township

Mitigation Strategies 2005

- 1) 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.
 - Hazard(s) Addressed: Fire - Structural, Infrastructure Failure - Electrical System, Infrastructure Failure - Water System
 - Progress: COMPLETED

Mitigation strategies 2012

- 1) Continue educating people on hazardous weather conditions so they can be prepared for bad weather.
 - Hazard(s) Addressed: High Winds and Tornadoes, Winter Hazards

Village of Ortonville

Mitigation strategies 2005

- 1) Provide additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING
- 2) Provide confined space rescue equipment. There is a need for equipment to properly respond to vehicle accidents and other hazards.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Infrastructure Failure - Sanitary Sewer System, Infrastructure Failure - Storm Sewer System, Subsidence, Transportation Accidents, Highway, Transportation Accidents - Surface Roads
 - Progress: COMPLETED
- 3) Address flooding that causes road closures on Poli Road.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Plan to install fire suppression well in downtown Ortonville to help with possible fire in downtown area.
 - Hazard(s) Addressed: Fire - Structural
- 2) Install additional outdoor warning sirens for full coverage in the Village.
 - Hazard(s) Addressed: High Winds and Tornadoes

Oxford Township

Mitigation Strategies 2005

- 1) Fund specialized training and provide equipment for hazmat.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Petroleum and Natural Gas Pipeline Accidents
 - Progress: ONGOING - Coordination through mutual aid agreements has mitigated some of the risk for hazmat response

- 2) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED - Additional outdoor warning sirens were installed
- 3) Provide additional equipment to assist in truck accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Highway
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue to work/communicate with the pipeline representatives to assure safe conditions along the pipeline within the Township.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Petroleum and Natural Gas Pipeline Accidents

The Village of Oxford

Mitigation Strategies 2005

- 1) Fund specialized training and provide equipment for hazmat incidents.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Petroleum and Natural Gas Pipeline Accidents
 - Progress: ONGOING - Coordination through mutual aid agreements has mitigated some of the risk for hazmat response
- 2) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED - Additional outdoor warning sirens were installed
- 3) Provide additional equipment to assist in truck accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Transportation, Transportation Accidents - Highway
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Fund specialized training and provide equipment for hazmat incidents.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Transportation Accidents - Highway
- 2) Provide additional equipment to assist in truck accidents.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation, Transportation Accidents - Highway

The City of Pleasant Ridge

Mitigation Strategies 2005

- 1) Provide additional manpower, training and equipment to be properly prepared for a civil disturbance due to the ethnic make-up of the City.
 - Hazard(s) Addressed: Civil Disturbance
 - Progress: ONGOING

- 2) Provide additional manpower and equipment to deal with vehicular accidents.
 - Hazard(s) Addressed: Transportation Accidents - Highway, Transportation Accidents - Surface Roads
 - Progress: ONGOING - Risk has been reduced due to mutual aid coverage with neighboring communities.

- 3) Provide emergency funding to provide water to citizens in cases of power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure - Electrical System, Infrastructure Failure - Water System
 - Progress: ONGOING - Water supply issues have been resolved with the involvement of the Southeastern Oakland County Water Authority (SOCWA). Power outages remain a problem.

Mitigation Strategies 2012

- 1) Provide ongoing training for public safety to provide a safe community.
 - Hazard(s) Addressed: All

- 2) Provide a dedicated/automatic switch-over generator for the city hall and additional generators for the community center.
 - Hazard(s) Addressed: Extreme Temperatures - Extreme Cold, Extreme Temperatures - Extreme Heat, High Winds and Tornadoes, Infrastructure Failure - Communications, Infrastructure Failure - Electrical System, Winter Hazards

The City of Pontiac

Mitigation Strategies 2005

- 1) Transfer individuals recently released from jail back to their own communities rather than placing them in a facility in Pontiac.
 - Hazard(s) Addressed: Criminal Acts
 - Progress: ONGOING

- 2) 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).
 - Hazard(s) Addressed: All
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Provide a designated special hazmat route for trucks to follow through the City of Pontiac to help contain hazardous materials.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation

- 2) Seek funding to provide County-wide wireless internet security cameras to be placed in high crime areas for police and fire departments.
 - Hazard(s) Addressed: Criminal Acts

The City of Rochester

Mitigation Strategy 2005

- 1) Continuance of current levels of cooperation from Oakland County. – IN PROCESS
 - Hazard(s) Addressed: All (particularly Fire - Structural, High Winds and Tornadoes)
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue efforts to clean up and manage woody debris in the Clinton River.
 - Hazard(s) Addressed: Flooding – Riverine
- 2) Plan and implement improvements to prevent erosion along the soft shoulder of the Clinton River.
 - Hazard(s) Addressed: Flooding – Riverine
- 3) Improve security and maintenance at water systems.
 - Hazard(s) Addressed: Flooding – Riverine

The City of Rochester Hills

Mitigation Strategy 2005

- 1) Provide transportation for citizens, especially seniors, in cases of emergencies.
 - Hazard(s) Addressed: All (particularly Fire - Structural, High Winds and Tornadoes)
 - Progress: ONGOING
- 2) Address the problem of Clinton River flooding from storm water runoff and dam/lake level control structure releases upstream.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
 - Progress: ONGOING
- 3) 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.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Seek funding to complete bank erosion repair of Clinton River.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
- 2) Seek funding to remove woody debris removal of the Clinton River and Paint Creek.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban
- 3) Seek funding to address flooding on Livernois and Avon Roads.
 - Hazard(s) Addressed: Flooding - Riverine, Flooding - Urban

Rose Township

Mitigation Strategies 2005

- 1) Install tornado sirens in the Township.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED
- 2) Correct the problem of trains blocking emergency vehicles from entering and exiting Holly Shores Mobile Home Park.
 - Hazard(s) Addressed: Transportation – Rail, Transportation – Surface Roads
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Seek funding to pave Rose Center Road (the only east/west roadway) and improve local road/primary road intersections.
 - Hazard(s) Addressed: Transportation – Rail, Transportation – Surface Roads
- 2) Advocate for a central accountability system for all emergencies including hazmat accidents.
 - Hazard(s) Addressed: All
- 3) 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.
 - Hazard(s) Addressed: All

Royal Oak Township

Mitigation Strategies 2005

- 1) Improve mutual assistance from surrounding communities in fighting building fires.
 - Hazard(s) Addressed: Fire - Structural
 - Progress: COMPLETED – Contracted with Ferndale Fire Department
- 2) Provide funding for equipment to respond to hazmat emergencies.
 - Hazard(s) Addressed: Transportation – Rail, Transportation – Surface Roads
 - Progress: COMPLETED – Contracted with the Ferndale Fire Department to handle hazmat emergencies.
- 3) Purchase an ambulance for the community.
 - Hazard(s) Addressed: All
 - Progress: ONGOING – Michigan State Police and the Oakland County Sheriff's Office are assisting with emergency response for traffic accidents.

Mitigation Strategies 2012

- 1) Continue contracting with Ferndale Fire Department to handle all fires and hazmat emergencies.
 - Hazard(s) Addressed: Fire – Structural, Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
- 2) Continue mutual aid agreement with Michigan State Police and Oakland County Sheriff's Office to handle traffic accidents.
 - Hazard(s) Addressed: Transportation – Surface Roads, Transportation Accidents - Highway

The City of Royal Oak

Mitigation Strategies 2005

- 1) Purchase a new trailer with a special affects video system to expand the community education program about tornadoes and other hazards.
 - Hazard(s) Addressed: All, particularly High Winds and Tornadoes
 - Progress: COMPLETED

- 2) Compile a list of contractors with heavy equipment able to provide immediate assistance in emergency situations, particularly tornadoes and train derailments.
 - Hazard(s) Addressed: High Winds and Tornadoes, Transportation Accidents - Rail
 - Progress: ONGOING
- 3) Provide additional manpower for large scale celebrations/crowds downtown.
 - Hazard(s) Addressed: Civil Disturbance
 - Progress: ONGOING
- 4) Provide the necessary training and equipment needed to address hazmat emergencies.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Seek funding for communication boosters for the OakWin Radio System to address dead zones in the network.
 - Hazard(s) Addressed: All

The City of South Lyon

Mitigation Strategies 2005

- 1) Improve drainage to prevent future flooding in the Colonial Acres senior community.
 - Hazard(s) Addressed: Flooding - Urban
 - Progress: ONGOING
- 2) Provide the police department with a self-contained breathing apparatus to be better prepared for hazmat accidents.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Rail, Petroleum and Natural Gas Pipeline Accidents
 - Progress: ONGOING
- 3) Continue a high level of preparedness to respond to a tornado emergency.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents - Rail
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Upgrade generators for the police station and city hall to provide power during emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Infrastructure Failure – Communication Systems, Winter Hazards

The City of Southfield

Mitigation Strategies 2005

- 1) Provide additional manpower and training to deal with potential hazmat emergencies.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Highway, Transportation Accidents – Surface Roads
 - Progress: ONGOING

- 2) Provide means for detaining storm water to avoid area flooding.
 - Hazard(s) Addressed: Flooding -Riverine, Flooding -Urban
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Provide continuing training for potential hazmat emergencies.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Highway, Transportation Accidents – Surface Roads
- 2) Provide funding to continue to upgrade emergency equipment to deal with all types of emergencies.
 - Hazard(s) Addressed: All

Southfield Township

Southfield Township consists primarily of 3 villages: Beverly Hills, Bingham Farms and Franklin. All decisions regarding hazards and mitigations for Southfield Township are addressed individually by the 3 Villages.

Springfield Township

Mitigation Strategies 2005

- 1) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: COMPLETED
- 2) Provide an emergency response system, bus transportation and an evacuation plan for school children in case of a railroad hazmat spill.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Highway, Transportation Accidents – Rail, Transportation Accidents – Surface Roads
 - Progress: ONGOING
- 3) Provide funding to transport individuals involved in multi-vehicle accidents.
 - Hazard(s) Addressed: Transportation Accidents – Highway, Transportation Accidents – Surface Roads
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue to provide training for hazmat situations.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Highway, Transportation Accidents – Rail, Transportation Accidents – Surface Roads

The City of Sylvan Lake

Mitigation Strategies 2005

- 1) Address sewer back-ups on Cheltingham, Garland and Avondale Streets.
 - Hazard(s) Addressed: Flooding -Urban
 - Progress: COMPLETED

- 2) Provide engineering assistance necessary to control the flooding in the area of Avondale and Garland Streets.
 - Hazard(s) Addressed: Flooding - Urban
 - Progress: COMPLETED

Mitigation Strategies 2012

- 1) Pursue funding for portable repeaters to address the deficiencies in the OakWin Radio System.
 - Hazard(s) Addressed: All
- 2) Address deficiencies in water rescue capabilities on area lakes.
 - Hazard(s) Addressed: Transportation - Marine

The City of Troy

Mitigation Strategies 2005

- 1) Study the feasibility of implementing an emergency warning system that could provide different tones for different types of emergencies.
 - Hazard(s) Addressed: Multiple
 - Progress: NOT COMPLETED – 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.
- 2) Visit a command center in another community with experience in disaster response to learn how problems were handled.
 - Hazard(s) Addressed: All
 - Progress: ONGOING
- 3) Continue educational programs regarding tornadoes, high rise building fires and other potential hazards.
 - Hazard(s) Addressed: Multiple, particularly Fire – Structural, High Winds and Tornadoes
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Seek funding for a citizens 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).
 - Hazard(s) Addressed: Multiple, particularly Fire – Structural, High Winds and Tornadoes
- 2) Seek funding to provide additional training and equipment for officers to actively and aggressively intervene in mass shooting situations.
 - Hazard(s) Addressed: Criminal Acts – Mass Shootings

The City of Walled Lake

Mitigation Strategies 2005

- 1) Upgrade the current emergency radio system to provide better communication between police and fire departments and with neighboring communities.
 - Hazard(s) Addressed: All
 - Progress: COMPLETED

- 2) Provide funding to purchase an ambulance to transport accident victims to area hospitals.
 - Hazard(s) Addressed: Multiple, particularly Transportation Accidents – Surface Roads
 - Progress: COMPLETED
- 3) Continue training in response to tornadoes, fires, hazmat accidents and other emergencies.
 - Hazard(s) Addressed: ALL
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Provide funding to upgrade the generators at the police station and the fire hall.
 - Hazard(s) Addressed: Infrastructure Failure – Communications System, Infrastructure Failure – Electrical System

Waterford Township

Mitigation Strategies 2005

- 1) Address the flooding concerns adjacent to lakes and rivers.
 - Hazard(s) Addressed: Flooding - Riverine
 - Progress: ONGOING
- 2) Provide funding to upgrade current, or purchase new, hazmat equipment as needed.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents - Transportation
 - Progress: ONGOING
- 3) Implement additional training to mutual assistance in time of mass emergencies.
 - Hazard(s) Addressed: ALL
 - Progress: ONGOING
- 4) Maintain mutual assistance agreements for a potential emergency at the Oakland County International Airport.
 - Hazard(s) Addressed: Transportation Accidents - Air
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Provide funding for protection and security to the 18 ground water wells in the Township.
 - Hazard(s) Addressed: Infrastructure Failure - Water Supply, Terrorism
- 2) Provide funding for additional manpower for public safety for flooding issues and possible hazmat accidents.
 - Hazard(s) Addressed: Flooding - Riverine, Hazmat Incidents - Fixed Sites, Hazmat Incidents – Transportation
- 3) Provide funding to install generators for emergency power at the water and wastewater treatment plants.
 - Hazard(s) Addressed: Infrastructure Failure - Sanitary Sewer System, Infrastructure Failure - Water System

West Bloomfield Township

Mitigation Strategies 2005

- 1) Provide specialized technical training (e.g., confined space entry) and equipment to members of the Township public safety departments.
 - Hazard(s) Addressed: All, particularly Subsidence
 - Progress: COMPLETED

- 2) Find a solution for the flooding problems in the Township, particularly in the area of Parkland and Springwater Streets.
 - Hazard(s) Addressed: Flooding – Riverine, Flooding - Urban
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Acquire equipment to remove debris following tornadoes and/or high wind storms.
 - Hazard(s) Addressed: High Winds and Tornadoes

- 2) Continue to advocate for the widening of Maple Road to improve and maintain access to Henry Ford Hospital.
 - Hazard(s) Addressed: All

- 3) Acquire equipment to allow radio communication in all buildings in the Township.
 - Hazard(s) Addressed: All

White Lake Township

Mitigation Strategies 2005

- 1) Install additional tornado sirens.
 - Hazard(s) Addressed: High Winds and Tornadoes
 - Progress: ONGOING – Three additional outdoor warning siren have been added since 2005.

- 2) Hire additional public safety officers to meet the increasing needs of the Township.
 - Hazard(s) Addressed: All
 - Progress: ONGOING

- 3) Provide additional training for responding to potential airplane crashes at the Oakland County International Airport.
 - Hazard(s) Addressed: Transportation Accidents - Air
 - Progress: ONGOING

- 4) Provide training for closed-space rescue.
 - Hazard(s) Addressed: Transportation Accidents - Air
 - Progress: ONGOING

- 5) Provide proper training is to respond to such emergencies as multi-vehicle accidents and trench or building collapse emergencies.
 - Hazard(s) Addressed: All, particularly Transportation Accidents – Highway, Transportation Accidents – Surface Roads
 - Progress: ONGOING – Coordination through MABAS has reduced this risk somewhat.

Mitigation Strategies 2012

- 1) Continue to provide training for public safety officers.
 - Hazard(s) Addressed: All

The City of Wixom

Mitigation Strategies 2005

- 1) Provide funding for hazmat training and equipment.
 - Hazard(s) Addressed: Hazmat Incidents – Fixed Site, Hazmat Incidents – Transportation, Transportation Accidents – Highway, Transportation Accidents – Rail, Transportation Accidents – Surface Roads
 - Progress: COMPLETED - The Wixom Assembly Plant and the railroad switching yard have been closed and abandoned. All above ground hazards at the assembly plant have been cleared. Coordination with mutual aid communities has reduced response time for hazmat incidents.
- 2) Provide additional barricades, for emergency response personnel protection, to be used at multi-vehicle accidents.
 - Hazard(s) Addressed: Transportation Accidents – Highway, Transportation Accidents – Surface Roads
 - Progress: COMPLETED – The City now owns a barricade trailer that is ready to be deployed as necessary.

Mitigation Strategies 2012

- 1) Obtain portable radio repeaters to provide cohesive and consistent communication between emergency response personnel.
 - Hazard(s) Addressed: All
- 2) Provide large scale disaster response training for all first responders in the City of Wixom.
 - Hazard(s) Addressed: All

The Village of Wolverine Lake

Mitigation Strategies 2005

- 1) Study the potential effect of a dam failure on the proposed development located downstream.
 - Hazard(s) Addressed: Flooding – Dam Failure
 - Progress: ONGOING

Mitigation Strategies 2012

- 1) Continue to plan a response in the event of a dam failure on properties located downstream.
 - Hazard(s) Addressed: Flooding – Dam Failure

6.3.2 School Mitigation Strategies

Schools districts were not included in the 2005 Oakland County Hazard Mitigation Plan. The mitigation strategies identified for each school district in the following section are all new to the 2012 HMP update.

Avondale Schools

Hazard Mitigation Strategies:

- 1) Acquire additional generators to augment or replace aging equipment to provide emergency power.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
- 2) Acquire GPS systems for the bus fleet.
 - Hazard(s) Addressed: Transportation Accidents – Surface Roads
- 3) Provide ongoing staff training for emergency preparedness at the buildings
 - Hazard(s) Addressed: All

Berkley Schools

Hazard Mitigation Strategies:

- 1) Acquire additional generators to augment or replace aging equipment to provide emergency power.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
- 2) Seek funding for additional cameras for outside surveillance of the school grounds to increase student security.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Birmingham Public Schools

Hazard Mitigation Strategies:

- 1) Install physical deterrents at school buildings.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Obtain additional generator coverage for all school buildings.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards

Bloomfield Hills Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies - Pandemics and Epidemics
- 2) Seek funding for security cameras at all the schools on wireless systems.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Obtain additional generators at all of the schools building in case of power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure - Electrical System, Winter Hazards

Brandon School District

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies - Pandemics and Epidemics

- 2) Acquire and install additional surveillance cameras for all buildings.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Access control systems for all buildings.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 4) Implement the use of GPS systems in all buses.
 - Hazard(s) Addressed: Transportation Accidents – Surface Roads

Clarenceville School District

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies - Pandemics and Epidemics
- 2) Provide funding for wireless security cameras at all schools to monitor and for local law enforcement to be able to access for emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Clarkston Community Schools

Hazard Mitigation Strategies:

- 1) Seek funding for security cameras at all schools.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Provide funding for wireless security cameras at all schools for schools to monitor and for local law enforcement to be able to access for emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Obtain generators for all school buildings in the district.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies - Pandemics and Epidemics
- 4) Seek funding for key card entry for all school buildings in the district.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Clawson Public Schools

Mitigation Strategies:

- 1) Provide specific training, additional manpower and equipment for responding to a potential plane crash in the vicinity of local elementary school located on the flight path to the Oakland Troy airport.
 - Hazard(s) Addressed: Transportation Accidents - Air
- 2) Complete the technology bond grant to obtain new generators to power school phones and computers for communications.
 - Hazard(s) Addressed: Infrastructure Failure - Communication System, Infrastructure Failure - Electrical System

- 3) Continue to plan for an upgrade to a new phone system utilizing future technology bond grant dollars.
 - Hazard(s) Addressed: Infrastructure Failure - Communication System
- 4) Complete feasibility study to determine if the water main pipeline needs repair, replacing or relocation from the high school.
 - Hazard(s) Addressed: Infrastructure Failure – Water System
- 5) Complete feasibility study to determine where to put students in case of a water main break under the high school.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts, Flooding – Urban, Infrastructure Failure – Water System, Terrorism

Farmington Public Schools

Hazard Mitigation Strategies:

- 1) Increase surveillance capabilities in all school buildings that allows for increased security and a record should law enforcement action be required.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Obtain additional automatic dedicated generators.
 - Hazard(s) Addressed: Infrastructure Failure - Communication System, Infrastructure Failure - Electrical System

Ferndale Public Schools

Hazard Mitigation Strategies:

- 1) Seek funding for security cameras at all school buildings to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Obtain and install front main door cameras and security push button access.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Seek funding to provide generators in all school building for backup power in case of power outages.
 - Hazard(s) Addressed: Infrastructure Failure - Communication System, Infrastructure Failure - Electrical System
- 4) Plan to increase security by installing key card ID readers for access to school buildings.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Hazel Park Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornados and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics

Holly Area Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornados and health emergencies.

- Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all school buildings to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Huron Valley Schools

Hazard Mitigation Strategies:

- 1) Implement a more consistent radio communication system.
 - Hazard(s) Addressed: All
- 2) Research and implement a real time attendance system in all buildings for tracking students in the event of an evacuation.
 - Hazard(s) Addressed: All
- 3) The school district would like to have access to more flexible training materials (e.g., video or online training) for the ever changing staff in various buildings.
 - Hazard(s) Addressed: All, particularly Criminal Acts - Mass Shootings

Lake Orion Community Schools

Hazard Mitigation Strategies:

- 1) Continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all school buildings to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Provide funding for generators for all school buildings in the school district.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts - Mass Shootings, Terrorism
- 4) Provide funding for key card entry for all school buildings in the district.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts - Mass Shootings, Terrorism

The Lamphere Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education programs for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all the schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Madison District Public Schools

Hazard Mitigation Strategies:

- 1) Seek funding for security cameras at all school buildings to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Install main door security cameras and increase building security access by push button.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Have generators available in all school buildings in case of power outages.
 - Hazard(s) Addressed: High Winds and Tornadoes, Infrastructure Failure – Electrical System, Winter Hazards
- 4) Seek funding for key card ID readers for access to school buildings.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 5) Update all emergency plans and cross-communication channels between school districts.
 - Hazard(s) Addressed: All

Oak Park Schools

Hazard Mitigation Strategies:

- 1) Continue education to support security and safety of students.
 - Hazard(s) Addressed: All

Oakland Community College

Hazard Mitigation Strategies:

- 1) Implement the use of outdoor emergency notification system (e.g., external building and parking lot warning/P.A. systems).
 - Hazard(s) Addressed: All
- 2) Obtain and install additional cameras/infrastructure for existing CCTV security system.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Provide additional response equipment for public safety officers in the event of a “human hazard.”
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Oakland University

Hazard Mitigation Strategies:

- 1) Seek funding to supply secondary fuel source.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
- 2) Seek funding for additional generators to cover the entire campus.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
- 3) Provide additional training for public safety officers in the event of a hazmat accident.
 - Hazard(s) Addressed: Hazmat Incidents - Fixed Site, Hazmat Incidents - Transportation

Oxford Community Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics

Pontiac School District

Hazard Mitigation strategies:

- 1) Seek funding for camera surveillance, key card access and improved security systems.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Obtain generators in all active school buildings.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System
- 3) Seek funding for emergency lighting and exits.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System

Rochester Community Schools

Hazard Mitigation Strategies:

- 1) Continue the use of a critical incident team to identify any potential hazards.
 - Hazard(s) Addressed: All
- 2) Provide continuing education regarding tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 3) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 4) Obtain funding for card reader door access for emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Royal Oak School District

Hazard Mitigation Strategies:

- 1) Provide continuing education regarding tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

South Lyon Community Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education (e.g., tornado drills, fire drills, action plans, early alert systems, testing and upkeep of current safety equipment and communication equipment) regarding tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for additional back-up generators for all of the school buildings.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System

Southfield Public Schools

Hazard Mitigation Strategies:

- 1) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 2) Provide continuing education regarding tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 3) Obtain and install gating to confine public access for after-school activities.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 4) Seek funding to provide generators at all of school buildings in case of power outages.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System

Troy School District

Hazard Mitigation Strategies:

- 1) Provide continuing education for tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Investigate additional homeland security training (e.g., lockdowns for mass shooting incidents or terrorist attacks).
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

Walled Lake Consolidated Schools

Hazard Mitigation Strategies:

- 1) Provide continuing education regarding tornadoes and health emergencies.
 - Hazard(s) Addressed: High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics

- 2) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism
- 3) Obtain funding for emergency manual updates.
 - Hazard(s) Addressed: All
- 4) Acquire funding to upgrade generators to provide power during power outages.
 - Hazard(s) Addressed: Infrastructure Failure – Electrical System

Waterford School District

Hazard Mitigation Strategies:

- 1) Provide continuing education regarding tornadoes, health emergencies and mass shooting incidents.
 - Hazard(s) Addressed: Criminal Acts – Mass Shootings, High Winds and Tornadoes, Public Health Emergencies – Pandemics and Epidemics
- 2) Seek funding for security cameras at all schools to monitor grounds and for local law enforcement access in emergencies.
 - Hazard(s) Addressed: Civil Disobedience, Criminal Acts- Mass Shootings, Terrorism

West Bloomfield School District

Hazard Mitigation Strategies:

- 1) Utilize Department of Education grant monies to provide ongoing emergency management training.
 - Hazard(s) Addressed: Flooding – Dam Failure

6.4. Alternatives Selected

The Advisory Committee considered 349 mitigation strategies based on input from the mitigation survey, community meetings and workshop discussions. From the initial list of 349 strategies, Advisory Committee members selected a list of 24 high priority hazard mitigation strategies.

As part of this evaluation, the Advisory Committee also reviewed the mitigation strategies and Action Plans developed in 2005. The committee determined that 1 of the mitigation strategies selected for development of an Action Item in 2005, tree trimming to prevent/reduce power line damage in storms, was not appropriate for the County, but is instead a function of private utility companies. The remaining 7 Action Items developed in 2005 were retained and are listed below, followed by the 24 new mitigation strategies identified during this Plan update. Please note that number 16 identified during the 2012 Oakland County HMP Update is essentially the same as mitigation strategy number 4 from the 2005 Plan.

1. Install additional tornado sirens in the community.
2. Implement additional hazmat training.
3. Provide additional human resources to meet the needs of the public safety departments.
4. Encourage communities to acquire generators for backup power at critical facilities in the event of a power failure.

5. Ensure readiness at critical facilities by encouraging cities, villages and townships to conduct vulnerability assessments, perform regular maintenance and equipment checks and pre-plan for fuel needs for existing and backup power sources.
6. Implement rapid damage assessment.
7. Improve coordination of agencies and mutual aid agreements for response planning, responding to incidents and activities.

The following 24 mitigation strategies, in addition to those retained from the 2005 HMP (above) were identified as the highest priorities during the 2012 HMP Update. As noted above, mitigation strategy number 16 below is essentially the same as number 4 from the 2005 Plan.

1. Encourage residents to receive immunizations against communicable diseases.
2. Provide resources for development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas.
3. Utilize public warning systems for public health communications.
4. Obtain communication boosters for deficient areas in the OakWin Radio System.
5. Improve and continue training for emergency responders and provide adequate equipment.
6. Provide mutual aid pacts to provide personnel and resources to assist during and following storms.
7. Increase public awareness of the causes, symptoms and protective actions for disease outbreaks and other potential public health emergencies.
8. Pre-arrange heating/cooling centers/shelters for vulnerable populations, stranded motorists, etc.
9. Pre-plan for debris management staging and storage areas.
10. Coordinate mutual aid assistance for failures in utility and communications systems (including 9-1-1).
11. Encourage residents to create family escape plans and disaster supply kits.
12. Provide outreach to vulnerable populations during periods of extreme temperatures.
13. Enhance and maintain early warning systems and networks.
14. Train, plan and prepare for mass-casualty incidents.
15. Continue to create public information material (newsletters, pamphlets, news articles, educational programs, website links, contact persons) to explain tornado and severe wind hazards, self and property protection measures and current warning and response systems currently in place.

16. Encourage communities to obtain adequate supply of generators for emergency temporary power.
17. Provide baseline training, planning and preparedness for hazardous material incidents along roadways, railways and pipelines.
18. Adopt and enforce appropriate building codes.
19. Keep roads and driveways accessible to vehicles and emergency equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around, etc.
20. Utilize public warning systems and networks.
21. Provide transportation for elderly and disabled to shelters.
22. Make sure warming and cooling centers have adequate redundant power sources.
23. Educate residents to prepare family disaster plans and supply kits (72-hour go kits).
24. Improve communications between municipalities (local, state and regional) in event of mass event.

**Table 27. Final Mitigation Strategies For Action Plan Development
Oakland County Hazard Mitigation Plan Update**

#	Mitigation Strategy	Rank	Hazard Categories													Mitigation Goals Supported										
			High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline Accidents	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence	Protection of public health and safety/ Prevention and reduction of loss of life and injury	Improve and support public and private organizational response capabilities	Prevention and reduction of damage to public/private property and infrastructure	Protect critical assets - hospitals, nursing homes, schools	Increase awareness and preparedness of public, business, non-profit, government, etc. about hazards	Encourage personal responsibility
1	Encouraging residents to receive immunizations against communicable diseases	1					√													●				●	●	●
2	Provide resources for development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites	1	x	x	x	x	x	x	x	x	x	x	x	x	x	√	x	x	●	●	●	●	●	●	●	
3	Utilize public warning systems for public health communications	1					√												●	●		●				
4	Obtain communication boosters for deficient areas in Open Sky Network	1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	●	●	●					
5	Improve and continue training for emergency responders and the provide adequate equipment	1	x	x	x	x	x	x	x	x	x	x	x	x	√	x	x	●	●		●	●				
6	Provide mutual aid pacts to provide personnel and resources to assist during and following storms	1	√	x	x													●	●		●					
7	Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies	1					√											●				●				
8	Pre-arrange heating/cooling centers/shelters for vulnerable populations, stranded motorists, etc.	1		√	x		x							√				●	●							
9	Pre-plan for debris management staging and storage areas	9	√	x		x				x	x	x		x					●							
10	Coordinate mutual aid assistance for failures in utility and communications systems (including 911)	10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	●	●							
11	Encourage residents to create family escape plans and disaster supply kits	11	√	√	√	√		√	√				√	√	√	√	●	●			●		●			
12	Outreach to vulnerable populations during periods of extreme temperatures	11		x			x							√			●				●					
13	Enhance and maintain early warning systems and networks	11	√	x	x					x							●	●	●	●						
14	Train, plan, and prepare for mass-casualty incidents	11	x				x	x	x	√							●	●		●	●	●				
15	Create public information material (newsletters, pamphlets, news articles, educational programs, website links, contact persons) to explain tornado and severe wind hazards, self and property protection measures, current warning and response systems currently in place	11		√													●		●	●	●	●	●			
16	Encourage communities to obtain adequate supply of generators for emergency temporary power	16	x	x	√									x				●	●	●						
17	Provide baseline training, planning, and preparedness for hazardous material incidents along roadways and railways and pipelines	17				√		√	x	x							●	●	●	●	●	●				
18	Adopt and enforce appropriate building codes	18	x		x					x				√	x		●		●	●						
19	Keep roads and driveways accessible to vehicles and emergency equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around.	18		√	√	√		√	√	√	x	x	√	x	√	√	√	●	●	●	●	●				
20	Utilize public warning systems and networks	20	x			x	x	√	x				x			x	●	●	●	●						
21	Provide transportation for elderly and disabled to shelters	20												√			●									
22	Make sure warming and cooling centers have adequate backup power generators	22		x										√			●		●	●						
23	Educate residents to prepare family disaster plans and supply kits (72-hour go kits)	23	√	√	√	√		√	√		x	x		√	√	√	●	●			●		●			
24	Improve communications between municipalities (local, state, regional) in event of mass event	24	x	x	x	x	x	x	x	x	x	x	x	x	x	x	●	●	●	●						

Notes

- Community Responses
- Survey Responses
- Workshop Responses
- From Goals List

√ = strategy was associated with this hazard in the original survey
x = other hazards for which that strategy may be appropriate

Action Plans

6.5. Recommended Mitigation Actions

Oakland County included the following 8 Action Items in their 2005 HMP:

1. Install additional tornado sirens in the community.
2. Implement additional hazmat training.
3. Encourage continued tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines.
4. Provide additional human resources to meet the needs of the public safety departments.
5. Encourage communities to acquire generators for backup power at critical facilities in the event of a power failure.
6. Ensure readiness at critical facilities by encouraging cities, villages and townships to conduct vulnerability assessments, perform regular maintenance and equipment checks, pre-plan for fuel needs for existing and redundant power sources.
7. Implement rapid damage assessment.
8. Improve coordination of agencies and mutual aid agreements for response planning, responding to incidents and activities.

Progress made on each of these actions plans since development of the 2005 Oakland County Hazard Mitigation Plan includes the following:

1. Oakland County Homeland Security has installed 72 new or replacement outdoor warning sirens since January 2005. The average siren cost is \$20,000 with funding coming from a combination of County, local community and/or grant funding. It is anticipated that 4 new sirens will be installed in Lyon Township in 2012 and an estimated 3 sirens per year will be installed in various locations each year during the 5-year life of the 2012 Oakland County HMP. In addition to filling the last few remaining gaps in County-wide outdoor warning siren coverage, the Oakland County Homeland Security Division would like to provide additional outdoor warning sirens close to critical assets such as schools and outdoor entertainment venues.
2. Oakland County has formed 2 hazmat teams that are able to respond to any incident throughout the County. In addition, UASI Region 2, has also been expanding capability. Urban Areas Security Initiative (UASI) funding has been used to expand the training and equipment capabilities of the teams over the past few years.
3. Tree trimming activities have been conducted throughout the County by private utility companies and cities, villages and townships. The Oakland County Homeland Security Division has not taken a lead role regarding this action, has no role in tree trimming activities, and, as such, has decided to drop this goal from the 2012 HMP Update.

4. The Oakland County Homeland Security Division has continued to work with communities to expand Community Emergency Response Teams (CERT) through local police and fire departments; has conducted several training programs throughout the County regarding preparedness; has continued to update resource manuals and educational materials; has conducted exercises to strengthen private/public partnerships and encouraged communities to participate in discussions regarding Memos of Understanding (MOUs).
5. Neither the Oakland County Homeland Security Division nor the Oakland County LEPC has, as yet, made progress to complete this task.
6. The Oakland County Homeland Security Division has provided several training programs and provided technical assistance to communities with planning assessments upon request.
7. The Oakland County Homeland Security Division has continued to expand the rapid damage assessment capabilities by continuing to train professional teams such as the Oakland County Building Officials Association (OCBOA) and Amateur Radio Public Service Corps (ARPSC).
8. The Oakland County Homeland Security Division attends meeting and is consistently sharing information with OCBOA and ARPSC stressing the importance of the mutual aid pacts in the event of a disaster. .

In reviewing the progress made on each of these Action Plans, and whether they should be retained within the 2012 Oakland County HMP Update, the Oakland County Homeland Security Division determined that all but number 3 above should be retained within the updated Plan.

The Action Plan eliminated from the current Plan was Action Item 3 in the 2005 HMP, "Encourage Continued Tree Trimming and Maintenance to Prevent Limb Breakage and Safeguard Nearby Utility Lines." This action had not been implemented by the County since the 2005 Plan was adopted. County representatives determined that this action, although necessary, was not an appropriate action for the County. Tree trimming in Oakland County is conducted by private utility companies.

This HMP retains the remaining 7 Action Items from the 2005 HMP. They are incorporated into Action Items 1 through 4 and 13 (in the following section).

Initially, an additional 15 Actions Items were developed during the 2012 Oakland County HMP Update. However, upon further review several of these Action Items were combined with each other or with the Action Items from the 2005 HMP. A few others, such as those encouraging local mutual aid agreements, etc., were determined by the Oakland County Homeland Security Division personnel to be local rather than County actions.

Ultimately, 13 Action Plans were developed to guide implementation of selected mitigation strategies. These are presented below. Each Action Plan includes a short description of the relevant hazard(s) and the strategy aimed to mitigate its impact. The agencies responsible for implementation, the general form of costs associated with the strategy and its benefits are also listed for each Action Plan.

The 13 Action Items below have been selected and developed based upon the prioritization exercises and Advisory Committee discussions described previously, but implementation of each will be guided by an analysis of the benefits expected relative to program costs.

Implementation will be determined, in part, based upon the availability of grant or shared funding; how well each Action Item fits within established programs, goals and initiatives of the responsible agencies and program needs identified through ongoing feedback from Oakland County municipal officials, emergency response staff and the Oakland County LEPC.

6.5.1 County Action Plans

Action Item 1. Install additional outdoor warning sirens in the community and enhance and maintain early weather warning/alert systems and networks

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies): Public (homes and businesses)

Primary Responsibility: Oakland County Homeland Security Division and individual municipalities

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.

Implementation Tasks: The Oakland County Homeland Security Division 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.

Cost(s): 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.

Benefit(s): 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.

Anticipated Funding Source(s): County and municipal general funds, public/private partnerships and federal grants.

Schedule: 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.

Action Item 2. Provide additional hazmat and other emergency training and equipment to first responders (including, but not limited to, fire, police and civilian responders).

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies) All identified in Plan

Primary Responsibility: City, Township and Village first responders and Oakland County Homeland Security Division

Initiatives Needed: The Oakland County Homeland Security Division 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 Homeland Security Division 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, definition of work and project activities).

Implementation Tasks: Specific tasks include: conducting a survey to assess current training programs, identify 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.

Cost(s): 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.

Benefit(s): 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.

Anticipated Funding Source(s): County and municipal general funds and state and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 3. 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.

Specific Hazard(s) Addressed: Extreme Temperatures, Infrastructure Failure, Thunderstorms, Tornadoes and High Winds and Winter Hazards

Specific Vulnerability(ies): Public (homes and businesses), utilities, hospitals, industrial sites, airports and warming and cooling centers

Primary Responsibility: Oakland County Homeland Security Division and municipalities

Initiatives Needed: The Oakland County Homeland Security Division 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.

Implementation Tasks: The Oakland County Homeland Security Division 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.

Cost(s): Staff time for educating public and municipal officials, printing, engineering/consultant fees and redundant power source installation costs.

Benefit(s): Provision of key services/operation of critical facilities during emergencies.

Anticipated Funding Source(s): County and municipal general funds and state and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 4. Implement rapid damage assessment.

Specific Hazard Addressed: Any Natural or Man-Made Hazard Causing Personal Injury and/or Damage to Property

Specific Vulnerability(ies): Public (homes and businesses).

Primary Responsibility: Oakland County Homeland Security Division

Initiatives Needed: Continue to organize additional groups to conduct work, develop policy on response and develop a uniform method for reporting.

Implementation Tasks: 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.

Cost(s): Staff time, printing costs, paging system, supplies and training costs.

Benefit(s): 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.

Anticipated Funding Source(s): County and municipal general funds and state and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 5. Encourage residents to receive immunizations against communicable diseases.

Specific Hazard(s) Addressed: Public Health Emergencies

Specific Vulnerability(ies): Public (homes and businesses).

Primary Responsibility: Oakland County Health Division

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.

Implementation Tasks: 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.

Cost(s): Staff time and equipment, print and mailing costs, training costs and the cost of vaccines and immunizations.

Benefit(s): 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.

Action Item 6. Utilize public warning systems for public health communications.

Specific Hazard(s) Addressed: Public Health Emergencies

Specific Vulnerability(ies): Public (homes and businesses)

Primary Responsibility: Oakland County Homeland Security and Oakland County Health Divisions

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 includes 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).

Implementation Tasks: 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; on-going 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.

Cost(s): Labor and technology

Benefit(s): Save lives, reduce economic impact and reduce the impact of a public health emergency.

Anticipated Funding Source(s): County and municipal general funds, state and federal grants and private funding sources.

Schedule: Implement emergency notification system within 2-3 years.

Action Item 7. Obtain communication boosters for deficient areas of the OakWin Radio System.

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies): All identified in Plan

Primary Responsibility: Oakland County Department of Information Technology

Initiatives Needed: Determine additional towers and cell site locations to provide maximum coverage.

Implementation Tasks: Obtain permission and install 2 towers and 10 cell sites in local jurisdictions.

Cost(s): Cost for installation, repair and maintenance and printing and postage costs for public awareness material. Initial cost estimates - \$2 million to \$3 million.

Benefit(s): Provide improved OakWin Radio System coverage within Oakland County.

Anticipated Funding Source(s): Oakland County Radio Fund

Schedule: Ongoing throughout 5 year Plan period.

Action Item 8. Increase public awareness of the causes, symptoms and protective actions for disease outbreaks and other potential public health emergencies.

Specific Hazard(s) Addressed: Public Health Emergencies & Terrorism (specifically: Anthrax, Avian Influenza, boil water advisory, Botulism, Brucellosis, Chloride, Cyanide, Food Contamination, Plague, Power Outages, Radiation, Ricin, Smallpox, Tularemia, Nerve Agent VX, SARS [Severe Acute Respiratory Syndrome]).

Specific Vulnerability(ies): Public

Primary Responsibility: Oakland County Health Division

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.

Implementation Tasks: 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.

Cost(s): Staff time for review, development and training and technology.

Benefit(s): Improve readiness to respond to an emergency and effectively disseminate updated, accurate information and improve efficiency and penetration of information into the community.

Anticipated Funding Source(s): County general funds and state and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 9. Pre-arrange heating/cooling centers/shelters for vulnerable (special needs) populations, stranded motorists, etc.

Specific Hazard(s) Addressed: Extreme Temperatures; Winter Hazards and Infrastructure Failure

Specific Vulnerability(ies): Public

Primary Responsibility: Oakland County Homeland Security Division, local municipalities, American Red Cross

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.

Implementation Tasks: 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.

Cost(s): No costs anticipated to County or local municipality.

Benefit(s): Having a pro-active plan for assessing heating and cooling emergencies that will effectively allocate resources in the most efficient and effective manner.

Anticipated Funding Source(s): County and municipal general funds and state and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 10. Pre-plan for debris management staging and storage areas.

Specific Hazard(s) Addressed: Tornadoes and High Winds, Winter Hazards, Petroleum and Natural Gas Pipeline Accidents, Flooding, Terrorism, Civil Disturbance and Earthquakes

Specific Vulnerability(ies): Public (homes and businesses).

Primary Responsibility: Oakland County Homeland Security Division and local municipalities

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 County has an adequate fleet of trucks and equipment to respond to an emergency.

Implementation Tasks: Contract with local trucking and construction companies and encourage local municipalities to establish mutual aid agreements to assist each other.

Cost(s): Personnel, equipment and planning costs.

Benefit(s): Clear roads for rapid response of emergency personnel and to aid in sanitation for health concerns.

Anticipated Funding Source(s): County and municipal general funds, state and federal grants and public and private partnerships.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 11. 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.

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies): Public (homes and businesses)

Primary Responsibility: Oakland County Homeland Security Division

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.

Implementation Tasks: 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.

Cost(s): 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.

Benefit(s): Saving lives related to tornados 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.

Anticipated Funding Source(s): County and municipal general funds, state and federal grants and public and private partnerships.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 12. Keep County roads accessible to emergency vehicles and equipment.

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies): Public (homes and businesses)

Primary Responsibility: Agency, association or group with jurisdiction of particular road systems

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.

Implementation Tasks: Assist agency, association, group or communities in need of a plan to complete their process.

Cost(s): Personnel, equipment, fuel

Benefit(s): Will create a consistent County-wide plan

Anticipated Funding Source(s): State and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

Action Item 13. Improve communications between municipalities (local, state and regional) in the event of a mass incident/event.

Specific Hazard(s) Addressed: All Hazards

Specific Vulnerability(ies): All identified in Plan

Primary Responsibility: Oakland County Department of Information Technology and the Oakland County Sheriff's Office

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.

Implementation Tasks: 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.

Cost(s): 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.

Benefit(s): This will provide and enhanced interoperable communications within Oakland County, the State of Michigan and surrounding counties.

Anticipated Funding Source(s): State and federal grants.

Schedule: Ongoing throughout 5 year Plan period.

6.5.2 Additional Action Plans

Five of the selected mitigation strategies were not included in the final Action Plan list above. Of these, the following mitigation strategy is being implemented under permit programs for storm water control and, therefore, was not considered for an Action Plan:

- Detect and prevent/discourage illegal discharges from home footing drains, downspouts, and sump pumps into storm water sewer systems.

The remaining 4 mitigation strategies required additional information and, therefore, were not completed for inclusion in this Plan. Action Plans for these mitigation strategies may be developed as time and information allows during the lifetime of this Plan. Development of additional Action Plan items will be evaluated during reviews by the LEPC described in Section 6.2 below:

- Equip public safety officers with hazmat detection equipment, provide additional equipment to clean up a chemical spill and upgrade and improve current respiratory equipment.
- Identify community roads that are susceptible to flooding during times of heavy rain.
- Enhance coordinated public health response plans.
- Obtain/maintain backup generators for pumping and lift stations and treatment plants, including possible separation of combined storm/sanitary sewer systems, if appropriate.

6.6. Plan Monitoring and Revision

The Oakland County LEPC will monitor this Plan on a regular basis. Plan evaluation and maintenance is the responsibility of the Oakland County Homeland Security Division. Reviews of at least the hazard evaluation, mitigation strategies and Action Plans will be conducted as necessary to maintain consistency with the changing community and hazard history, as well as the goals and objectives of the County. The LEPC will meet at least annually to discuss and implement any required changes.

Appendix A

Figures (intentionally removed for public distribution)

Appendix B

Public Meeting and Outreach Materials

Oakland County Hazard Mitigation Plan

Oakland County Hazard Mitigation Plan Update Public Meeting

Hazard Mitigation Plan Update




1st Public Meeting



Overview

- Introduction
- The Function of a Hazard Mitigation Plan
- The Oakland County Plan Update
- Community Input

Introduction

Teams

- Project Team
 - Oakland County Homeland Security
 - ASTI Environmental
- Advisory Committee
- Local Communities
- Stakeholders
- Public

The Oakland County Plan
www.ochmp.com

Project Team


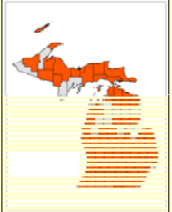

- Sara Stoddard
- Tricia Smith
- Thomas Wackerman, CHMM
- Paul Rentschler
- Lisa Sullivan
- Sarah Pavelko
- Karen Van Tiem

The Oakland County Plan
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ASTI Environmental

Established in 1985
Over 90% Repeat/Referral
Over 7,000 projects in the United States
Projects in Canada, Mexico and the Czech Republic

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Project Locations

Oakland County Hazard Mitigation Plan Update Public Meeting

ASTI_{Environmental}

<i>Investigation</i>	
<i>Restoration</i>	
<i>Remediation</i>	
<i>Compliance</i>	

Contact Information

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Advisory Committee

County LEPC
Schools
Industry/Businesses
Adjacent Communities

The Oakland County Plan
www.ochmp.com

Community Reps

All 63 Communities

- Emergency Management Coordinators
- Local Leaders

The Oakland County Plan
www.ochmp.com

Stakeholders

Adjacent Communities
Industry and Business
Non-Government Organizations
Interested Individuals

The Oakland County Plan
www.ochmp.com

Hazard Mitigation Plans



Oakland County Hazard Mitigation Plan Update Public Meeting

What is a HMP?

- A Hazard Mitigation Plan (HMP) will...
- identify hazards in the community,
 - evaluate and highlight those hazards,
 - provide mitigation alternatives

Hazard Mitigation Plans

What is a HMP?

- The objectives of a Plan are to;
- reduce risks from natural, human, and technological hazards by focusing on those hazards,
 - provide guidance when committing resources that will reduce the effects of hazards, and
 - **provide a basis for technical assistance and funding**

Hazard Mitigation Plans

What is a HMP?

- The Plan must comply with:
- the Disaster Mitigation Act of 2000,
 - the Emergency Management Act,
 - FEMA and Michigan Department of State Police guidance documents,
 - and all applicable federal, state, and local regulations.

Hazard Mitigation Plans

What is a HMP?

- The Plan is only a part of the emergency planning, mitigation, preparedness, response, and recovery process. Must coordinate with:
- All existing plans and programs
 - **Existing Plans can be included in the Final HMP by reference**

Hazard Mitigation Plans

Why Prepare A Plan?

- To save lives and protect property
- To preserve and protect an area's environment and economy
- To preserve and maintain an area's essential services and quality of life

Hazard Mitigation Plans

Why Prepare A Plan?

- To provide information to citizens, businesses, and officials (including future emergency managers), for
- Planning
 - Economic development
 - Project development decisions
 - Emergency Management

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting

Why Prepare A Plan?

To support hazard mitigation project implementation and **funding.**

- Identifies specific hazards
- Identifies specific vulnerabilities
- Documents mitigation options
- Demonstrates community involvement and support
- Part of an effective overall plan

Hazard Mitigation Plans

Considerations - Hazards

2005 Emphasis	2011 Emphasis??
Terrorism	Flooding
Weapons of Mass Destruction	Earthquakes
	Pipeline Ruptures

Hazard Mitigation Plans

Considerations - Features

Actual Land Use
Anticipated development
Bridges
Brownfields
Cell Towers
Community shelters
Dams
Emergency warning sirens
EMS Stations
Erosion Areas

Hazard Mitigation Plans

Considerations - Features

Floodplains/Floodways
Forested Areas
Government buildings (offices)
Hazardous Waste Generators
Highways (including vehicle counts)
Historic Districts
Hospitals
Lakes and Streams

Hazard Mitigation Plans

Considerations - Features

Major Power lines
Military facilities (including National Guard)
Oil and Gas Wells
Parks and Public Spaces
Pipelines
Pipelines
Police and fire stations
Power Plants
Public works yards
Railroads
Rivers

Hazard Mitigation Plans

Considerations - Features

Roads
SARA Title III Facilities
Schools
Stadiums
Waste Disposal Facilities
Waste Transfer Facilities
Water towers
Water Treatment Plants
Wetlands
Zoning

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting

Considerations - Hazards

Natural – 17 Total
14 Considered in 2005
1 Not Considered in 2005
2 New

Hazard Mitigation Plans

Considerations – Natural Hazards

Drought
Earthquakes
Erosion
Extreme Temperature
Fog
Flooding
Fire Hazards
Invasive Species
Subsidence
Thunderstorms
Tornadoes
Winter Hazards – Ice, Sleet, Snowstorms

Hazard Mitigation Plans

Considerations Hazards

Technological – 17 Total
15 Considered in 2005
• 1 Addressed Under Separate Program
1 Not Considered in 2005
1 New

Hazard Mitigation Plans

Considerations – Technological Hazards

Fires – Structural or tires
Flooding – Dam Failure/Urban
Hazmat Incidents – Transportation or Fixed
Infrastructure Failure
Nuclear Power Plants
Oil & Gas Well Accidents
Petroleum Pipeline Accidents
Subsidence – Mining or technical

Hazard Mitigation Plans

Considerations Hazards

Human Related – 15 Total
9 Considered in 2005
• 2 Addressed Under Separate Program
3 Not Considered in 2005
3 New

Hazard Mitigation Plans

Considerations – Human Hazards

Civil Disturbance
Criminal Acts
Gas/Oil Shortages or Supply Disruptions
Public Health Emergencies
Terrorism & Sabotage
Transportation Accident
Weapons of Mass Destruction

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting

Considerations - Critical Assets

- Commercial Sites
- Hospitals/Response Facilities
- Industrial Sites
- Open Space
- Public Facilities
- Residential Areas
- Roads, Railroads, Bridges
- Utility Facilities
- Schools, Churches
- Sports/Entertainment Arenas
- Central Business Dist.

Hazard Mitigation Plans

The Oakland County Plan Update



The Process

- Prepare hazard history and community profile
- Identify significant hazards and risks
- Identify specific vulnerabilities

Hazard Mitigation Plans

The Process

- Identify hazard mitigation goals and objectives
- Suggest strategies to achieve mitigation goals and objectives
- Evaluate strategies using locally chosen criteria
- Select feasible strategies based on evaluation criteria

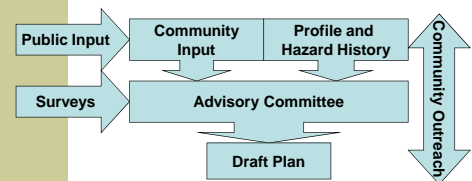
Hazard Mitigation Plans

The Process

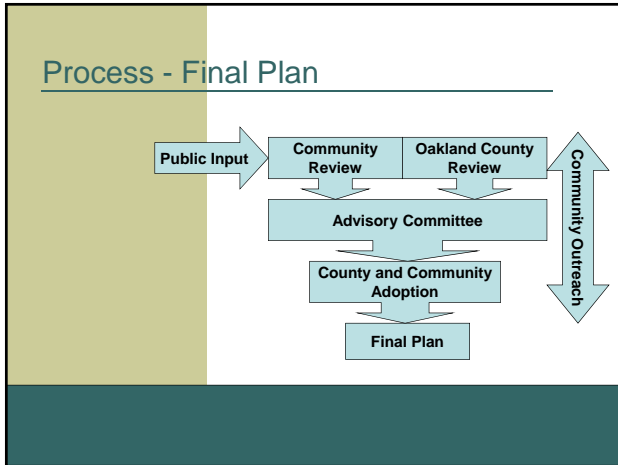
- Propose specific action steps that will achieve desired objectives
- Prepare the plan
- Adopt the plan
- Implement the plan
- Monitor and update the plan

Hazard Mitigation Plans

Process - Draft Plan



Oakland County Hazard Mitigation Plan Update Public Meeting



Process - Outreach

Public

- Two public meetings
- Community announcements
- Web page
 - Comment Form
 - General Information
 - Plan updates and Draft Plan
- Phone, email and regular mail contact information

Process - Outreach

Stakeholders

- Newsletter
- Web page
 - Meeting agendas and minutes
- Social Media
- Draft Plan Available

Process - Outreach

Community Representatives


- Three surveys
- Meeting on local hazards and specific vulnerabilities
- Draft Plan Review
- Plan Adoption

Process - Outreach


Advisory Committee

- Two Workshops
- Three Surveys
- Web page
 - Draft Plan
- Telephone Input
- Draft Plan Review

The Oakland County Plan



Circa 2005



Oakland County Hazard Mitigation Plan Update Public Meeting

Hazard Ranking Criteria

Criteria	Weighting
Population Impacted	9
Economic Impact	4
Env./Serv. Impacted	5

Env./Serv. Impacted includes quality of life, environmental, services, and community confidence

Hazard Identification
Advisory Committee Meeting of September, 2011

Assets at Risk From Hazards

Critical Asset	Criticality Rank	Asset Risk Rank	Vulnerability
Commercial Sites	1	5	4
Hospitals/Response Facilities	11	8	4
Industrial Sites	6	2	2
Open Space	7	11	4
Public Facilities	3	9	3
Residential Areas	8	6	4
Roads, Railroads, Bridges	4	1	1
Utility Facilities	10	3	2
Schools, Churches	9	7	3
Sports/Entertainment Arenas	2	9	3
Central Business Dist	5	3	1

Vulnerability Assessment		
Risk	1-5	6-11
1-5	1	2
6-11	3	4

Hazard Identification
Advisory Committee Meeting of September, 2011

Final Survey Results - Top 22

23 Responses
Yellow Highlight
Selected Hazards

Hazard	Listing Rank
Extreme Temperatures: Extreme Cold	14
Extreme Temperatures: Extreme Heat	16
Flooding - Riverine	22
Thunderstorms - Hail	18
Thunderstorms - Lightning	17
Thunderstorms - Severe Wind	3
Tornadoes	10
Winter Hazards - Ice and Sleet	1
Winter Hazards - Snowstorms	2
Fires - Structural	19
Hazmat Incidents - Transportation	3
Hazmat Incidents - Fixed	12
Infrastructure Failure - All	3
Petroleum and Natural Gas Pipeline Accidents	15
Subsidence - Technical	22
Civil Disturbance	21
Criminal Acts (Vandalism and Arson)	20
Public Health Emergencies	6
Terrorism and Sabotage	8
Transportation Acc. - Highway	7
Transportation Acc. - Rail	11
Transportation Acc. - Air	9
Weapons of Mass Destruction	13

Community Survey Results - Top 22

43 Responses
Yellow Highlight
Selected Hazards

Hazard	Listing Rank
Extreme Temperatures: Extreme Cold	19
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Public Health Emergencies	4
Terrorism and Sabotage	5
Transportation Acc. - Highway	9
Transportation Acc. - Rail	12
Transportation Acc. - Air	15
Weapons of Mass Destruction	10

Top Hazards To Consider

Hazard Event	Workshop Rank	Hazard Risk Rank	Action Plan Needed
High Winds and Tornadoes	5	1	1
Hazmat Incidents - Transportation	7	6	4
Winter Hazards - Ice and Sleet	2	3	1
Winter Hazards - Snowstorms	4	4	1
Hazmat Incidents - Fixed	10	8	4
Infrastructure Failure All	1	2	1
Transportation Acc. - All	7	9	4
Flooding	6	7	4
Public Health Emergencies	2	10	3
Petroleum and Natural Gas Pipeline Accidents	7	5	2

Action Plan Assessment		
Risk	1-5	6-10
1-5	1	2
6-10	3	4

Hazard Identification
Advisory Committee Meeting of September, 2011

Public Input



Oakland County Hazard Mitigation Plan Update Public Meeting

Contact Information




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Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Hazard Mitigation Plan Update




2nd Public Meeting
March 22, 2012



Overview

Introduction
The Function of a Hazard Mitigation Plan
The Oakland County Plan Update
Community Input

Introduction



Teams

Project Team
Oakland County Homeland Security
ASTI Environmental
Advisory Committee
Local Communities
Stakeholders
Public

The Oakland County Plan
www.ochmp.com

Project Team


Sara Stoddard
Tricia Smith
Thomas Wackerman, CHMM
Paul Rentschler
Lisa Sullivan
Sarah Pavelko
Karen Van Tiem

The Oakland County Plan
www.ochmp.com


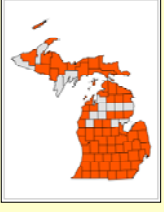
ASTI Environmental

Established in 1985
Over 90% Repeat/Referral
Over 7,000 projects in the United States
Projects in Canada, Mexico and the Czech Republic

1.800.395.2784 • www.asti-env.com



Project Locations



Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

ASTIEnvironmental

<i>Investigation</i>	
<i>Restoration</i>	
<i>Remediation</i>	
<i>Compliance</i>	

Contact Information

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Fax 810.225.3800
prentschrer@asti-env.com

Advisory Committee

- County LEPC
- Schools
- Industry/Businesses
- Emergency Response Agencies
- Michigan State Police
- Oakland County Depts./Agencies

The Oakland County Plan
www.ochmp.com

Community Reps

All 62 Communities

- Local Officials
- Emergency Management Coordinators
- Staff
- Engineers

The Oakland County Plan
www.ochmp.com

Stakeholders

- Adjacent Communities
- Industry and Business
- Non-Governmental Organizations
- Interested Individuals

The Oakland County Plan
www.ochmp.com

Hazard Mitigation Plans



Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

What is a HMP?

A Hazard Mitigation Plan (HMP) will...

- identify hazards in the community,
- evaluate and highlight those hazards,
- provide mitigation alternatives

Hazard Mitigation Plans

What is a HMP?

The objectives of a Plan are to;

- reduce risks from natural, human, and technological hazards,
- provide guidance when committing resources that will reduce the effects of hazards, and
- **provide a basis for technical assistance and funding**

Hazard Mitigation Plans

What is a HMP?

The Plan must comply with:

- the Disaster Mitigation Act of 2000,
- the Emergency Management Act,
- FEMA and Michigan Department of State Police guidance documents,
- and all applicable federal, state, and local regulations.

Hazard Mitigation Plans

What is a HMP?

The Plan is only a part of the emergency planning, mitigation, preparedness, response, and recovery process. Must coordinate with:

- All existing plans and programs
- **Existing Plans can be included in the Final HMP by reference**

Hazard Mitigation Plans

Why Prepare A Plan?

To save lives and protect property
To preserve and protect an area's environment and economy
To preserve and maintain an area's essential services and quality of life

Hazard Mitigation Plans

Why Prepare A Plan?

To provide information to citizens, businesses, and officials (including future emergency managers), for

- Planning
- Economic development
- Project development decisions
- Emergency Management

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Why Prepare A Plan?

To support hazard mitigation project implementation and **funding**.

- Identifies specific hazards
- Identifies specific vulnerabilities
- Documents mitigation options
- Demonstrates community involvement and support
- Part of an effective overall plan

Hazard Mitigation Plans

Considerations - Hazards

2005 Emphasis	2011 Emphasis
Flooding	High Winds and Tornadoes
Hazmat Incidents – Transportation	Hazmat Incidents – Transportation
Infrastructure Failure	Winter Hazards – Ice & Sleet
Public Health Emergencies	Winter Hazards – Snowstorms
Tornadoes	Hazmat Incidents – Fixed Site
	Infrastructure Failure
	Transportation Accidents
	Flooding
	Public Health Emergencies
	Petroleum & Natural Gas Pipeline Accidents

Hazard Mitigation Plans

Considerations - Features

- Actual Land Use
- Anticipated development
- Bridges
- Brownfields
- Cell Towers
- Community shelters
- Dams
- Emergency warning sirens
- EMS Stations
- Erosion Areas

Hazard Mitigation Plans

Considerations - Features

- Floodplains/Floodways
- Forested Areas
- Government buildings (offices)
- Hazardous Waste Generators
- Highways (including vehicle counts)
- Historic Districts
- Hospitals
- Lakes and Streams

Hazard Mitigation Plans

Considerations - Features

- Major Power lines
- Military facilities (including National Guard)
- Oil and Gas Wells
- Parks and Public Spaces
- Pipelines
- Pipelines
- Police and fire stations
- Power Plants
- Public works yards
- Railroads
- Rivers

Hazard Mitigation Plans

Considerations - Features

- Roads
- SARA Title III Facilities
- Schools
- Stadiums
- Waste Disposal Facilities
- Waste Transfer Facilities
- Water towers
- Water Treatment Plants
- Wetlands
- Zoning

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Considerations - Hazards

Natural – 18 Total
14 Considered in 2005

Hazard Mitigation Plans

Considerations – Natural Hazards

- Drought
- Earthquakes
- Erosion
- Extreme Temperatures – Cold, Heat
- Fog
- Flooding - Riverine, Shoreline Erosion
- Fire - Wild Fire
- Invasive Species
- Subsidence - Natural
- Thunderstorms – Hail, Lightning, Severe Winds
- Tornadoes
- Winter Hazards – Ice & Sleet, Snowstorms
- Unpredictable Weather

Hazard Mitigation Plans

Considerations Hazards

Technological – 17 Total
15 Considered in 2005

Hazard Mitigation Plans

Considerations – Technological Hazards

- Fires – Structural, Tires
- Flooding – Dam Failure, Urban
- Hazmat Incidents – Transportation, Fixed
- Infrastructure Failure - All
- Nuclear Power Plant Accidents
- Oil & Gas Well Accidents
- Petroleum & Nat. Gas Pipeline Accidents
- Subsidence – Mining

Hazard Mitigation Plans

Considerations Hazards

Human Related – 18 Total
9 Considered in 2005

Hazard Mitigation Plans

Considerations – Human Hazards

- Civil Disturbance
- Criminal Acts – Vandalism/Arson, Economic Collapse, Mass Shootings
- Gas/Oil Shortages or Supply Disruptions
- Unemployment & Under-employment
- Electromagnetic Pulse
- Public Health Emergencies – Disease, Food/Water Contamination
- Terrorism & Sabotage
- Transportation Accidents
- Weapons of Mass Destruction

Hazard Mitigation Plans



Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Considerations - Critical Assets

- Commercial Sites
- Hospitals/Response Facilities
- Industrial Sites
- Open Space
- Public Facilities
- Residential Areas
- Roads, Railroads, Bridges
- Utility Facilities
- Schools, Churches
- Sports/Entertainment Arenas
- Central Business Dist.

Hazard Mitigation Plans

The Oakland County Plan Update

The Process

- Prepare hazard history and community profile
- Identify significant hazards and risks
- Identify specific vulnerabilities

Hazard Mitigation Plans

The Process

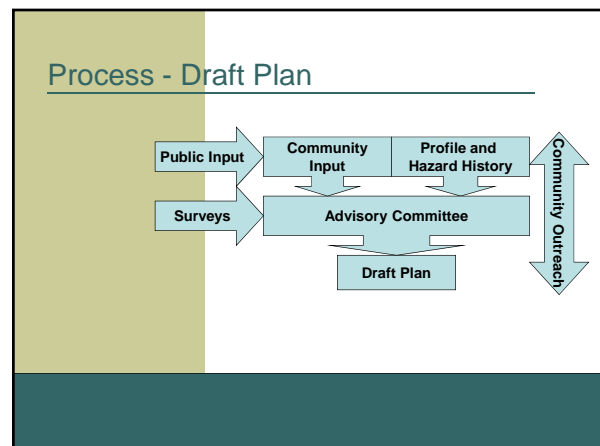
- Identify hazard mitigation goals and objectives
- Suggest strategies to achieve mitigation goals and objectives
- Evaluate strategies using locally chosen criteria
- Select feasible strategies based on evaluation criteria

Hazard Mitigation Plans

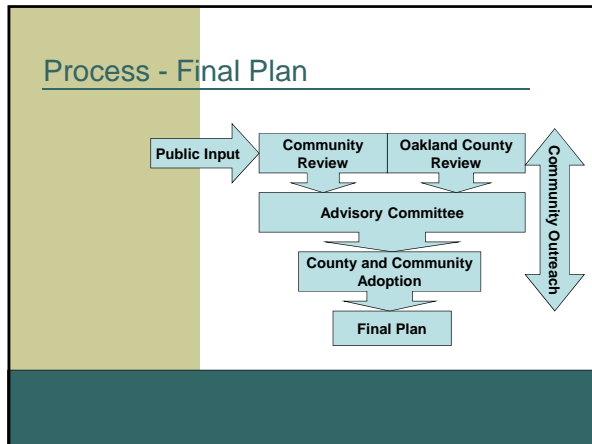
The Process

- Propose specific action steps that will achieve desired objectives
- Prepare the plan
- Adopt the plan
- Implement the plan
- Monitor and update the plan

Hazard Mitigation Plans



Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review



Process - Outreach

Public

- Two public meetings
- Community announcements
- Web page
 - Comment Form
 - General Information
 - Draft Plan
- Phone and email contact information

Process - Outreach

Stakeholders

- Newsletter
- Web page
- Social Media
- Draft Plan Available

Process - Outreach

Community Representatives

- One survey
- Interviews to ID local hazards, specific vulnerabilities, and mitigation strategies
- Draft Plan Review
- Plan Adoption



Process - Outreach

Advisory Committee

- Three Workshops
- Two Surveys
- Action Plan Development
- Web page
 - Draft Plan
- Draft Plan Review

The Oakland County Plan

2012 Update



Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Hazard Ranking Criteria

Criteria	Weighting
Population Impacted	9
Economic Impact	4
Env./Serv. Impacted	5

Env./Serv. Impacted includes quality of life, environmental, services, and community confidence

Hazard Identification
Advisory Committee Meeting of September, 2011

Assets at Risk From Hazards

Critical Asset	Criticality Rank	Asset Risk Rank	Vulnerability
Commercial Sites	1	5	5
Hospitals/Response Facilities	11	8	4
Industrial Sites	6	2	2
Open Space	7	11	3
Public Facilities	3	9	3
Residential Areas	8	6	4
Roads, Railroads, Bridges	4	1	1
Utility Facilities	10	3	2
Schools, Churches	9	7	4
Sports/Entertainment Arenas	2	9	3
Central Business Dist.	5	3	1

Vulnerability Assessment	
Risk	Criticality
1-5	1-5
6-11	6-11

Hazard Identification
Advisory Committee Meeting of September, 2011

Final Survey Results - Top 22

23 Responses
Yellow Highlight Selected Hazards

Hazard	Listing Rank
Extreme Temperatures - Extreme Cold	14
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Thunderstorms - Lightning	17
Thunderstorms - Severe Wind	5
Tornadoes	10
Winter Hazards - Ice and Sleet	1
Winter Hazards - Snowstorms	2
Fires - Structural	19
Hazmat Incidents - Transportation	3
Hazmat Incidents - Fixed	12
Infrastructure Failure - All	3
Petroleum and Natural Gas Pipeline Accidents	15
Subsidence - Technical	22
Soil Disturbance	21
Criminal Acts (Vandalism and Arson)	20
Public Health Emergencies	6
Terrorism and Sabotage	8
Transportation Acc. - Highway	7
Transportation Acc. - Rail	11
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Weapons of Mass Destruction	13

Community Survey Results - Top 22

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Transportation Acc. - Rail	12
Transportation Acc. - Air	15
Weapons of Mass Destruction	10

Top Hazards To Consider

Hazard Event	Workshop Rank	Hazard Risk Rank	Action Plan Needed
High Winds and Tornadoes	8	1	4
Hazmat Incidents - Transportation	7	6	4
Winter Hazards - Ice and Sleet	2	3	1
Winter Hazards - Snowstorms	4	4	1
Hazmat Incidents - Fixed	10	8	4
Infrastructure Failure All	1	2	1
Transportation Acc. All	7	9	4
Flooding	6	7	4
Public Health Emergencies	2	10	3
Petroleum and Natural Gas Pipeline Accidents	7	5	3

Action Plan Assessment	
Risk	Rank
1-5	1-5
6-10	6-10

Hazard Identification
Advisory Committee Meeting of September, 2011

Selected Mitigation Strategies

1. Install additional tornado sirens in the community
2. Implement additional hazmat training
3. Hire additional people to meet the needs of municipal public safety departments
4. Identify community roads that are susceptible to flooding during times of heavy rainfall
5. Obtain/maintain back-up generators for pumping and lift stations and treatment plants, including possible separation of combined storm/sanitary sewer systems, if appropriate
6. Coordinate mutual aid assistance for failures in utility and communications systems (including 9-1-1)
7. Continue to encourage communities to acquire generators for backup power at critical facilities

Hazard Mitigation Plans

Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review

Selected Mitigation Strategies

8. Ensure readiness at critical facilities by requiring facilities to perform regular maintenance and equipment checks, pre-plan for fuel needs of existing and backup power sources (including gas stations and key facilities)
9. Equip public safety officers with hazmat detection equipment, provide additional equipment to cleanup a chemical spill, upgrade and improve current respiratory equipment
10. Mutual aid agreements for responding to incidents
11. Enhance coordinated public health response plans
12. Improve coordination of agencies in response planning and activities
13. Implement rapid damage assessment
14. Detect and prevent/discourage illegal discharges from home footing drains, downspouts, and sump pumps into storm water system

Hazard Mitigation Plans

Selected Mitigation Strategies

15. Encourage residents to receive immunizations against communicable diseases
16. Continue providing resources for development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites
17. Utilize public warning systems for public health communications
18. Obtain communication boosters for deficient areas in Open Sky Network (Oakland County's 800mhz radio system)
19. Improve and continue training for emergency responders and provide adequate equipment
20. Provide mutual aid pacts to provide personnel and resources to assist during and following storms

Hazard Mitigation Plans

Selected Mitigation Strategies

21. Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies
22. Pre-arrange heating/cooling centers/shelters for vulnerable populations, stranded motorists, etc.
23. Pre-plan for debris management staging and storage areas
24. Coordinate mutual aid assistance for failures in utility and communications systems (including 9-1-1)
25. Continue to encourage residents to create family escape plans and disaster supply kits
26. Continue outreach to vulnerable populations during periods of extreme temperatures

Hazard Mitigation Plans

Selected Mitigation Strategies

27. Continue to enhance and maintain early warning systems and networks
28. Continue to train, plan, and prepare for mass-casualty incidents
29. Continue to create and update public information material (newsletters, pamphlets, news articles, educational programs, website links, contact persons) to explain tornado and severe wind hazards, self and property protection measures, current warning and response systems currently in place
30. Encourage communities to obtain adequate supply of generators for emergency temporary power
31. Provide baseline training, planning, and preparedness for hazardous material incidents along roadways and railways and pipelines
32. Adopt and enforce appropriate building codes

Hazard Mitigation Plans

Selected Mitigation Strategies

33. Keep roads and driveways accessible to vehicles and emergency equipment - bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around
34. Utilize public warning systems and networks
35. Provide transportation for elderly and disabled to shelters
36. Make sure warming and cooling centers have adequate backup power generators
37. Continue to educate residents to prepare family disaster plans and supply kits (72-hour go kits)
38. Improve communications between municipalities (local, state, regional) in event of mass event

Hazard Mitigation Plans

Action Plans

1. Install additional tornado sirens in the community, and enhance and maintain early warning/alert systems and networks Utilize public warning systems and networks
2. Provide additional Hazmat and other emergency training and equipment to first responders (including, but not limited to, fire, police & civilian responders)
3. (1) Encourage communities and private interests to acquire generators for back-up power at critical facilities in the event of power failures, (2) Ensure readiness at critical facilities by requiring facilities to perform regular maintenance and equipment checks, and pre-plan for fuel needs
4. Implement Rapid Damage Assessment
5. Encourage Residents to Receive Immunizations Against Communicable Diseases

Hazard Mitigation Plans


Oakland County Hazard Mitigation Plan Update Public Meeting - Draft Plan for Review


Action Plans

- Utilize public warning systems for public health communications
- Obtain communication boosters for deficient areas of the Open Sky Network
- Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies
- Pre-arrange heating/cooling centers/shelters for vulnerable (special needs) populations, stranded motorists, etc.
- Pre-plan for debris management staging and storage areas
- Deliver and distribute public information materials (newsletters, pamphlets, news articles, educational programs, website links, contact persons, etc.) to explain tornado and high wind hazards, self and property protection measures, and warning and response systems
- Keep County roads accessible to emergency vehicles and equipment
- Improve communications between municipalities (local, state, regional) in the event of a mass incident/event

Hazard Mitigation Plans

Public Input

 Link to Draft Plan at:
www.ochmp.com
Comments Due March 27



Contact Information

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Advisory Committee

OAKLAND COUNTY HAZARD MITIGATION PLAN

The Advisory Committee is a critical component of providing community input for updating the Hazard Mitigation Plan (HMP). The committee will assist the County in identifying and prioritizing hazards and mitigation strategies, and will provide review for the draft HMP. Using a combination of web-based surveys, interviews, and workshops, the committee members will provide the input necessary to focus the HMP on those hazards that are specific to Oakland County, and to coordinate future mitigation strategies with existing goals and objectives of the County and its communities.

As a committee member you will be asked to complete three web-based surveys, attend three all-day workshops, and be available for telephone interviews. In addition, you will be asked to become familiar with the hazard mitigation process, and to review and provide comments on the draft HMP.

The web surveys will be completed prior to the workshops in order to provide information for discussion. Each one should take 15 to 20 minutes to complete. The workshops are scheduled for the following dates from 9am to 3pm. They will be held at the Oakland County Executive Office Building Conference Center 2100 Pontiac Lake Rd, Bldg. 41 West, Waterford.

First Workshop	September 20
Second Workshop	November 22 (tentative)
Third Workshop	December 20 (tentative)

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Overview

OAKLAND COUNTY HAZARD MITIGATION PLAN

Oakland County Homeland Security is updating its County-wide Hazard Mitigation Plan. To complete the Plan, they have contracted with ASTI Environmental, Inc. (ASTI).

The updated Plan will provide a basis for identifying and managing hazards among all sixty-two communities, while complying with the requirements of the Disaster Mitigation Act of 2000, the Emergency Management Act, the Federal Emergency Management Agency (FEMA) and applicable federal, state, and local regulations. The Plan is only a part of the emergency planning, mitigation, preparedness, response, and recovery process, so it will be coordinated with existing emergency plans, programs, and procedures used by the various communities of Oakland County.

A Hazard Mitigation Plan is an important tool for reducing the risks from natural hazards, and for providing a guide to commit resources that will reduce the effects of natural hazards. In addition, it provides a basis for the State of Michigan to provide technical assistance and to prioritize funding, and it is necessary to receive Hazard Mitigation Grant Program (HMGP) project grants from FEMA.

A multi-jurisdictional Hazard Mitigation Plan is a tool to focus resources on critical regional hazards. Because it coordinates numerous communities with unique hazards and miti-

(Continued on page 2)

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gation needs, a multi-jurisdictional Plan provides an additional set of challenges for communication and consensus building. Obtaining input from communities, facilitating decision making, and maintaining focus are some of those challenges.

A number of methods will be used to obtain input from the communities and general public. These methods are discussed in the Public Input Flyer available on the project web site referenced on the front of this flyer.

Updating the Plan will include the following activities:

- Develop a hazard analysis
- Obtain input from the communities and the public
- Estimate hazard risk and assess vulnerabilities
- Prepare a County-wide community profile
- Identify mitigation goals and objectives based on the hazard analysis
- Evaluate strategies to achieve the mitigation goals and objectives
- Identify action steps to achieving the strategies
- Prepare a draft plan
- Obtain input on the draft plan from the County, participating communities, adjacent communities and the public
- Prepare the final plan

The key milestones for completing the Plan are as follows:

Conduct Community Meetings: September 19—October 7

Initial Public Meeting: December 12

Complete Hazard and Vulnerability Analysis: September 27

Complete Evaluation of Mitigation Alternatives: December 2

Submit Draft Plan to the County: January 11

Submit Final Plan to the State: February 2

Contact information:

Paul Rentschler

ASTI Environmental

prentschler@asti-env.com

810.225.2800 226

Public Input

OAKLAND COUNTY HAZARD MITIGATION PLAN

A number of methods will be used to obtain input from the communities and general public. ASTI Environmental (ASTI) will coordinate public input and participation for the County.

First, a project web site has been created to provide access to information, list meeting dates, and track project progress. This is where a copy of the draft plan will be provided for public review and comment. The site address is listed in the lower left corner of this flyer. If you do not have access to the internet, please contact us at 800.395.ASTI and we will provide the information by regular mail.

Secondly, comments, requests for information, and input to surveys will be provided through the web site. In addition, you can contact the project team directly by email, phone or regular mail at the numbers listed on the bottom left of this flyer.

Thirdly, a free monthly newsletter will be provided to all communities in Oakland County, as well as any interested residents and other stakeholders. The newsletter will describe progress on the Plan, and highlight opportunities to comment or contribute to the process. Subscriptions can be obtained through the project web site, or by contacting ASTI directly.

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(Continued on page 2)

Fourth, two public meetings will be conducted. The first meeting will present an overview of the process and provide an opportunity for input. The second meeting will present the draft plan and provide opportunity for discussion. Prior to the second meeting, the draft plan will be made available on the project web site. The first public meeting is scheduled for December 12.

Notification of the public meetings will be provided to each of the communities, and will be announced on the project web page.

For more information, visit the project web site, or contact the Project Manager:

Paul Rentschler
ASTI Environmental, Inc. (ASTI)
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Oakland County Hazard Mitigation Newsletter

September 2011

Issue 1

Special points of interest:

- 63 communities are included in the Plan.
- To maintain eligibility for FEMA grant dollars, all of the communities must participate in, and ratify the Plan.
- The Hazard Mitigation Plan must be updated every 5 years to maintain eligibility for FEMA grant dollars.

In this issue:

- Advisory Committee 2
- Community Participation 2
- Input Needed 2
- Plan Progress 3
- Keeping Informed 3
- Project Information 3

Updating the Oakland County Plan

The Oakland County Homeland Security Division is updating the Hazard Mitigation Plan (HMP) completed in 2005. The HMP will cover all communities in the County and provide a basis for identifying and managing hazards, while complying with the requirements of the Disaster Mitigation Act of 2000, the Emergency Management Act, and the Federal Emergency Management Agency (FEMA). To maintain eligibility, the HMP must be updated every 5 years.

The Plan is only a part of the emergency planning, mitigation, preparedness, response, and recovery process, so it will be coordinated with existing emergency plans, programs, and procedures used by the various communities of Oakland County.

A Hazard Mitigation Plan is a tool for reducing the risks from natural hazards, and for providing a guide to commit resources that will reduce the effects of natural hazards. In addition, it provides a basis for the State of Michigan to provide technical assistance and to prioritize funding, and it is necessary to receive Hazard Mitigation Grant

Program (HMGP) project grants from FEMA.

The objectives of this plan are to:

- Identify and describe significant natural, technological, and human related hazards in the County and its communities.
- Identify and describe hazard mitigation options that can be implemented within a reasonable time frame.
- Obtain public and community input on hazards and mitigation options.
- Preserve the ability of the County and each of its communities to obtain FEMA grants.

(Continued on page 4)

Wind Damage to a House



Public Participation

Two important elements of the Plan are outreach to, and input from, the public. Because of the diverse nature of the communities in Oakland County, this input is critical to making sure that the Plan adequately identifies concerns in the County, and that the communities and citizens feel that their issues have been addressed. Because of the size of the County, and the short deadlines, communication must be as effective as possible.

To facilitate public communication, a project web site has been established (see page 3, “Keeping Informed”). This site provides information about the process and Plan, methods for communicating with the project team, and opportunities to provide input to specific questions being considered as the Plan is prepared. For those that do not have access to the internet, phone and mail contact information is also provided in this newsletter.

(Continued on page 2)





Advisory Committee

In order to provide input on hazard recognition and mitigation options, an Advisory Committee of 39 individuals was formed. Many of these individuals are members of the County Local Emergency Planning Committee, who were joined by representatives from industry, adjacent communities, schools, and local police and fire departments.

The first task was to have Advisory Committee members and community representatives complete a survey that ranked hazards. Information from this survey was then used in the first Advisory Committee meeting on September 20, where overall risks were reviewed, updated, and reassessed.

The committee will assist the County in identifying and prioritizing hazards and mitigation strategies. This will be accomplished using surveys and workshops that focus the Plan on those hazards and programs that will most benefit Oakland County.

When completed, the committee will be asked to review the draft Plan prior to submittal to the public. In addition, their expertise will be used to obtain information about County operations, vulnerable areas, and existing hazard mitigation programs.

Public Input Requested

What: 1st Public Meeting

When: Oct. 10, 2011

Time: 7pm

Where: Oakland County Executive Office Building Conference Center located at 2100 Pontiac Lake Rd, Bldg. 41 West, Waterford MI 48328

Keeping Informed Made EASY!

- Periodically review the project web site for announcements and current information. A comment form and newsletter subscription request forms are available. In addition, copies of project materials, as well as past issues of the newsletter are available at this location.
- Contact any project staff to request information or provide input listed.
- Receive your own copy of this newsletter.
- Contact your community representative for information on hazards and programs specific to your community

Project Information Available at:

- www.ochmp.com
- Linked In:
- 800.395.ASTI
- prentschler@asti-env.com
- 10448 Citation, #100, Brighton, MI 48116

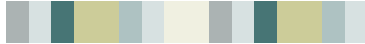
Public Participation (continued)

More importantly, two public meetings will be conducted to obtain input from County citizens and other stakeholders. The first meeting will be October 10 at 7pm at the Oakland County Executive Office Building Conference Center (see side bar for address). It will present an overview of the process and an outline of the Plan. This meeting will focus on identifying specific hazards in the County, and collecting information on mitigation options. There will be time for questions and answers.

The second meeting will provide an opportunity to discuss the draft Plan. Following review by the

County, the draft Plan (text only) will be posted to the project web site approximately two weeks prior to the meeting. At the meeting, a summary of the Plan will be presented, and input will be requested on the Plan.

Communication will also be provided in this monthly newsletter. The newsletter will be provided free to all interested parties, and community leaders will be encouraged to make the newsletter available at their offices. Copies of the newsletter will also be available on the project web site.



Plan Progress

Preparation of the Oakland County Hazard Mitigation Plan began when Oakland County contracted with Applied Science & Technology, Inc. (ASTI Environmental) of Brighton, Michigan, to update the Harzard Mitigation Plan (HMP). ASTI was the consultant for the original plan in 2005.

Based on the success of the original plan, four groups will assist with creating the plan. The first group consists of staff at the Oakland County Homeland Security Division that will be assisting with data collection, information management, and graphic presentation. Because the Oakland County Geographic Information System is so advanced, it was decided that this system would be used to prepare base maps for the Plan.

The second group consists of representatives of various stakeholders in the County that were willing to be on the Advisory Committee (see page 2).

The third group represents the individual communities. Interviews will be held with key stakeholders in the community . Each community will be kept informed on the progress of the plan and will be asked to provide additional outreach to the public.

The last group consists of all other stockholders and

interested parties. These individuals have been provided with a method of contacting the project team and will receive information on project progress.

The Advisory Committee held its first meeting on September 20, 2011 (see page 2 for more information.) The community profile and hazard history are now being updated. These sections of the Plan will describe the unique nature of Oakland County and its communities, and will review the historic frequency and impact of each of the hazards in Oakland County. These sections, in conjunction with the risk assessment conducted previously, will be the basis for selecting mitigation options over the next two months.

The project web site is operating, and now provides a single point of contact for information about the Plan and a method to provide comments on the process. The draft plan will be made available on this site in order to facilitate public review and comment.

Clearing Debris from a Tornado



Community Participation

This multi-jurisdictional Hazard Mitigation Plan (HMP) is a tool to focus resources on critical regional hazards. Because it coordinates numerous communities with unique hazards and mitigation needs, the Plan provides an additional set of challenges for communication and consensus building. Obtaining input from communities, facilitating decision making, and maintaining focus are some of those challenges.

To meet these challenges, representatives from each of the 63 communities are being contacted to assist with updating the HMP. Starting with the Emergency Management Coordinator for each com-

munity, one community representative is being asked to contribute to various surveys, meet with the project team, comment on the draft plan, and keep their community informed. In addition, the Mayor, Township Supervisor, Village President, and/or City Manager in each of the communities has received a notice concerning the project, and will receive the monthly newsletters.

This extends participation to nearly 300 individuals! They will be encouraged to participate, and, in turn, to encourage public participation.



The Oakland County Plan (continued)

(Continued from page 1)

Preparation of the Plan will include the following activities:

- Update the hazard analysis for the entire County, with emphasis on key hazards in each community.
- Obtain input from the communities and the public concerning specific hazards, and revising and identifying new mitigation activities for those hazards.
- Estimate hazard risk and assess vulnerabilities for the top hazards in the County.
- Update the County-wide community profiles, emphasizing how growth and change will effect hazard mitigation.
- Update previously identified mitigation goals and objectives based on the hazard analysis.
- Evaluate previously identified strategies and new strategies to achieve the mitigation goals and objectives.
- Determine progress on previous action steps and identify new action steps to achieving the strategies.
- Prepare a draft plan.
- Obtain input on the draft plan from the County, participating communities, adjacent communities and the public.
- Prepare the final plan.
- Manage and update the Plan as necessary to address hazards and mitigation options in the County.

The hazards reviewed by this Plan are listed below. Hazard definitions are included on the project web site listed in this newsletter.

Civil Disturbance
Criminal Acts
Dam Failures
Drought

Earthquakes
Extreme Temperatures
Fires (Buildings)
Fires (Forest)
Fires (Scrap Tire)
Flooding (Non Dam)
Fog
Invasive Species
Oil and Gas Well Accidents
Hazmat Incidences
Infrastructure Failure
Nuclear Power Plant Accidents
Pipeline Accidents (Gas)
Public Health Emergencies
Subsidence (Sink Holes)
Terrorism
Thunderstorms (Severe)
Tornadoes
Transportation Accidents
Weapons of Mass Destruction
Winter Hazards

The evaluation of each hazard will include a discussion of the historic frequency, an estimate of impacts to population and area, and an estimate of impact costs. Areas that are vulnerable to each of the hazards will be identified and included in the Plan.

In order to make sure that the Plan addresses the needs of the individual communities, mitigation programs being conducted, planned for the future, or on the ever present wish list, must be included in the plan. To accomplish this, each of the community representatives will be asked to include mitigation options. In addition, the general public, or other interested parties, will have an opportunity to provide mitigation suggestions on the project web site

A few mitigation options will be selected from the list, and action plans will be consider for each. These plans will form the basis of the recommendations in the Plan. However, all hazards and mitigation alternatives will be included in the Plan to assist with future planning activities.

We're on the web.
www.ochmp.com

Published By:
ASTI Environmental
P.O. Box 2160
Brighton, MI 48116
Phone: 800.395.ASTI
Fax:810.225.3800
www.asti-env.com



Oakland County Hazard Mitigation Newsletter

October 2011

Issue 2

Special points of interest:

- 43 communities in the County have provided input for the hazard assessment and mitigation portions of the HMP.
- 29 School Districts will be included in the Updated HMP

Plan Progress

The hazard identification and risk assessment portions of the Oakland County Hazard Mitigation Plan (HMP) have been updated. These portions of the HMP started with a survey of Advisory Committee members and community representatives. They included input from each of the 62 communities and a workshop for the Advisory Committee. Although all of the hazards will be considered by the HMP, the evaluation process highlighted the following hazards as having a significant impact in the County:

- Infrastructure Failure
- Winter Hazards
- Public Health Emergencies
- High Winds and Tornadoes
- Flooding

This year's hazard ranking results differed slightly from the results in 2005. For example in 2005, the hazards most frequently mentioned by communities as one of their top three priorities were tornadoes (39 communities), haz-mat transportation (18 communities), and terrorism (17 communities). Although tornadoes are still a top concern, the communities were also concerned about high winds, and infrastructure failure while terrorism and haz-mat transportation were ranked as 5th and 7th respectively.

Hazard selection was also discussed during the Advisory Committee meeting and this short list represents a combination of responses from each of the 62 communities and the advisory committee. In addition, the short list excludes hazards that are being addressed elsewhere; for example—weapons of mass destruction.

Excluding a hazard from this short list in no way limits the hazard evaluation or restricts the process of selecting and implementing mitigation measures. It will only be used to focus the HMP on a first set of mitigation strategies. Since the HMP will be updated again, additional hazards can be emphasized based on future evaluations.

(Continued on page 2)

In this issue:

- Advisory Committee 2
- Community Participation 2
- Keeping Informed 2

Preparation for Flooding



Public Participation

The first of two public meetings was conducted on October 10 at the Executive Office Building Conference Center on Oakland County's campus. Attendance was light, but if you missed the meeting, information on the progress of the HMP. General information about hazard mitigation plans, including the PowerPoint presentation, can be accessed on the project web site by selecting "Public Participation."

The second public meeting will focus on the draft HMP.

The objective of the meeting will be to obtain comments on the draft HMP prior to submittal to the Federal Emergency Management Agency (FEMA). The draft HMP meeting is scheduled for January 2012. Time and place will be identified at the HMP website: www.ochmp.com





Advisory Committee

After evaluating hazards in the County using a survey, the Advisory Committee members met to identify critical assets and functions effected by the hazards and to conduct a hazard risk assessment.

Aftermath of A Heavy Snowstorm



A second survey will be conducted in November to rank potential mitigation strategies. Based on the results of this survey and information gathered during the community interviews, the committee will evaluate the mitigation strategies, set priorities for mitigation selection, and identify the action plans to write.

Community Participation

Project staff have met with 52 of the County's 62 communities and should complete the interviews in early November. The HMP update will also include input from the County's 29 school districts. The objective of these meetings is to discuss locally significant hazards and preferred mitigation strategies.

These meetings identify locally significant hazards, mitigation strategies, and specific areas of the community that are vulnerable to one or more of the hazards considered. All of the information obtained during these meetings will be included in the HMP in order to provide a basis for each community to evaluate hazards and hazard mitigation.

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- Periodically review the project web site for announcements and current information. A comment form and newsletter subscription request forms are available.
- Contact any project staff to request information or provide input listed.
- Receive your own copy of this newsletter.
- Contact your community representative for information on programs specific to your community

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- 800.395.ASTI
- prentschler@asti-env.com
- 10448 Citation, #100, Brighton, MI 48116
- Search for us on Facebook and Linked In

Plan Progress (continued)

(Continued from page 1)

As the hazard list was being evaluated and updated, the County-wide hazard history was being updated. This history reviewed the frequency and impact of events in each of the hazard categories. It also began the process of identifying specific areas or improvements in the County that are particularly vulnerable to each hazard.

Vulnerability Assessment

An update to the vulnerability assessment is currently underway. This assessment is based on the hazard history, discussions with each community, and input from the Advisory Committee. First, critical buildings are evaluated, and the consequences of impacts from

each hazard identified. Second, hazard prone locations in each community are identified and mapped. Finally, areas vulnerable to specific hazards, based on development or location, are identified and mapped.

Mitigation Evaluation

The mitigation strategy portion of the HMP is also underway. Initial selection of mitigation strategies will start with a survey to the Advisory Committee members to be conducted in early November. Input on mitigation strategies will also be obtained from each of the communities.

This information will be used to update strategies and action plans included in the previous HMP.

Published By:
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www.asti-env.com





Oakland County Hazard Mitigation Newsletter

November 2011

Issue 3

Special points of interest:

- All the communities in the County have provided input for the hazard assessment and mitigation portions of the HMP.
- 29 School Districts in the County have provided input for the HMP.

In this issue:

Advisory Committee **2**

For More Information
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Plan Progress

All of the communities in the County have provided input for the HMP Update. The community input has been summarized and is ready to be included in the draft document.

All of the School Districts in the County have provided input for the HMP Update. The School District input has been summarized and is ready to be included in the draft document.

The second survey of Advisory Committee members and community representatives was conducted in November 2011. The second survey focused on mitigation strategies. A list of 349 mitigation strategies were compiled from the surveys and community input. The list was divided into three categories: Category 1 (strategies 1-29), Category 2 (strategies 30-61), and Category 3 (strategies 62+). Category 1 ranked above 4 on the survey or ranked highest on the community based responses. Category 2 ranked a 4 on the survey. Category 3 ranked below a 4 on the survey.

The mitigation strategies were presented to the Advisory Committee during the second workshop. The Advisory Committee narrowed the strategies down to 24.

The mitigation strategies will be used to write Action Plans which will be assigned to members of the Advisory Committee. The Advisory Committee has until December 16, 2011 to submit the draft Action Plan.

The Action Plans will be discussed and reviewed during the third workshop scheduled for December 20, 2011.

The Mitigation Objectives were also determined during the second workshop. They are as follows:

- Ability to accomplish fund measure and sustain
- Technical feasibility
- Cost effectiveness
- Protection of critical resources
- Community and public acceptance



Public Participation

The first of two public meetings was conducted on October 10 at the Executive Office Building Conference Center on Oakland County's campus.

The second public meeting will be held in January 2012 and will focus on the draft HMP. The objective of the meeting will be to obtain public comment on the draft HMP prior to submittal to the Federal Emergency Management Agency (FEMA). Time and place will be identified at the HMP website: www.ochmp.com

Upcoming Events

December 2011

12-16-11 Draft Action Plans Due

12-20-11 Third Workshop

January 2012

Second Public Meeting



Advisory Committee



Disaster Relief

We're on the web.
www.ochmp.com

The second survey was conducted November 20, 2011 to evaluate potential mitigation strategies. The Advisory Committee was presented 349 mitigation strategies compiled from the second survey results and community input. The list was narrowed down to 24 of the most important mitigation strategies. The mitigation strategies were as follows:

1. Encouraging residents to receive immunizations against communicable diseases
2. Provide resources for development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites
3. Utilize public warning systems for public health communications
4. Obtain communication boosters for deficient areas in Open Sky Network
5. Improve and continue training for emergency responders and provide adequate equipment
6. Provide mutual aid pacts to provide personnel and resources to assist during and following storms
7. Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies
8. Pre-arrange heating/cooling centers/shelters for vulnerable populations, stranded motorists, etc.
9. Pre-plan for debris management staging and storage areas
10. Coordinate mutual aid assistance for failures in utility and communications systems (including 911)
11. Encourage residents to create family escape plans and disaster supply kits
12. Outreach to vulnerable populations during periods of extreme temperatures
13. Enhance and maintain early warning systems and networks
14. Train, plan, and prepare for mass-casualty incidents
15. Create public information material to explain tornado and severe wind hazards, self and property protection measures, current warning and response systems currently in place
16. Encourage communities to obtain adequate supply of generators for emergency temporary power
17. Provide baseline training, planning, and preparedness for hazardous material incidents along roadways, railways, and pipelines
18. Adopt and enforce appropriate building codes
19. Keep roads and driveways accessible to vehicles and emergency equipment- bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around
20. Utilize public warning systems and networks
21. Provide transportation for the elderly and disabled to shelters
22. Make sure warming and cooling centers have adequate backup power generators
23. Educate residents to prepare family disaster plans and supply kits (72-hour go kits)
24. Improve Communications between municipalities (local, state, and regional) in event of mass event

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The mitigation strategies will be assigned to Advisory Committee members to write draft Action Plans. The Action Plans will be due December 16, 2011. The draft Action Plans will be discussed at the third workshop scheduled for December 20, 2011

Appendix C

Public Comment and Input

Oakland County Hazard Mitigation Plan

From: [John Cieslik](mailto:John.Cieslik@rochestertermi.org)
To: [Paul Rentschler](mailto:Paul.Rentschler@asti-env.com)
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review
Date: Monday, March 26, 2012 10:34:39 AM

I have reviewed the section for The City of Rochester and have no changes to recommend. At what point do we need to have our city council pass a resolution to adopt the plan?? Should we start the process now or wait??

-----Original Message-----

From: Paul Rentschler [mailto:PRentschler@asti-env.com]
Sent: Thursday, March 22, 2012 8:57 AM
To: John Cieslik
Cc: Paul Rentschler
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review

Hi John,

Thank you for your note. Was it the link to the website or the link to the document that was problematic? The link below should take you straight to the document. I'm going to cc my self on this email just to make sure.

http://www.ochmp.com/images/031912_Draft_Report_Compiled_reduced.pdf

Paul

From: John Cieslik [mailto:JCieslik@rochestertermi.org]
Sent: Wednesday, March 21, 2012 9:35 PM
To: Paul Rentschler
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review

Unable to access with the link provided

-----Original Message-----

From: Paul Rentschler [mailto:PRentschler@asti-env.com]
Sent: Wednesday, March 21, 2012 5:00 PM
To: Michael Mertz; David Larson; Marion Ginopolis; David Wagner; Bill Benoit; Alison Kalcec; Marilyn Stephan; Samuel Lucido; Anthony Spencer; Kevin Yee; Jay Wiseman; William Morgan; Paul Zelenak; Patrick Browne; Joe Young; Karl Woodard; Gordon Rinschler; Terry McCauley; Jay Wiseman; Oakland HMP; Louise E. Schilling; George Heitsch; William C. Skilling; Edward Harris; Joe George; David Niedermeier; April L. McGrath; Lorraine McMahon; Robert Cairnduff; William A. Pearson; John Ellsworth; Leon Jukowski; Steve Fairman; David Landry; Steve Schettenhelm; Jeff Walker; Edward Klobucher; Sherry Beens; Aron Lorenz; Elena Danishevskaya; Michael Simeck; Jeff Roberts; Karl Swieczkowski; Mark Venus; Frank Brock; Mike Howell; Bill Ireland; Jack Lloyd; Bill Bohlen; Loyd Cureton; Paul Shakinas; Groveland Post #27; Pamela Swert; Jaymes Vettraino; John McNeilance; Pete Auger; Victor Mayo; Sue Osborn; Don Ostrowski; Jim Ellison; Susan H. Zurvalec; Cory Bartsch; Dennis Storrs; Collin Walls; Peter Burkett; John Silveri; Leo Savoie; Mary Hughes; Tony Averbuch; Jeffrey Cuthbertson; James Allen; Paul Shearlock; Dave Papke; Jerry Morawski; S. Young; Robert DePalma; Daveda J. Colbert; Wanda Cook-Robinson; Arthur L. Shufflebarger; Wayne Domine; John Fletcher; Kevin Scheid; Karl Woodard; Jeff Key; Gary Mayer; Alex Allie; Ronald F Gillham; Pete Scholz; Bruce Naile; Bruce Pearson; Michael Neymanowski; Mike Burns; Roseanne Koss; Tony Averbuch; Lloyd Collins; Jim Scharret; Tyrone Jarrett; Kathryn Hagaman; John Cieslik; Chuck Nebus; Michael Zambricki; Clay Jansson; Fire

From: [Emile Bair](#)
To: [Paul Rentschler](#)
Subject: RE: Draft Mitigation Plan Update
Date: Thursday, March 22, 2012 12:48:22 PM

Please just send sections specific to rose township fax # is 248-634-6888 Thanks Emile Bair

From: Paul Rentschler [mailto:PRentschler@asti-env.com]
Sent: Thursday, March 22, 2012 12:01 PM
To: Emile Bair
Subject: RE: Draft Mitigation Plan Update

Sure. Would you like just the sections specific to Rose Township or the entire document (31 pp)?
If just your sections I can send them via fax.

From: Emile Bair [mailto:constable@rosetownship.com]
Sent: Thursday, March 22, 2012 11:42 AM
To: Paul Rentschler
Subject: Draft Mitigation Plan Update

Would you please send the Draft Mitigation Plan Update to me as I am not able to open this document. Thank you.

Emile Bair
Rose Township Constable
248-634-8737

From: [Burkett, Pete](#)
To: [Paul Rentschler](#)
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review
Date: Thursday, March 22, 2012 11:38:11 AM

10-4 Thanks

Sergeant Peter Burkett
Oakland County Sheriff's Office
Brandon Substation Commander
1-248-627-2394

From: Paul Rentschler [mailto:PRentschler@asti-env.com]

Sent: Wednesday, March 21, 2012 5:00 PM

To: Michael Mertz; David Larson; Marion Ginopolis; David Wagner; Bill Benoit; Alison Kalcec; Marilyn Stephan; Samuel Lucido; Anthony Spencer; Kevin Yee; Jay Wiseman; William Morgan; Paul Zelenak; Patrick Browne; Joe Young; Karl Woodard; Gordon Rinschler; Terry McCauley; Jay Wiseman; Oakland HMP; Louise E. Schilling; George Heitsch; William C. Skilling; Edward Harris; Joe George; David Niedermeier; April L. McGrath; Lorraine McMahon; Robert Cairnduff; William A. Pearson; John Ellsworth; Leon Jukowski; Steve Fairman; David Landry; Steven Schettenhelm; Jeff Walker; Edward Klobucher; Sherry Beens; Aron Lorenz; Elena Danishevskaya; Michael Simeck; Jeff Roberts; Karl Swieczkowski; Mark Venus; Frank Brock; Mike Howell; Bill Ireland; Jack Lloyd; Bill Bohlen; Loyd Cureton; Paul Shakinias; Groveland Post #27; Pamela Swert; Jaymes Vettrano; John McNeilance; Pete Auger; Victor Mayo; Sue Osborn; Don Ostrowski; Jim Ellison; Susan H. Zurvalec; Cory Bartsch; Dennis Storrs; Collin Walls; Peter Burkett; John Silveri; Leo Savoie; Mary Hughes; Tony Averbuch; Jeffrey Cuthbertson; James Allen; Paul Shearlock; Dave Papke; Jerry Morawski; S. Young; Robert DePalma; Daveda J. Colbert; Wanda Cook-Robinson; Arthur L. Shufflebarger; Wayne Domine; John Fletcher; Kevin Scheid; Karl Woodard; Jeff Key; Gary Mayer; Alex Allie; Ronald F Gillham; Pete Scholz; Bruce Naile; Bruce Pearson; Michael Neymanowski; Mike Burns; Roseanne Koss; Tony Averbuch; Lloyd Collins; Jim Scharret; Tyrone Jarrett; Kathryn Hagaman; John Cieslik; Chuck Nebus; Michael Zambricki; Clay Jansson; Fire Chief; Doreen Olko; Robert North; Kevin Sullivan; William Dunn; Steve Brock; Christopher Johnson; Mike Kazyak; Jim McDonald; Michael Johnson; Kirt Bowden; Michelle Economou Ureste; John MacDougal; Wayne Wills; William Roberts; Fred Gallasch; Thomas Zoner; Jerry Ellis; Mike Kennedy; Chris Wilson; Mark Pollock; Jesse Lambert; Richard Eshman; Sharon Miller; Ellen E. Marshall; Jon Austin; Michael McDonald; Richard J. Matott; Gerald Naftaly; John Magee; Joseph Schornack; Bruce McIntyre; Penny Luebs; Teri Stiles; Rod Rock; Dennis Ritter; Patrick Sullivan; Frank Coutts; Ken Van Sparrentak; Jerry Narsh; R. Kent Barnes; Scott Patterson; Harry Anderson; Jackie Johnston; Mike Patton; John Burmiester; Triscia Pilchowski; Tom Buck; Tricia Smith; Rick Fox; Donald Green; Steve McGee; Timothy R. Meyer; Steve Matthews; William Armstrong; Glenn McIntosh; Jay Cravens; Marsha Pando; Anthony Roberts; Joe Luginski; Edward Swanson; Robert Bruner Jr.; Greg Baroni; Derrick Schueller; Kenneth Gutman; Cheryl Rogers; Ronald Crowell; Robert Schultz; Carol Klenow; Ray DeWalt; Jeffery Johnson; William Nelson; Gary Gross; Matt Wiktorowski; David Kwapis; Bill Morgan; Jim Creech; Thomas G. Maridada II; Rick Aro; Anthony Maltese; Kathy Thurman; Michael Burns; Robert Glass; Lannie Young; Daniel McCaw; JoAnn Andrees; David Molloy; Clarence Goodlein; Gary W. Meier; Peter Healy; David Leckie; Vincent Pastue; Kevin Sullivan; Kevin Sullivan; Sara Stoddard; Joan Fogler; Kathy Thurman; Bryan K. Barnett; David Piche'; David Kwapis; Shawn Lewis-Lakin; Ted Wallace; Bob Gatt; Barbara A. Fowler; Sherry Ball; Brenda Lawrence; Carl Solden; Dawn Ferguson; Ralph Castelli; robertsj@huronvalley.k12.mi.us; firechief@milfordtownship.com; M_Patton@wbpolice.org; D_FERGUSON@WBPOLICE.ORG; j_wiseman@wbtpw.com; edanishevskaya@hollypolice.com; smcgee@grovelandfire.org; rkos@cityofnovi.org; pscholz@oxfordtownship.org; currie@westbloomfield.k12.mi.us; tmaltese@whitelaketwp.com; gbaroni@whitelaketwp.com; john.shinske@farmington.k12.mi.us; jon.riebe@farmington.k12.mi.us; m_eu@wbtpw.com; zelenakp@lakeorion.org; jroberts@wixomgov.org; cgoodlein@wixomgov.org; jallen@ci.northville.mi.us

Cc: Stoddard, Sara; Smith, Tricia; Paul Rentschler; mitigationplan@ochmp.com

Subject: Draft Oakland County Hazard Mitigation Plan for Review

Hello,

From: [Walls, Collin](#)
To: [Paul Rentschler](#)
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review
Date: Thursday, March 22, 2012 9:44:47 AM

Mr Rentschler,

Comments on the Springfield Township Section of the draft are not major.

1. 1st paragraph last line should refer to mobile home parks (plural) located at Dixie Hwy north of E. Holly Road. *All of one park is in Springfield but a portion of the park north of Oak Hill is also in Springfield. There are several Holly roads in the area. The one in Springfield is East Holly.*
2. The utility paragraph/sentence should state *"A large electric substation serving Springfield and nearby communities is located in the Southeastern portion of the township"*

Thank You,

Collin Walls, Supervisor

From: Paul Rentschler [mailto:PRentschler@asti-env.com]

Sent: Wednesday, March 21, 2012 5:00 PM

To: Michael Mertz; David Larson; Marion Ginopolis; David Wagner; Bill Benoit; Alison Kalcec; Marilyn Stephan; Samuel Lucido; Anthony Spencer; Kevin Yee; Jay Wiseman; William Morgan; Paul Zelenak; Patrick Browne; Joe Young; Karl Woodard; Gordon Rinschler; Terry McCauley; Jay Wiseman; Oakland HMP; Louise E. Schilling; George Heitsch; William C. Skilling; Edward Harris; Joe George; David Niedermeier; April L. McGrath; Lorraine McMahan; Robert Cairnduff; William A. Pearson; John Ellsworth; Leon Jukowski; Steve Fairman; David Landry; Steven Schettenhelm; Jeff Walker; Edward Klobucher; Sherry Beens; Aron Lorenz; Elena Danishevskaya; Michael Simeck; Jeff Roberts; Karl Swieczkowski; Mark Venus; Frank Brock; Mike Howell; Bill Ireland; Jack Lloyd; Bill Bohlen; Loyd Cureton; Paul Shakinis; Groveland Post #27; Pamela Swert; Jaymes Vettraino; John McNeilance; Pete Auger; Victor Mayo; Sue Osborn; Don Ostrowski; Jim Ellison; Susan H. Zurvalec; Cory Bartsch; Dennis Storrs; Collin Walls; Peter Burkett; John Silveri; Leo Savoie; Mary Hughes; Tony Averbuch; Jeffrey Cuthbertson; James Allen; Paul Shearlock; Dave Papke; Jerry Morawski; S. Young; Robert DePalma; Daveda J. Colbert; Wanda Cook-Robinson; Arthur L. Shufflebarger; Wayne Domine; John Fletcher; Kevin Scheid; Karl Woodard; Jeff Key; Gary Mayer; Alex Allie; Ronald F Gillham; Pete Scholz; Bruce Naile; Bruce Pearson; Michael Neymanowski; Mike Burns; Roseanne Koss; Tony Averbuch; Lloyd Collins; Jim Scharret; Tyrone Jarrett; Kathryn Hagaman; John Cieslik; Chuck Nebus; Michael Zambricki; Clay Jansson; Fire Chief; Doreen Olko; Robert North; Kevin Sullivan; William Dunn; Steve Brock; Christopher Johnson; Mike Kazyak; Jim McDonald; Michael Johnson; Kirt Bowden; Michelle Economou Ureste; John MacDougal; Wayne Wills; William Roberts; Fred Gallasch; Thomas Zoner; Jerry Ellis; Mike Kennedy; Chris Wilson; Mark Pollock; Jesse Lambert; Richard Eshman; Sharon Miller; Ellen E. Marshall; Jon Austin; Michael McDonald; Richard J. Matott; Gerald Naftaly; John Magee; Joseph Schornack; Bruce McIntyre; Penny Luebs; Teri Stiles; Rod Rock; Dennis Ritter; Patrick Sullivan; Frank Coutts; Ken Van Sparrentak; Jerry Narsh; R. Kent Barnes; Scott Patterson; Harry Anderson; Jackie Johnston; Mike Patton; John Burmiester; Triscia Pilchowski; Tom Buck; Tricia Smith; Rick Fox; Donald Green; Steve McGee; Timothy R. Meyer; Steve Matthews; William Armstrong; Glenn McIntosh; Jay Cravens; Marsha Pando; Anthony Roberts; Joe Luginski; Edward Swanson; Robert Bruner Jr.; Greg Baroni; Derrick Schueller; Kenneth Gutman; Cheryl Rogers; Ronald Crowell; Robert Schultz; Carol Klenow; Ray DeWalt; Jeffery Johnson; William Nelson; Gary Gross; Matt Wiktorowski; David Kwapis; Bill Morgan; Jim Creech; Thomas G. Maridada II; Rick Aro; Anthony Maltese; Kathy Thurman; Michael Burns; Robert Glass; Lannie Young; Daniel McCaw; JoAnn Andrees; David Molloy; Clarence Goodlein; Gary W. Meier; Peter Healy; David Leckie; Vincent Pastue; Kevin Sullivan; Kevin Sullivan; Sara Stoddard; Joan Fogler; Kathy Thurman; Bryan K. Barnett; David Piche; David Kwapis; Shawn Lewis-Lakin; Ted Wallace; Bob Gatt; Barbara A. Fowler; Sherry Ball; Brenda Lawrence; Carl Solden; Dawn Ferguson; Ralph Castelli; robertsj@huronvalley.k12.mi.us; firechief@milfordtownship.com; M_Patton@wbpolice.org; D_FERGUSON@WBPOLICE.ORG; j_wiseman@wbtpw.com; edanishevskaya@hollypolice.com; smcgee@grovelandfire.org; rkos@cityofnovi.org; pscholz@oxfordtownship.org; currie@westbloomfield.k12.mi.us; tmaltese@whitelaketwp.com; gbaroni@whitelaketwp.com; john.shinske@farmington.k12.mi.us;

From: [Denny Hughes](#)
To: [Paul Rentschler](#)
Subject: Re: Draft HMP for your review
Date: Thursday, March 22, 2012 8:28:47 AM

Good morning Paul,

I did a rather quick look at the "Draft". Very impressive! Only a couple of spelling errors jumped out at me. On page 20, when recognizing our Fire Chief Corey Bartsch, the letter "e" was left out of his first name (**Corey** is correct spelling) . On page 122, when talking about the City of Farmington Hills, one of the floor areas is at 14 Mile and Halstead Roads. The street "Halsted" does not have a second letter "a" after the letter "e". (**Halsted** is correct spelling)
Thanks, and best of luck with the final product!

Denny Hughes

Denny Hughes
Administrative Staff Lieutenant
Farmington Hills (MI) Fire-Rescue
31455 W. Eleven Mile Road
Farmington Hills, MI. 48336
(248) 871-2823 Wk.
(248) 231-7929 Cell
(248) 871-2801 Fax

"Tough times don't last very long, but tough people do"

>>> "Paul Rentschler" <PRentschler@asti-env.com> 3/21/2012 4:04 PM >>>

Dear Oakland County Hazard Mitigation Plan Advisory Committee Members,

A draft of the updated Hazard Mitigation Plan is available on the project website (www.ochmp.com) for your review. Links to the document are available on the website home page, public participation page, and news and events page.

Thank you all for participating in this process to date. Please note that some of the draft action plans you worked on have been revised. A few were eliminated because the actions were not a function of county government, but most of the changes involved actions were similar to one or more others These were combined in consultation with Homeland Security Division staff.

Please provide comments or suggested edits to me by email, fax or phone by the end of the day Tuesday March 27, 2012. My contact information is provide below.

Thank you

Paul

Paul Rentschler
Aquatic/Wetland Ecologist

From: [Schueller, Derrick](#)
To: [Paul Rentschler](#)
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review
Date: Thursday, March 22, 2012 8:13:29 AM

Hi Paul-

We haven't looked at this in detail yet but I did notice something in the City of Berkley section (page 102). The sentence about the Greenfield pipeline is actually petroleum based, not natural gas.

Thanks.

Derrick L. Schueller
Director of Public Works
City of Berkley
3238 Bacon Ave.
Berkley, Michigan 48072
248.658.3499 direct
248.658.3491 fax
dschueller@berkleymich.net

From: Paul Rentschler [mailto:PRentschler@asti-env.com]

Sent: Wednesday, March 21, 2012 5:00 PM

To: Michael Mertz; David Larson; Marion Ginopolis; David Wagner; Bill Benoit; Alison Kalcec; Marilyn Stephan; Samuel Lucido; Anthony Spencer; Kevin Yee; Jay Wiseman; William Morgan; Paul Zelenak; Patrick Browne; Joe Young; Karl Woodard; Gordon Rinschler; Terry McCauley; Jay Wiseman; Oakland HMP; Louise E. Schilling; George Heitsch; William C. Skilling; Edward Harris; Joe George; David Niedermeier; April L. McGrath; Lorraine McMahon; Robert Cairnduff; William A. Pearson; John Ellsworth; Leon Jukowski; Steve Fairman; David Landry; Steven Schettenhelm; Jeff Walker; Edward Klobucher; Sherry Beens; Aron Lorenz; Elena Danishevskaya; Michael Simeck; Jeff Roberts; Karl Swieczkowski; Mark Venus; Frank Brock; Mike Howell; Bill Ireland; Jack Lloyd; Bill Bohlen; Loyd Cureton; Paul Shakinis; Groveland Post #27; Pamela Swert; Jaymes Vettraino; John McNeilance; Pete Auger; Victor Mayo; Sue Osborn; Don Ostrowski; Jim Ellison; Susan H. Zurvalec; Cory Bartsch; Dennis Storrs; Collin Walls; Peter Burkett; John Silveri; Leo Savoie; Mary Hughes; Tony Averbuch; Jeffrey Cuthbertson; James Allen; Paul Shearlock; Dave Papke; Jerry Morawski; S. Young; Robert DePalma; Daveda J. Colbert; Wanda Cook-Robinson; Arthur L. Shufflebarger; Wayne Domine; John Fletcher; Kevin Scheid; Karl Woodard; Jeff Key; Gary Mayer; Alex Allie; Ronald F Gillham; Pete Scholz; Bruce Naile; Bruce Pearson; Michael Neymanowski; Mike Burns; Roseanne Koss; Tony Averbuch; Lloyd Collins; Jim Scharret; Tyrone Jarrett; Kathryn Hagaman; John Cieslik; Chuck Nebus; Michael Zambricki; Clay Jansson; Fire Chief; Doreen Olko; Robert North; Kevin Sullivan; William Dunn; Steve Brock; Christopher Johnson; Mike Kazyak; Jim McDonald; Michael Johnson; Kirt Bowden; Michelle Economou Ureste; John MacDougal; Wayne Wills; William Roberts; Fred Gallasch; Thomas Zoner; Jerry Ellis; Mike Kennedy; Chris Wilson; Mark Pollock; Jesse Lambert; Richard Eshman; Sharon Miller; Ellen E. Marshall; Jon Austin; Michael McDonald; Richard J. Matott; Gerald Naftaly; John Magee; Joseph Schornack; Bruce McIntyre; Penny Luebs; Teri Stiles; Rod Rock; Dennis Ritter; Patrick Sullivan; Frank Coutts; Ken Van Sparrentak; Jerry Narsh; R. Kent Barnes; Scott Patterson; Harry Anderson; Jackie Johnston; Mike Patton; John Burmiester; Triscia Pilchowski; Tom Buck; Tricia Smith; Rick Fox; Donald Green; Steve McGee; Timothy R. Meyer; Steve Matthews; William Armstrong; Glenn McIntosh; Jay Cravens; Marsha Pando; Anthony Roberts; Joe Luginski; Edward Swanson; Robert Bruner Jr.; Greg Baroni; Derrick Schueller; Kenneth Gutman; Cheryl Rogers; Ronald Crowell; Robert Schultz; Carol Klenow; Ray DeWalt; Jeffery Johnson; William Nelson; Gary Gross; Matt Wiktorowski; David Kwapis; Bill Morgan; Jim Creech; Thomas G. Maridada II; Rick Aro; Anthony Maltese; Kathy Thurman; Michael Burns; Robert Glass; Lannie Young; Daniel McCaw; JoAnn Andrees; David Molloy; Clarence Goodlein; Gary W. Meier; Peter Healy; David Leckie; Vincent Pastue;

From: [Domine, Wayne](#)
To: [Paul Rentschler](#)
Subject: RE: Draft Oakland County Hazard Mitigation Plan for Review
Date: Thursday, March 29, 2012 7:38:25 AM

Sorry for being a day late with comments. Below are the few comments I have.

The plan listed as one of Bloomfield Township's community contacts (Page 3) as "Leo Savoi, Supervisor" this last name is miss spelled. Its Leo Savoie.

Also, the report has identified Bloomfield Village as a separate community (on page 104) that is "... located mostly within the borders of Bloomfield Township...". I am not sure how this was listed in the old plan. Bloomfield Village is not a political jurisdiction and is a subdivision that is entirely within the Township. Even though they have their own police (Township employees) and fire (subdivision residents), all disaster related emergencies are handled by the Township. The Village is covered like all other subdivisions in the Township under our HMP approved by FEMA last year.

We adopted our own HMP last year and this is referenced in the County's draft plan. Even so we plan to pass the suggested resolution when the time comes.

Wayne

Wayne Domine, PE, Director
Engineering & Environmental Services Department
Bloomfield Township
4200 Telegraph Road
Bloomfield Hills, MI 48302
P:248-594-2800

From: Paul Rentschler [mailto:PRentschler@asti-env.com]
Sent: Wednesday, March 21, 2012 5:00 PM
To: Michael Mertz; David Larson; Marion Ginopolis; David Wagner; Bill Benoit; Alison Kalcec; Marilyn Stephan; Samuel Lucido; Anthony Spencer; Kevin Yee; Jay Wiseman; William Morgan; Paul Zelenak; Patrick Browne; Joe Young; Karl Woodard; Gordon Rinschler; Terry McCauley; Jay Wiseman; Oakland HMP; Louise E. Schilling; George Heitsch; William C. Skilling; Edward Harris; Joe George; David Niedermeier; April L. McGrath; Lorraine McMahon; Robert Cairnduff; William A. Pearson; John Ellsworth; Leon Jukowski; Steve Fairman; David Landry; Steven Schettenhelm; Jeff Walker; Edward Klobucher; Sherry Beens; Aron Lorenz; Elena Danishevskaya; Michael Simeck; Jeff Roberts; Karl Swieczkowski; Mark Venus; Frank Brock; Mike Howell; Bill Ireland; Jack Lloyd; Bill Bohlen; Loyd Cureton; Paul Shakinis; Groveland Post #27; Pamela Swert; Jaymes Vettraino; John McNeilance; Pete Auger; Victor Mayo; Sue Osborn; Don Ostrowski; Jim Ellison; Susan H. Zurvalec; Cory Bartsch; Dennis Storrs; Collin Walls; Peter Burkett; John Silveri; Savoie, Leo C.; Mary Hughes; Tony Averbuch; Jeffrey Cuthbertson; James Allen; Paul Shearlock; Dave Papke; Jerry Morawski; S. Young; Robert DePalma; Daveda J. Colbert; Wanda Cook-Robinson; Arthur L. Shufflebarger; Domine, Wayne; John Fletcher; Kevin Scheid; Karl Woodard; Jeff Key; Gary Mayer; Alex Allie; Ronald F Gillham; Pete Scholz; Bruce Naile; Bruce Pearson; Michael Neymanowski; Mike Burns; Roseanne Koss; Tony Averbuch; Lloyd Collins; Jim Scharret; Tyrone Jarrett; Kathryn Hagaman; John Cieslik; Chuck Nebus; Michael Zambricki; Clay

From: [Thompson, Curtis](#)
To: [Paul Rentschler](#)
Cc: [Spears, Ron](#); [Solden, Carl](#); [Finkbeiner, Jeffrey](#)
Subject: FW: Oakland County Hazard Mitigation Plan
Date: Thursday, April 12, 2012 1:55:30 PM

Paul,

We have reviewed the OCHMP Document and request the following changes:

1. Please change the Waterford Township Fire Department to the Waterford Regional Fire Department
2. Please Correct the Fire Chief of Waterford Regional Fire Department from Dennis Storrs to Ronald R. Spears
3. Please add "Fire Services provided by the Waterford Regional Fire Department" to the City of Pontiac
4. Please make the following changes to the document as seen below:

Feel free to contact me if you have any additional questions.

5.2.58 Township of Waterford

There are 31 lakes covering 2,923 acres within the Township of Waterford. These lakes, along with the Clinton River running through many areas of the Township, contribute to area flooding. A specific area of flooding that has caused property damage is the area around the eastern side of Scott Lake.

Areas of particular concern to the Township is the risk of a hazardous material accident, either on a highway (such as the heavily traveled M-59) or at an industrial facility that may use or store hazardous materials. **(ADD) Because of the proximity and frequency of local lakes, Hazardous Materials releasing into the ground is a major concern for Waterford Township officials.**

In addition, a plane crash at The Oakland County International Airport is an identified hazard for the Township.

~~(DELETE) Railroad crossings located on Williams Lake Road and on Dixie Highway are potential accident areas.~~ **(ADD) Waterford Township has nearly 6 miles of rail lines including 6 highway crossings.**

Structural fires inside transient buildings are of particular concern because there may be a lag time in contacting emergency services.

Thirteen water treatment plants could be a hazmat incident or be a target in a potential terrorist attack.

Eighteen water wells that feed the water treatment plants could also be a potential hazard.

A 4-inch crude oil pipeline on the west side of William Lake Road could be a potential for a hazard incident which could affect the surrounding lakes and rivers.

5.2.45 City of Pontiac

Hazards such as tornadoes, winter weather hazards, hazardous incidents, and traffic accidents are all concerns to the residents of the City of Pontiac.

A major concern that presents a significant risk to the community 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. (ADD) Within the City limits is a Railroad, which increases its potential for a Hazardous Materials incident or terrorist event.

The high frequency of crime, as in many large cities, is a significant issue in the City of Pontiac. The practice of assigning inmates released from the Oakland County Jail to half-way houses and other facilities in Pontiac, rather than requiring them to return to their own communities is a concern to City of Pontiac representatives.

5.2.46 City of Rochester Hills

Respectfully,

Lt. Curt Thompson
Training Officer
Waterford Township Fire Department
2495 Crescent Lake Road
Waterford, MI 48329
248-618-7570 Office
248-640-5867 Cell
248-674-4095 Fax
cthompson@twp.waterford.mi.us



"Knowing is not enough; *you must apply.*
Willing is not enough, you must do."

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Appendix D

Workshop Materials

Oakland County Hazard Mitigation Plan

Agenda

Date: September 20, 2011

**RE: First Advisory Committee Meeting
Oakland County Hazard Mitigation Plan Update (ASTI File No. 7685)**

Meeting Objective: Hazard Identification and Risk Analysis

Begin Meeting 9:00am

1. **Introduction**
2. **Overview of the Hazard Mitigation Planning Process**
3. **Overview of Existing Plan**
4. **Summary of Goals**
5. **Reviewing and Ranking Hazardous Events**
6. **Reviewing and Ranking Critical Assets**
7. **Reviewing Impact of Hazards on Assets**

Lunch Break

8. **Hazard Consequences**
9. **Hazard Risk Analysis**
10. **Mapping Hazards and Critical Assets**
11. **Existing Mitigation Programs - Progress from Current Plan**
12. **Next Meeting - Mitigation Strategies**
Next Meeting Date: November 22

Adjourn 3:30 p.m.

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Hazard Mitigation Plan Update



Overview

- Introduction
- The Function of a Hazard Mitigation Plan
- The 2005 Oakland County Plan
- The Oakland County Plan Update
- First workshop
- Survey Results

Introduction



Confidentiality

- Contact Information Confidential
- But You Will Be Listed in the Plan
- Workshop Sources Confidential
- Secure Version of Final Document
- Critical Assets
- Critical Infrastructure

Teams

- Project Team
 - Oakland County Homeland Security
 - ASTI Environmental
- Advisory Committee
- Local Communities
- Stakeholders
- Public

The Oakland County Plan
www.ochmp.com

Project Team


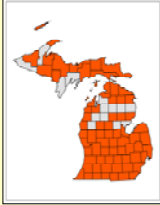

- Sara Stoddard
- Tricia Smith
- Thomas Wackerman, CHMM
- Paul Rentschler
- Lisa Sullivan
- Sarah Pavelko
- Karen Van Tiem

The Oakland County Plan
www.ochmp.com

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

ASTI Environmental
 Established in 1985
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Project Locations

ASTI Environmental

<i>Investigation</i>			
<i>Restoration</i>			
<i>Remediation</i>			
<i>Compliance</i>			

Contact Information

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 Project Manager
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 Brighton, Michigan 48116
 Phone 810.225.2800 x 226
 Fax 810.225.3800
 prentschler@asti-env.com

Advisory Committee

County LEPC
 Schools
 Industry/Businesses
 Adjacent Communities

The Oakland County Plan
www.ochmp.com

Community Reps

All 62 Communities
 – Emergency Management Coordinators
 – Local Leaders

The Oakland County Plan
www.ochmp.com

Stakeholders

All 62 Communities
 – Mayors, Managers
 Adjacent Communities
 Industry and Business
 Non-Government Organizations
 Interested Individuals

The Oakland County Plan
www.ochmp.com

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Hazard Mitigation Plans



What is a HMP?

A Hazard Mitigation Plan (HMP) will...

- identify hazards in the community,
- evaluate and highlight those hazards,
- provide mitigation alternatives

Hazard Mitigation Plans

What is a HMP?

The objectives of a Plan are to;

- reduce risks from natural, human, and technological hazards by focusing on those hazards,
- provide guidance when committing resources that will reduce the effects of hazards, and
- **provide a basis for technical assistance and funding**

Hazard Mitigation Plans

What is a HMP?

The Plan must comply with:

- the Disaster Mitigation Act of 2000,
- the Emergency Management Act,
- FEMA and Michigan Department of State Police guidance documents,
- and all applicable federal, state, and local regulations.

Hazard Mitigation Plans

What is a HMP?

The Plan is only a part of the emergency planning, mitigation, preparedness, response, and recovery process. Must coordinate with:

- All existing plans and programs
- **Existing Plans can be included in the Final HMP by reference**

Hazard Mitigation Plans

Why Prepare A Plan?

- To save lives and protect property
- To preserve and protect an area's environment and economy
- To preserve and maintain an area's essential services and quality of life

Hazard Mitigation Plans

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Why Prepare A Plan?

To provide information to citizens, businesses, and officials (including future emergency managers), for

- Planning
- Economic development
- Project development decisions
- Emergency Management

Hazard Mitigation Plans

Why Prepare A Plan?

To support hazard mitigation project implementation and **funding**.

- Identifies specific hazards
- Identifies specific vulnerabilities
- Documents mitigation options
- Demonstrates community involvement and support
- Part of an effective overall plan

Funding Sources (attached)

Hazard Mitigation Plans

The Process

Prepare hazard history and community profile

Identify significant hazards and risks

Identify specific vulnerabilities

Hazard Mitigation Plans

The Process

Identify hazard mitigation goals and objectives

Suggest strategies to achieve mitigation goals and objectives

Evaluate strategies using locally chosen criteria

Select feasible strategies based on evaluation criteria

Hazard Mitigation Plans

The Process

Propose specific action steps that will achieve desired objectives

Prepare the plan

Adopt the plan



Implement the plan

Monitor and update the plan

Hazard Mitigation Plans

The Oakland County Plan

Circa 2005

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Hazard Ranking Criteria

Criteria	Weighting
Population Impacted	9
Economic Impact	5
Env./Serv. Impacted	4

Env./Serv. Impacted includes quality of life, environmental, services, and community confidence

Hazard Identification
Advisory Committee Meeting of June 10, 2004

Assets at Risk From Hazards

	Asset Rank	VA Quad.
Utility Facilities	1	1
Hospitals	2	1
Sports/Entertainment Arenas	3	1
Schools, Churches	4	3
Industrial Sites	5	3
Public Facilities	6	4
Commercial Sites	7	2
Central Business Dist.	8	4
Roads, Railroads, Bridges	9	4
Residential Areas	10	4
Open Space	11	4

Risk Sums	Vulnerability Quadrants	
	Asset Rank	VA Quad.
>1.3	1-3	High Prior.
<1.3	4	Med. Prior.
	5-11	Low Prior.

Hazard Identification
Advisory Committee Meeting of June 10, 2004

Critical Response Facilities

- Hazmat Response
- Health
- Emergency Response
- Utilities
- Schools
- Assembly Areas
- Highways and Bridges

Hazard Identification
Advisory Committee Meeting of June 10, 2004

Hazard History Ranking – Top 10

Hazard Identification	Hazard History		
	Annual Frequency	Consequence	Rank
Criminal Acts - Vandalism	10,011	Low	1
Fire Hazards - Structural Fires	544	Medium	2
Criminal Acts - Arson	252	Low-Medium	3
Infrastructure Failure - Water System	257	Low	4
Fire Hazards - Forest/Field	54	Medium	5
Flooding - Dam Failure	18	Medium	6
HazMat Incidents - Fixed Sites	20	Low	7
Transportation Accidents - Highway	10	Low	8
HazMat Incidents - Transportation	6	Low-Medium	9
Transportation Accidents - Air	3	Low	10

Ranked by Frequency * Consequence

Hazard Identification
2005 Plan

Final Survey Results - Top 13

25 Responses

Hazards Ranked by Survey Results

Weapons of Mass Destruction
Infrastructure Failure-Electrical
Public Health Emergencies
Infrastructure Failure-Water System
Terrorism
Infrastructure Failure-Communications
Nuclear Power Plant Accidents
Tornadoes
Transportation Accidents-Highway
Hazmat Incidences-Transportation
Infrastructure Failure-Sewer System
Transportation Accidents-Surface Roads
Hazmat Incidences-Fixed Sites

Yellow Highlight
Selected Hazards
Excluding Weapons of Mass Destruction, Terrorism and Nuclear Power Plant Accidents, and combining all Infrastructure subcategories.)

Mode
1 - Highest priority
2 - Second Priority
Etc.

Hazard Identification
2005 Plan

Community Meeting Results – Top 10

59 Responses

Hazard (Responses)	Meeting Results	
	Rank (by No. of Responses)	Mode (Priority)
Tornadoes (39)	1	1
Hazmat Incidents - Transportation (18)	2	1
Terrorism (17)	3	2
Flooding (Non-Dam) (13)	4	1
Transportation Acc.-Highway, (11)	5	3
Hazmat Incidents -Fixed (10)	6	3
Transportation Acc. - Rail (10)	6	2
Fires (Structural) (9)	8	2
Winter Hazards (8)	9	1
Pipeline Acc. (5)	10	4
Civil Disturbance (5)	10	4
Transportation Acc.-Air (5)	10	2

Hazard Identification
2005 Plan

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Community Meeting Results – Top 10

59 Responses

Hazard (Responses)	Meeting Results	
	Rank (by No. of Responses)	Mode (Priority)
Tornadoes (39)	1	1
Hazmat Incidents - Transportation (18)	2	1
Terrorism (17)	3	2
Flooding (Non-Dam) (13)	4	1
Transportation Acc.-Highway (11)	5	3
Hazmat Incidents - Fixed (10)	6	3
Transportation Acc. - Rail (10)	6	2
Fires (Structural) (9)	8	2
Winter Hazards (8)	9	1
Pipeline Acc. (5)	10	4
Civil Disturbance (5)	10	4
Transportation Acc.-Air (5)	10	2

Yellow Highlight
Selected Hazards Excluding Weapons of Mass Destruction, Terrorism and Nuclear Power Plant Accidents, and combining all Infrastructure subcategories.)

Hazard Identification
2005 Plan

Top Hazards To Consider

Hazard	Survey Rank (Pair Wise Sum)	Community Rank (Number of Responses)	Hazard History Rank (Frequency * Consequence)
Criminal Acts (Vandalism and Arson)	16	14	1
Fires (Structural)	18	8	2
Flooding (Non-Dam)	24	4	13
Hazmat Incidents - Transportation	10	2	9
Infrastructure Failure (All Categories)	2	13	3
Public Health Emergencies	3	21	25
Tornadoes	8	1	15
Transportation Acc. - Rail	14	6	16
Winter Hazards	22	9	16

Combining top 3 from each of the three evaluations, excluding Weapons of Mass Destruction, Terrorism and Nuclear Power Plant Accidents, and combining all Infrastructure subcategories.

Note: Survey Rank is the same as Hazard Impact Rank for top 3.

Hazard Identification
2005 Plan



Top Hazards To Consider

Hazard	Survey Rank (Pair Wise Sum)	Community Rank (Number of Responses)	Hazard History Rank (Frequency * Consequence)
Criminal Acts (Vandalism and Arson)	16	14	1
Fires (Structural)	18	8	2
Flooding (Non-Dam)	24	4	13
Hazmat Incidents - Transportation	10	2	9
Infrastructure Failure (All Categories)	2	13	3
Public Health Emergencies	3	21	25
Tornadoes	8	1	15
Transportation Acc. - Rail	14	6	16
Winter Hazards	22	9	16

Yellow Highlight
Recommended Hazards

Hazard Identification
2005 Plan

The Oakland County Plan Update

Considerations - Hazards

2005 Emphasis	2011 Emphasis??
Terrorism	Flooding
Weapons of Mass Destruction	Earthquakes
	Pipeline Ruptures

Considerations - Hazards

Natural – 17 Total
14 Considered in 2005
1 Not Considered in 2005
2 New

List of Hazards (attached)

Advisory Committee Workshop

Oakland County Hazard Mitigation Plan Update

Considerations Hazards

Technological – 17 Total

- 15 Considered in 2005
 - 1 Addressed Under Separate Program
- 1 Not Considered in 2005
- 1 New

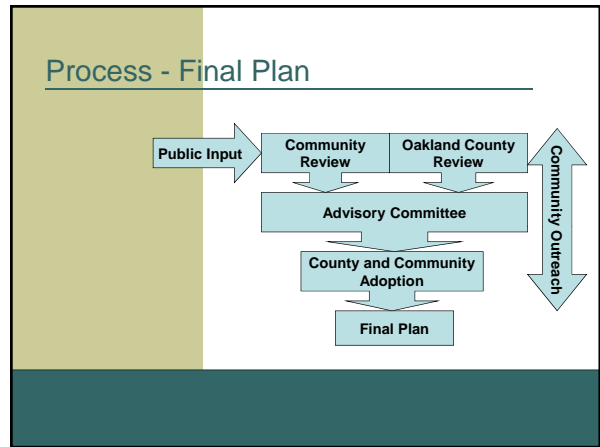
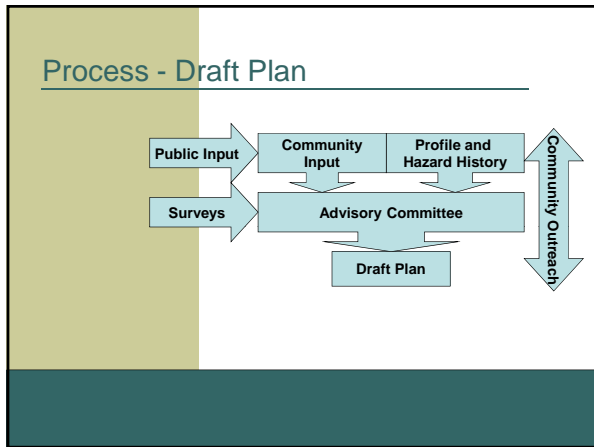
List of Hazards (attached)

Considerations Hazards

Human Related – 15 Total

- 9 Considered in 2005
 - 2 Addressed Under Separate Program
- 3 Not Considered in 2005
- 3 New

List of Hazards (attached)



Process - Outreach

Public

- Two public meetings
- Community announcements
- Web page
 - Comment Form
 - General Information
 - Plan updates and Draft Plan
- Phone, email and regular mail contact information

Process - Outreach

Stakeholders

- Newsletter
- Web page
 - Meeting agendas and minutes
- Social Media
- Draft Plan Available

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Process - Outreach

Community Representatives

- Three surveys
- Meeting on local hazards and specific vulnerabilities
- Draft Plan Review
- Plan Adoption

Process - Outreach

Advisory Committee

- Two Workshops
- Three Surveys
- Web page
 - Draft Plan
- Telephone Input
- Draft Plan Review

First Workshop




Meeting Agenda

- Identify and rank hazard events
- Rank critical assets
- Analyze threats
- Identify specific vulnerabilities
- Begin discussing mitigation alternatives

(see attached)

First Meeting
September 20, 2011

Keep in Mind

Analyze threats

$R = V \times P \times C$

- vulnerability, probability, consequence

Importance:
Fear ≠ Risk

Consequence:
Typical not Worst Case

Specific Hazard Definitions

The End Game

First Meeting
September 20, 2011

Keep in Mind

Decision Assisting Tool
Not A
Decision Making Tool

Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Review Goals

To retain access to Federal Emergency Management Agency (FEMA) funding for the County and its communities by complying with Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165)

Review Goals

To provide a basis for identifying and mitigating hazards that affect the County and its communities

Review Goals

To develop a method to incorporate hazard identification and mitigation into the planning process of the County and its communities



Review Weighting Criteria

Population Impacted (9)
Economic Impact (5)
Environment/Services Impacted, including quality of life, environmental, community services, and community confidence (4)

The Heavy Lifting - Worksheets

Hazard Ranking
Critical Assets
Hazard Likelihood and Consequences
The Magic

Assessment



Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Ranking	
5 =	much greater
4 =	greater than
3 =	the same as
2 =	lower than
1 =	much lower
<small>Population: deaths, injuries, illnesses Economic: property damage, response costs, physical damage, business closure, disruption costs Env./Services Impacted: Quality of life, environmental, services, community confidence</small>	

Ranking		
High	Happened more than once	3
Medium	Happened once	2
Low	Never happened, but could	1

Ranking	
3 =	High
2 =	Medium
1 =	Low

Summary of Current Plan – Hazard History from 2005 Plan
Oakland County
Hazard Mitigation Plan
Workshop of September 20, 2011

Hazard	Annual Frequency	Hazard Impact				Hazard Rank
		Probability	Health & Safety	Area (sq miles)	Economic	
Civil Disturbances	0.1	Low	Medium	<1	Medium	25
Criminal Acts - Vandalism	10,011	Very High	Low	<1	Low	1
Criminal Acts - Arson	252	Very High	High	<1	Low	3
Drought	0.04	Low	Low	70	Low	27
Earthquakes	0	Low	Low	907	Low	28
Extreme Temperatures	0.28	Medium	Medium	907	Low	23
Fire Hazards - Forest/Field	54	High	Low	<1	Low	5
Fire Hazards - Scrap Tire Fires	0.33	Low	Medium	<1	Low	21
Fire Hazards - Structural Fires	544	Very High	High	<1	Medium	2
Flooding - Dam Failure	18	High	Low	1-5	High	6
Flooding-Riverine Flooding	0.5	Low	Low	1-5	High	18
Flood-Urban Flooding	1	Medium	Low	1-5	High	13
Flood-Shoreline and Erosion	NA	NA	NA	NA	NA	28
HazMat Incidents - Fixed Sites	20	High	Medium	3	Medium	7
HazMat Incidents - Transportation	6	Medium	Medium	3	Medium	9
Infrastructure Failure - Water System	257	Very High	Low	<1	Low	4
Infrastructure Failure - Electrical System	1	Medium	Medium	1-5	High	13
Infrastructure Failure - Storm Sewer System	0.5	Low	Medium	<1	Low	18
Infrastructure Failure - Sanitary Sewer System	0.05	Low	High	1-5	Medium	26
Infrastructure Failure - Communications	0.5	Low	High	<1	Low	20
Nuclear Power Plant Accidents	0	Low	Medium	425	High	28
Oil and Gas Well Incidents	0.25	Low	Low	<1	Low	22
Petroleum and Natural Gas Pipeline Accidents	1	Medium	Medium	<1	Medium	12
Public Health Emergencies	0.12	Low	High	907	Low	24
Subsidence	NA	Low	Low	<1	Low	28
Terrorism	0	Low	High	<1	High	28
Thunderstorm	5-7	High	Medium	907	Low	10
Tornados	0.54	Low	High	16	High	15
Transportation Accidents - Air	3	Medium	Medium	5	Low	11
Transportation Accidents - Highway	10	High	Medium	<1-5	High	8
Transportation Accidents - Rail	1	Medium	Low	<1-5	Low	16
Transportation Accidents - Marine	NA	NA	NA	NA	NA	28
Weapons of Mass Destruction	0	Low	High	1-907	High	28
Winter Hazards	1	Medium	Medium	907	Medium	16

Summary of Current Plan – Hazard Ranking Comparison 2005 Plan
Oakland County
Hazard Mitigation Plan
Workshop of September 20, 2011

	Hazard	2005 History Ranking	2005 Survey Ranking	2005 Selected	2005 Report Section	Comments
Natural Hazards	Drought	27	29		4.3	
	Earthquakes	28	30		4.4	
	Erosion - Shoreline	28				Not Considered
	Extreme Temperatures: Extreme Cold				4.5.2	
	Extreme Temperatures: Extreme Heat	23	26		4.5.1	
	Fires - Forest and Field	5	27		4.6.1	
	Flooding - Riverine			Yes	4.7.2	
	Flooding - Shoreline	18	24	Yes	4.7.4	
	Fog					New
	Invasive Species					New
	Subsidence - Natural	28	31		4.14.1	
	Thunderstorms - Hail				4.15.1	
	Thunderstorms - Lightning	10	21		4.15.2	
	Thunderstorms - Severe Wind				4.15.3	
	Tomadoes	15	8	Yes	4.16	
	Technological Hazards	Winter Hazards - Ice and Sleet				4.18.1
Winter Hazards - Snowstorms		16	22		4.18.2	
Fires -Scrap Tire		21	28		4.6.2	
Fires -Structural		2	18		4.6.3	
Flooding - Dam Failure		6	25	Yes	4.7.1	
Flooding - Urban		13		Yes	4.7.3	
Hazmat Incidents - Transportation		9	10	Yes	4.8.2	
Hazmat Incidents -Fixed		7	13		4.8.1	
Infrastructure Failure - Bridges, Roads, Overpass						New
Infrastructure Failure - Communications		20	6	Yes	4.9.3	
Infrastructure Failure - Electrical System		13	2	Yes	4.9.2	
Infrastructure Failure - Sanitary Sewer System		26	11	Yes	4.9.5	
Infrastructure Failure - Storm Sewer System		18	19	Yes	4.9.4	
Infrastructure Failure - Water System		4	4	Yes	4.9.1	
Nuclear Power Plants		28	7		4.10.	Handled in Separate Program
Human Related Hazards		Oil and Gas Well Accidents	22	23		4.11
	Petroleum and Natural Gas Pipeline Accidents	12	20		4.12	
	Subsidence - Mining				4.14.2	
	Subsidence - Technical					Not Considered
	Civil Disturbance	25	17		4.1	
	Criminal Acts (Vandalism and Arson)	1	16		4.2.1-4.2.2	
	Gas/Oil Shortages or Supply Disruptions					New
	Public Health Emergencies	24	3	Yes	4.13	
	Pandemics and Epidemics					New
	Contaminated Food/Water					New
	Terrorism	28	5		4.19	Handled in Separate Program
Transportation Acc. - Highway	8	9		4.17.2		
Transportation Acc. - Rail	16	14		4.17.3		
Transportation Acc.-Air	11	15		4.17.1		
Transportation - Surface Roads		12			Not Considered	
Transportation - Marine	28				Not Considered	
Transportation Accidents - Rail/Highway Crossings					Not Considered	
Weapons of Mass Destruction	28	1		4.20.	Handled in Separate Program	
Notes						
	Indicates focus of 2005 Report					
	Indicates ranked in top 10					
	Indicates selected for top 10 in 2005 Workshop					

Summary of Hazard Evaluation – First Survey Results
 Oakland County
 Hazard Mitigation Plan
 Workshop of September 20, 2011

First Survey Results Ranked: Advisory Committee (N=23)

		Advisory Committee				
		Open Ended Questions			Ranking	
Hazard		Total	Rank	Average	Rank	Mode
Natural Hazards	Drought	1	37	2.00	30	2
	Earthquakes	0	40	1.72	31	1
	Erosion - Shoreline	4	27	0.00	0	0
	Extreme Temperatures: Extreme Cold	7	22	3.89	14	3
	Extreme Temperatures: Extreme Heat	4	27	3.76	16	3
	Fires - Forest and Field	3	30	2.39	27	3
	Flooding - Riverine	4	27	3.20	22	2
	Flooding - Shoreline	2	32	0.00	0	0
	Subsidence - Natural	11	17	2.12	29	2
	Thunderstorms - Hail	23	3	3.53	18	5
	Thunderstorms - Lightning	26	1	3.65	17	4
	Thunderstorms - Severe Wind	24	2	4.41	3	5
	Tornadoes	16	8	4.11	10	4
	Winter Hazards - Ice and Sleet	10	19	4.50	1	5
	Winter Hazards -Snowstorms	5	25	4.47	2	5
Technological Hazards	Fires -Scrap Tire	7	22	2.61	26	3
	Fires -Structural	7	22	3.50	19	4
	Flooding - Dam Failure	2	32	2.29	28	2
	Flooding - Urban	10	19	0.00	0	0
	Hazmat Incidents - Transportation	18	7	4.41	3	5
	Hazmat Incidents -Fixed	16	8	4.06	12	5
	Infrastructure Failure - Communications	15	10	4.41	3	5
	Infrastructure Failure - Electrical System	15	10	0.00	0	0
	Infrastructure Failure - Sanitary Sewer System	14	12	0.00	0	0
	Infrastructure Failure - Storm Sewer System	14	12	0.00	0	0
	Infrastructure Failure - Water System	8	21	0.00	0	0
	Nuclear Power Plants	2	32	2.94	24	3
	Oil and Gas Well Accidents	3	30	2.87	25	3
	Petroleum and Natural Gas Pipeline Accidents	2	32	3.87	15	4
Subsidence - Mining	1	37	0.00	0	0	
Subsidence - Technical	2	32	3.20	22	3	
Human Related Hazards	Civil Disturbance	5	25	3.25	21	3
	Criminal Acts (Vandalism and Arson)	14	12	3.35	20	5
	Public Health Emergencies	14	12	4.29	6	4
	Terrorism	14	12	4.18	8	5
	Transportation Acc. - Highway	20	4	4.24	7	5
	Transportation Acc. - Rail	20	4	4.06	11	4
	Transportation Acc.-Air	20	4	4.13	9	5
	Transportation Accidents - Rail/Highway Crossings	11	17	0.00	0	0
	Weapons of Mass Destruction	1	37	3.93	13	5

Summary of Hazard Evaluation – First Survey Results
 Oakland County
 Hazard Mitigation Plan
 Workshop of September 20, 2011

First Survey Results Ranked: Community Representatives (N=45)

Hazard		Community Responses					
		Open Ended Questions			Ranking		
		Total	Rank		Average	Rank	Mode
Natural Hazards	Drought	1	28		1.84	30	2
	Earthquakes	0	30		1.60	31	1
	Erosion - Shoreline	0	30		0.00	0	0
	Extreme Temperatures: Extreme Cold	5	21		2.98	19	3
	Extreme Temperatures: Extreme Heat	5	21		2.96	20	3
	Fires - Forest and Field	0	30		2.24	27	2
	Flooding - Riverine	2	26		2.73	22	3
	Flooding - Shoreline	2	26		0.00	0	0
	Subsidence - Natural	0	30		2.33	26	3
	Thunderstorms - Hail	17	4		2.84	21	3
	Thunderstorms - Lightning	17	4		3.27	17	3
	Thunderstorms - Severe Wind	23	2		3.95	2	4
	Tornadoes	26	1		4.18	1	4
	Winter Hazards - Ice and Sleet	16	6		3.75	8	4
Winter Hazards -Snowstorms	15	11		3.80	6	4	
Technological Hazards	Fires -Scrap Tire	0	30		1.96	28	2
	Fires -Structural	5	21		3.29	16	3
	Flooding - Dam Failure	0	30		1.84	29	1
	Flooding - Urban	0	30		0.00	0	0
	Hazmat Incidents - Transportation	16	6		3.76	7	4
	Hazmat Incidents -Fixed	15	11		3.57	11	4
	Infrastructure Failure - Communications	16	6		3.89	3	4
	Infrastructure Failure - Electrical System	20	3		0.00	0	0
	Infrastructure Failure - Sanitary Sewer System	15	11		0.00	0	0
	Infrastructure Failure - Storm Sewer System	15	11		0.00	0	0
	Infrastructure Failure - Water System	16	6		0.00	0	0
	Nuclear Power Plants	1	28		2.47	24	2
	Oil and Gas Well Accidents	0	30		2.44	25	1
	Petroleum and Natural Gas Pipeline Accidents	7	20		3.38	14	3
Subsidence - Mining	0	30		0.00	0	0	
Subsidence - Technical	0	30		2.67	23	3	
Human Related Hazards	Civil Disturbance	3	25		3.16	18	3
	Criminal Acts (Vandalism and Arson)	8	19		3.44	13	3
	Public Health Emergencies	16	6		3.87	4	4
	Terrorism	5	21		3.80	5	5
	Transportation Acc. - Highway	14	15		3.66	9	4
	Transportation Acc. - Rail	13	16		3.47	12	4
	Transportation Acc.-Air	13	16		3.33	15	3
	Transportation Accidents - Rail/Highway Crossings	13	16		0.00	0	0
Weapons of Mass Destruction	0	30		3.58	10	5	

Summary of Hazard Evaluation – First Survey Results
 Oakland County
 Hazard Mitigation Plan
 Workshop of September 20, 2011

Critical Asset Ranking	Advisory Committee								
	Population Impacted			Impacts to Environment			Impact to Economic Activity		
	Average	Rank	Mode	Average	Rank	Mode	Average	Rank	Mode
Commercial Sites	3.83	2	5	3.38	6	3	3.25	4	5
Hospitals	2.58	9	1	2.08	10	1	2.40	10	1
Industrial Sites	3.50	4	3	2.67	9	1	3.10	5	3
Open Spaces	4.33	1	4	3.50	5	#N/A	0.00	0	0
Public Facilities	3.14	5	2	3.67	4	4	4.00	1	5
Residential Areas	2.00	11	1	4.00	3	5	3.67	3	#N/A
Roads, Bridges, Railroads	3.67	3	4	3.20	7	3	3.00	6	4
Utility Facilities	2.67	7	2	2.00	11	2	2.42	9	1
Schools and Churches	2.29	10	2	2.75	8	3	2.60	7	1
Sports/Entertainment Arenas	2.67	7	1	4.75	1	5	3.80	2	5
Central Business District	3.00	6	3	4.17	2	5	2.50	8	1

Critical Asset Ranking	Community Responses								
	Population Impacted			Impacts to Environment			Impact to Economic Activity		
	Average	Rank	Mode	Average	Rank	Mode	Average	Rank	Mode
Commercial Sites	3.94	1	5	3.67	2	4	2.91	8	4
Hospitals	2.43	9	1	2.25	10	1	3.50	1	4
Industrial Sites	3.64	2	5	3.55	3	5	3.08	6	4
Open Spaces	2.00	11	#N/A	2.86	7	1	0.00	0	#N/A
Public Facilities	3.33	4	3	3.17	6	4	3.50	1	5
Residential Areas	2.55	8	1	2.13	11	1	3.17	5	5
Roads, Bridges, Railroads	3.25	5	4	2.82	8	2	2.96	7	3
Utility Facilities	2.96	7	3	3.46	5	4	2.45	9	2
Schools and Churches	2.40	10	2	2.45	9	2	3.25	4	5
Sports/Entertainment Arenas	3.00	6	3	3.89	1	5	3.36	3	5
Central Business District	3.53	3	5	3.50	4	5	2.34	10	1

Summary of Survey Results – Combined
Oakland County
Hazard Mitigation Plan
Workshop of September 20, 2011

Hazard	Advisory Committee				Community Representatives			Workshop Consideration
	Historic Rank	Open Ended Question Rank	Listing Rank	Mode	Open Ended Question Rank	Listing Rank	Mode	
Drought	32	37	30	2	28	30	2	
Earthquakes	35	40	31	1	30	31	1	
Erosion - Shoreline		27	0	0	30	0	0	
Extreme Temperatures: Extreme Cold	11	22	14	3	21	19	3	
Extreme Temperatures: Extreme Heat		27	16	3	21	20	3	
Fires - Forest and Field	9	30	27	3	30	27	2	
Flooding - Riverine	17	27	22	2	26	22	3	
Flooding - Shoreline	36	32	0	0	26	0	0	
Fog	18							
Invasive Species	21							
Subsidence - Natural	36	17	29	2	30	26	3	
Thunderstorms - Hail	7	3	18	5	4	21	3	2
Thunderstorms - Lightning		1	17	4	4	17	3	2
Thunderstorms - Severe Wind		2	3	5	2	2	4	1
Tornadoes	15	8	10	4	1	1	4	1
Winter Hazards - Ice and Sleet	11	19	1	5	6	8	4	2
Winter Hazards -Snowstorms		25	2	5	11	6	4	2
Fires -Scrap Tire	25	22	26	3	30	28	2	
Fires -Structural	2	22	19	4	21	16	3	
Flooding - Dam Failure	5	32	28	2	30	29	1	
Flooding - Urban	11	19	0	0	30	0	0	
Hazmat Incidents - Transportation	30	7	3	5	6	7	4	1
Hazmat Incidents -Fixed	4	8	12	5	11	11	4	2
Infrastructure Failure - Bridges, Roads, Overpass	18							
Infrastructure Failure - Communications	18	10	3	5	6	3	4	1
Infrastructure Failure - Electrical System	10	10	0	0	3	0	0	2
Infrastructure Failure - Sanitary Sewer System	34	12	0	0	11	0	0	
Infrastructure Failure - Storm Sewer System	23	12	0	0	11	0	0	
Infrastructure Failure - Water System	31	21	0	0	6	0	0	3
Nuclear Power Plants	36	32	24	3	28	24	2	
Oil and Gas Well Accidents	26	30	25	3	30	25	1	
Petroleum and Natural Gas Pipeline Accidents	11	32	15	4	20	14	3	
Subsidence - Mining		37	0	0	30	0	0	
Subsidence - Technical		32	22	3	30	23	3	
Civil Disturbance	32	25	21	3	25	18	3	
Criminal Acts (Vandalism and Arson)	1	12	20	5	19	13	3	
Gas/Oil Shortages or Supply Disruptions	26							
Public Health Emergencies		12	6	4	6	4	4	2
Pandemics and Epidemics	28							
Contaminated Food/Water	28							
Terrorism	24	12	8	5	21	5	5	2
Transportation Acc. - Highway	6	4	7	5	15	9	4	1
Transportation Acc. - Rail	16	4	11	4	16	12	4	2
Transportation Acc.-Air	8	4	9	5	16	15	3	1
Transportation - Surface Roads								
Transportation - Marine	36							
Transportation Accidents - Rail/Highway Crossings		17	0	0	16	0	0	
Weapons of Mass Destruction	36	37	13	5	30	10	5	3
Unpredictable weather								
Connective weather								
Electromagnetic pulse								
Criminal acts due to economic collapse								
Centralized planning in Lansing & DC								
Unemployment & underemployment								
Information Technology Intrusion								

Hazard Impact Goals Worksheet Number 1

Oakland County

Hazard Mitigation Plan

Workshop of September 20, 2011

Objective: To identify the top three criteria for evaluating hazard event impacts in Wayne County.

Thought Questions: What are the top priorities for the community when considering hazard impacts? What do the community leaders represent as important? What are the top priorities for emergency response agencies when considering hazard impacts? What are the top challenges facing the County when a hazard occurs?

Individual Worksheet

1	
2	
3	
4	
5	

Group Worksheet

1	
2	
3	

Example Criteria

Population Impacted

Area Impacted

Economic Cost for Recovery

Loss of Life

Loss of Property

Damage to Infrastructure

Time to Recover to Pre-Incident Levels

Ecological Impact

Impact to Critical Response Facilities

Business Interruption

Infrastructure Failure

Transportation Disruption

Ability to Provide Health Care

Economic Impact

Hazard Impact Goals Worksheet Number 2

Oakland County

Hazard Mitigation Plan

Workshop of September 20, 2011

Objective: To identify concerns about the impact of the top ten hazards to the selected criteria.

Thought Questions: For purposes of hazard prevention and response, how concerned should the County be about each of the following impacts?

Ranking

3 = High

2 = Medium

1 = Low

		Concern About Impacts of Hazardous Events		
Hazard Events to Consider	Initial Rank	Population Impacted	Environ./Services Imp.	Economic Impact
	0			
	0			
	0			
	0			
	0			
	0			
	0			
	0			
	0			
	0			
	0			

Hazard Impact Goals Worksheet Number 3

Oakland County

Hazard Mitigation Plan

Workshop of September 20, 2011

Objective: To evaluate if the survey ranking makes sense.

Thought Questions: Look not only at the individual ranking, but also look across rows and down columns. Do the absolute values reflect reality? Do the relative values reflect reality?

2011 Plan Update Meeting Results					
Asset Criticality					
Based on Asset Class Characteristics estimate the effects of a hazard event to the listed criteria					
Asset to Consider	Population Impacted	Environ./Services Imp.	Economic Impact	Criticality	Rank
Commercial Sites	3.83	3.38	3.25	64	1
Hospitals/Response Facilities	2.58	2.08	2.40	44	11
Industrial Sites	3.50	2.67	3.10	58	5
Open Space	4.33	3.50	0.00	53	7
Public Facilities	3.14	3.67	4.00	63	2
Residential Areas	2.00	4.00	3.67	52	8
Roads, Railroads, Bridges	3.67	3.20	3.00	61	4
Utility Facilities	2.67	2.00	2.42	44	10
Schools, Churches	2.29	2.75	2.60	45	9
Sports/Entertainment Arenas	2.67	4.75	3.80	62	3
Central Business Dist.	3.00	4.17	2.50	56	6

2011 Plan Update Meeting Results					
Asset Criticality					
Based on Asset Class Characteristics estimate the effects of a hazard event to the listed criteria					
Asset to Consider	Population Impacted	Environ./Services Imp.	Economic Impact	Criticality	Rank
Commercial Sites				0	1
Hospitals/Response Facilities				0	1
Industrial Sites				0	1
Open Space				0	1
Public Facilities				0	1
Residential Areas				0	1
Roads, Railroads, Bridges				0	1
Utility Facilities				0	1
Schools, Churches				0	1
Sports/Entertainment Arenas				0	1
Central Business Dist.				0	1

Hazard Impact Goals Worksheet Number 4

Oakland County

Hazard Mitigation Plan

Workshop of September 20, 2011

Objective: To determine the overall likelihood of a hazard event for each asset.

Ranking

3 = High

2 = Medium

1 = Low

0 if not possible

	Likelihood of Hazardous Event Impacting the Asset					
	Comm. Sites	Hospitals/ Response Facilities	Indust. Sites	Open Space	Public Fac.	Resid. Sites
Event Sums	0	0	0	0	0	0

	Likelihood of Hazardous Event Impacting the Asset				
	Roads, RR, Bridges	Utility Fac.	Schools, Churches	Sports/Ent. Arenas	Central Bus. Dist.
Event Sums	0	0	0	0	0

Hazard Impact Goals Worksheet Number 5

Oakland County

Hazard Mitigation Plan

Workshop of September 20, 2011

Objective: To determine the overall consequence of a hazard event for each asset.

Ranking

3 = High

2 = Medium

1 = Low

	Consequences of Hazardous Event at the Asset					
	Comm. Sites	Hospitals/Response Facilities	Indust. Sites	Open Space	Public Fac.	Resid. Sites
Event Sums	0	0	0	0	0	0

	Consequences of Hazardous Event at the Asset				
	Roads, RR, Bridges	Utility Fac.	Schools, Churches	Sports/Ent. Arenas	Central Bus. Dist.
Event Sums	0	0	0	0	0

Hazard Definitions

Oakland County Hazard Mitigation Plan

Civil Disturbance

A public gathering or prison uprising which 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.

Criminal Acts - Arson

The willful or malicious burning or attempt to burn, with or without intent to defraud, a dwelling, public building, motor vehicle, or personal property of another.

Criminal Acts - Vandalism

The willful or malicious destruction, injury, disfigurement, or defacement of any public or private property, real or personal, without consent of the owner or person having control.

Drought

An extended period of time with significantly low precipitation levels that usually occurs during planting and growing seasons.

Earthquake

The sudden movement or motion in the earth caused by an abrupt release of slowly accumulating strain, which results in ground shaking, surface faulting, or ground failures.

Extreme Cold

A prolonged period of extreme low temperatures, usually accompanied by snowstorms, sleet and ice storms or hail.

Extreme Heat

A prolonged period of extreme high temperatures, often accompanied by conditions such as high humidity, high winds and lack of rain.

Fire Hazards - Forest/Field Fire

A fire within an open space, forested area, brush or grassed area, or wild land. Does not include prescribed fires.

Fire Hazards - Scrap Tire Fires

Fires which occur at a location where scrap tires are being stored for processing, recycling, or re-use.

Hazard Definitions

Oakland County Hazard Mitigation Plan

Fire Hazards - Structural Fires

A fire of any origin which ignites one or more structures, often results in loss of life and/or property.

Flooding – Dam Failure

The failure of an impoundment located in a river, stream, lake or other waterway resulting in downstream flooding.

Flooding - Riverine

The periodic occurrence of overbank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain.

Flooding - Shoreline

Shoreline erosion hazards typically involve the loss of property as sand or soil is removed by water action and is carried away over time.

Flooding – Urban

The overflow of storm sewer systems, usually caused by inadequate drainage following heavy rainfall or rapid snowmelt.

HazMat Incidents – Fixed Site

An uncontrolled release of a hazardous material originating from a building, structure, or fixed equipment which is capable of posing a risk to life, health, safety, property or the environment.

HazMat Incidents - Transportation

An uncontrolled release of a hazardous material during transport which is capable of posing a risk to life, health, safety, property or the environment.

Infrastructure Failure

(Includes Water, Sanitary Sewer, Storm Sewer, Electrical and Emergency Communications)

The failure of a critical public or private utility infrastructure which results in a short-term loss of service.

Nuclear Power Plant Accidents

An actual or potential release of radioactive material at a nuclear facility in a quantity sufficient to constitute a threat to the health and safety of offsite populations.

Oil and Gas Well Incidents

An oil or gas well incident could involve an uncontrolled release of oil or natural gas, or a release of hydrogen sulfide gas, a by-product of production wells.

Hazard Definitions

Oakland County Hazard Mitigation Plan

Petroleum and Natural Gas Pipeline Accidents

An uncontrolled release of petroleum or natural gas from transmission or distribution pipelines.

Public Health Emergencies

A widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well being of the public.

Subsidence - Mining

Lowering or collapse of the land surface due to loss of subsurface support in mining areas.

Subsidence - Natural

The lowering or collapse of the land surface due to loss of subsurface support. Generally caused by drainage of organic soils, underground fluid withdrawal, underground mining, natural compaction, sinkholes and hydrocompaction (collapsible soils).

Terrorism/Sabotage

An 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.

Thunderstorm Hazards - Hail

Conditions where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth.

Thunderstorm Hazards - Lightning

The discharge of electricity from within a thunderstorm.

Thunderstorm Hazards - Severe Wind

Winds greater than 58 miles per hour, not including tornadoes, are classified as windstorms.

Tornadoes

A violently rotating column of air extending downward to the ground from a cumulonimbus cloud.

Hazard Definitions

Oakland County Hazard Mitigation Plan

Transportation Accident – Air

A crash or other accident involving passenger transportation aircraft, does not include recreational aircraft.

Transportation Accidents - Highway

A crash or other accident involving public passenger transportation, does not include private auto transportation.

Transportation Accident – Highway/Rail Crossings

A crash or other accident involving which occurs at public, at-grade railroad crossings and involves the collision of an automobile and railcar.

Transportation Accident – Marine

A crash or other marine accident involving passenger transportation, does not include public or private recreational accidents.

Transportation Accident – Rail

A crash or other accident involving passenger or freight rail systems, does not include accidents which result in a HazMat response.

Winter Hazards - Ice and Sleet Storms

Freezing rain is rain that freezes on contact with surfaces causing a coating of ice on exposed surfaces.

Winter Hazards - Snowstorms

A period of rapid accumulation of snow accompanied by high winds and cold temperatures.

Weapons of Mass Destruction

Weapons intended to cause widespread damage and high number of casualties. Typically fall into four categories: 1) missiles, 2) biological weapons, 3) nuclear weapons, or 4) chemical weapons.

Items Funded By FEMA - Hazard Mitigation Grant Program (HMGP) Project Eligibility

Projects may be of any nature that will result in protection to public or private property. Eligible projects under the HMGP include, but are not limited to:

1. **Property Acquisition** and **Structure Demolition/Relocation** for floodplain protection;
2. **Structure Elevation** in compliance with federal, state, and local ordinances;
3. **Mitigation Reconstruction** of damaged buildings, outside of the floodway or high-risk erosion areas, to minimize future damage;
4. **Dry Floodproofing** of residential and non-residential buildings;
5. **Minor Flood Control** projects to reduce the frequency or severity of flooding (e.g., modification of culverts or creation of stormwater detention/retention);
6. **Localized Flood Control** projects to protect specific critical facilities;;
7. **Structural and Nonstructural Retrofitting** of facilities to eliminate the risk of future damage and to protect inhabitants;
8. **Safe Room Construction** for protection from tornadoes, hurricanes, or other high wind events;
9. **Infrastructure Retrofits** to reduce risks to utilities, roads and bridges;
10. **Vegetative Management** and programs such as:
 - Defensible space for wildlife;
 - Ignition-resistant construction;
 - Hazardous fuels reduction;
11. **Post-Disaster Code Enforcement** that supports reconstruction efforts;
12. **State discretionary projects** (5% set aside funding), that fund mitigation actions consistent state goals and objectives and local mitigation plans, but that otherwise may be difficult to prove cost effectiveness using standard benefit cost analysis.

**Table 6
Hazard History Summary
Oakland County Hazard Mitigation Plan**

Hazard	Annual Frequency	Hazard Impact				Hazard Rank
		Probability	Health & Safety	Area (sq miles)	Economic	
Civil Disturbances	0.1	Low	High	<1	Very High	32
Criminal Acts - Vandalism	10,011	Very High	Low	<1	Low	1
Criminal Acts - Arson	252	Very High	Medium	<1	Low	3
Criminal Acts - Mass Shooting	0.35	Low	High	1	Medium	21
Drought	0.1	Low	Low	70	Medium	32
Earthquakes	0.09	Low	Low	907	Low	35
Extreme Temperatures	1	High	Medium	907	Low	11
Fire Hazards - Wildfire	2.2	High	Low	<1	Low	9
Fire Hazards - Scrap Tire Fires	0.33	Low	Low	<1	Low	25
Fire Hazards - Structural Fires	544	Very High	High	<1	Medium	2
Flooding - Dam Failure	18	High	Low	5	High	5
Flooding-Riverine Flooding	0.6	Low	Low	5	High	17
Flood-Urban Flooding	1	Medium	Low	5	High	11
Flood-Shoreline and Erosion	NA	NA	NA	NA	NA	36
Fog	0.5	Low	Medium	10	Medium	18
Gas/Oil Shortages or Supply Disruption	0.16	Low	Low	907	High	26
HazMat Incidents - Fixed Sites	20	High	Medium	3	Very High	4
HazMat Incidents - Transportation	0.12	Low	Low	3	Medium	30
Infrastructure Failure - Water System	0.17	Low	Low	<1	Medium	31
Infrastructure Failure - Electrical System	1	Medium	Medium	5	High	10
Infrastructure Failure - Storm Sewer System	0.5	Low	Low	<1	Low	23
Infrastructure Failure - Sanitary Sewer System	0.05	Low	High	1-5	Medium	34
Infrastructure Failure - Communications	0.5	Low	Medium	<1	Low	18
Infrastructure Failure - Bridges, Roads, and Overpasses	0.5	Low	High	1	High	18
Invasive Species	0.35	Low	Low	907	High	21
Nuclear Power Plant Accidents	0	Low	Medium	425	High	36
Oil and Gas Well Incidents	0.32	Low	Low	<1	Medium	26
Petroleum and Natural Gas Pipeline Accidents	1	Medium	Medium	<1	Medium	11
Public Health Emergencies - Pandemics and Epidemics	0.13	Low	High	907	High	28
Public Health Emergencies - Contaminated Food Supply and/or Water Supply	0.13	Low	High	907	High	28
Subsidence	0.33	Low	Low	<1	Low	36
Terrorism and Sabotage	0.21	Low	High	<1	High	24
Thunderstorm	6	High	Low	907	Medium	7

**Table 6
Hazard History Summary
Oakland County Hazard Mitigation Plan**

Hazard	Annual Frequency	Hazard Impact				Hazard Rank
		Probability	Health & Safety	Area (sq miles)	Economic	
Tornados	0.51	Low	High	16	High	15
Transportation Accidents - Air	3	High	Medium	5	Low	8
Transportation Accidents - Highway	10	High	Medium	<1-5	High	6
Transportation Accidents - Rail	1	Medium	Low	<1-5	Low	16
Transportation Accidents - Marine	0	Low	Low	<1	Low	36
Weapons of Mass Destruction	0	Low	Very High	907	Very High	36
Winter Hazards	1	Medium	Medium	907	Medium	11

**Table 6
Hazard History Summary
Oakland County Hazard Mitigation Plan**

Hazard	Consequence	Data Source	Notes
Civil Disturbances	Medium	Statewide	
Criminal Acts - Vandalism	Low	Oakland County	
Criminal Acts - Arson	Medium	Oakland County	
Criminal Acts - Mass Shooting	Medium	Statewide	
Drought	Medium	Oakland, NOAA, NDMC	
Earthquakes	Low	Oakland County	
Extreme Temperatures	Medium	Oakland County	
Fire Hazards - Wildfire	Low	Oakland County	
Fire Hazards - Scrap Tire Fires	Low	Statewide	
Fire Hazards - Structural Fires	Medium	Oakland County	
Flooding - Dam Failure	Medium	Oakland County	23 High or significant dam hazards. 18 dam failures
Flooding-Riverine Flooding	Medium	Statewide	
Flood-Urban Flooding	Medium	Oakland County	The frequency is dependent on seasonal weather patterns. Urban flooding is more likely to occur in the Spring. Assumes one per year.
Flood-Shoreline and Erosion	NA	Not applicable	
Fog	Medium	Statewide	
Gas/Oil Shortages or Supply Disruption	High	Statewide	
HazMat Incidents - Fixed Sites	High	Oakland County	
HazMat Incidents - Transportation	Medium	Oakland County	
Infrastructure Failure - Water System	Low	Oakland County	significant events
Infrastructure Failure - Electrical System	High	Oakland County	significant events
Infrastructure Failure - Storm Sewer System	Low	Oakland County	
Infrastructure Failure - Sanitary Sewer System	High	Oakland County	
Infrastructure Failure - Communications	Medium	Oakland County	significant events - rating based on lack of communication with emergency response
Infrastructure Failure - Bridges, Roads, and Overpasses	Medium	Federal Highway Administration	significant events in the US
Invasive Species	Medium		
Nuclear Power Plant Accidents	Medium	No established frequency	No established frequency
Oil and Gas Well Incidents	Low	Statewide	
Petroleum and Natural Gas Pipeline Accidents	Medium	Oakland County	
Public Health Emergencies - Pandemics and Epidemics	Medium-High	Statewide	
Public Health Emergencies - Contaminated Food Supply and/or Water Supply	High	Statewide	
Subsidence	Low	Statewide	Statewide annual frequency based on non-mining subsidence
Terrorism and Sabotage	High	Statewide	
Thunderstorm	Medium	Oakland County	

Table 6
Hazard History Summary
Oakland County Hazard Mitigation Plan

Hazard	Consequence	Data Source	Notes
Tornados	High	Oakland County and NOAA	
Transportation Accidents - Air	Low	Oakland County	
Transportation Accidents - Highway	Medium	Oakland County	
Transportation Accidents - Rail	Low	Oakland County	
Transportation Accidents - Marine	Low	Oakland County	
Weapons of Mass Destruction	Very High	No established frequency	
Winter Hazards	Medium	Statewide	

First Survey: Hazard Ranking Oakland County Hazard Mitigation Plan Update

Advisory Committee

Hazard	Open Ended Questions		Ranking			
	Total	Rank	Average	Rank	Mode	
Natural Hazards	Drought	1	37	2.00	30	2
	Earthquakes	0	40	1.72	31	1
	Erosion - Shoreline	4	27	0.00	0	0
	Extreme Temperatures: Extreme Cold	7	22	3.89	14	3
	Extreme Temperatures: Extreme Heat	4	27	3.76	16	3
	Fires - Forest and Field	3	30	2.39	27	3
	Flooding - Riverine	4	27	3.20	22	2
	Flooding - Shoreline	2	32	0.00	0	0
	Subsidence - Natural	11	17	2.12	29	2
	Thunderstorms - Hail	23	3	3.53	18	5
	Thunderstorms - Lightning	26	1	3.65	17	4
	Thunderstorms - Severe Wind	24	2	4.41	3	5
	Tornadoes	16	8	4.11	10	4
	Winter Hazards - Ice and Sleet	10	19	4.50	1	5
Winter Hazards -Snowstorms	5	25	4.47	2	5	
Technological Hazards	Fires -Scrap Tire	7	22	2.61	26	3
	Fires -Structural	7	22	3.50	19	4
	Flooding - Dam Failure	2	32	2.29	28	2
	Flooding - Urban	10	19	0.00	0	0
	Hazmat Incidents - Transportation	18	7	4.41	3	5
	Hazmat Incidents -Fixed	16	8	4.06	12	5
	Infrastructure Failure - Communications	15	10	4.41	3	5
	Infrastructure Failure - Electrical System	15	10	0.00	0	0
	Infrastructure Failure - Sanitary Sewer System	14	12	0.00	0	0
	Infrastructure Failure - Storm Sewer System	14	12	0.00	0	0
	Infrastructure Failure - Water System	8	21	0.00	0	0
	Nuclear Power Plants	2	32	2.94	24	3
	Oil and Gas Well Accidents	3	30	2.87	25	3
	Petroleum and Natural Gas Pipeline Accidents	2	32	3.87	15	4
Human Related Hazards	Subsidence - Mining	1	37	0.00	0	0
	Subsidence - Technical	2	32	3.20	22	3
	Civil Disturbance	5	25	3.25	21	3
	Criminal Acts (Vandalism and Arson)	14	12	3.35	20	5
	Public Health Emergencies	14	12	4.29	6	4
	Terrorism	14	12	4.18	8	5
	Transportation Acc. - Highway	20	4	4.24	7	5
	Transportation Acc. - Rail	20	4	4.06	11	4
	Transportation Acc.-Air	20	4	4.13	9	5
Transportation Accidents - Rail/Highway Crossings	11	17	0.00	0	0	
Weapons of Mass Destruction	1	37	3.93	13	5	

First Survey: Hazard Ranking Oakland County Hazard Mitigation Plan Update

Critical Asset Ranking	Advisory Committee								
	Population Impacted			Impacts to Environment			Impact to Economic Activity		
	Average	Rank	Mode	Average	Rank	Mode	Average	Rank	Mode
Commercial Sites	3.83	2	5	3.38	6	3	3.25	4	5
Hospitals	2.58	9	1	2.08	10	1	2.40	10	1
Industrial Sites	3.50	4	3	2.67	9	1	3.10	5	3
Open Spaces	4.33	1	4	3.50	5	#N/A	0.00	0	0
Public Facilities	3.14	5	2	3.67	4	4	4.00	1	5
Residential Areas	2.00	11	1	4.00	3	5	3.67	3	#N/A
Roads, Bridges, Railroads	3.67	3	4	3.20	7	3	3.00	6	4
Utility Facilities	2.67	7	2	2.00	11	2	2.42	9	1
Schools and Churches	2.29	10	2	2.75	8	3	2.60	7	1
Sports/Entertainment Arenas	2.67	7	1	4.75	1	5	3.80	2	5
Central Business District	3.00	6	3	4.17	2	5	2.50	8	1

First Survey: Hazard Ranking Oakland County Hazard Mitigation F

Hazard		Community Responses					
		Open Ended Questions			Ranking		
		Total	Rank		Average	Rank	Mode
Natural Hazards	Drought	1	28		1.84	30	2
	Earthquakes	0	30		1.60	31	1
	Erosion - Shoreline	0	30		0.00	0	0
	Extreme Temperatures: Extreme Cold	5	21		2.98	19	3
	Extreme Temperatures: Extreme Heat	5	21		2.96	20	3
	Fires - Forest and Field	0	30		2.24	27	2
	Flooding - Riverine	2	26		2.73	22	3
	Flooding - Shoreline	2	26		0.00	0	0
	Subsidence - Natural	0	30		2.33	26	3
	Thunderstorms - Hail	17	4		2.84	21	3
	Thunderstorms - Lightning	17	4		3.27	17	3
	Thunderstorms - Severe Wind	23	2		3.95	2	4
	Tornadoes	26	1		4.18	1	4
	Winter Hazards - Ice and Sleet	16	6		3.75	8	4
Winter Hazards -Snowstorms	15	11		3.80	6	4	
Technological Hazards	Fires -Scrap Tire	0	30		1.96	28	2
	Fires -Structural	5	21		3.29	16	3
	Flooding - Dam Failure	0	30		1.84	29	1
	Flooding - Urban	0	30		0.00	0	0
	Hazmat Incidents - Transportation	16	6		3.76	7	4
	Hazmat Incidents -Fixed	15	11		3.57	11	4
	Infrastructure Failure - Communications	16	6		3.89	3	4
	Infrastructure Failure - Electrical System	20	3		0.00	0	0
	Infrastructure Failure - Sanitary Sewer System	15	11		0.00	0	0
	Infrastructure Failure - Storm Sewer System	15	11		0.00	0	0
	Infrastructure Failure - Water System	16	6		0.00	0	0
	Nuclear Power Plants	1	28		2.47	24	2
	Oil and Gas Well Accidents	0	30		2.44	25	1
	Petroleum and Natural Gas Pipeline Accidents	7	20		3.38	14	3
Subsidence - Mining	0	30		0.00	0	0	
Subsidence - Technical	0	30		2.67	23	3	
Human Related Hazards	Civil Disturbance	3	25		3.16	18	3
	Criminal Acts (Vandalism and Arson)	8	19		3.44	13	3
	Public Health Emergencies	16	6		3.87	4	4
	Terrorism	5	21		3.80	5	5
	Transportation Acc. - Highway	14	15		3.66	9	4
	Transportation Acc. - Rail	13	16		3.47	12	4
	Transportation Acc.-Air	13	16		3.33	15	3
	Transportation Accidents - Rail/Highway Crossings	13	16		0.00	0	0
	Weapons of Mass Destruction	0	30		3.58	10	5

First Survey: Hazard Ranking Oakland County Hazard Mitigation F

Critical Asset Ranking	Community Responses								
	Population Impacted			Impacts to Environment			Impact to Economic Activity		
	Average	Rank	Mode	Average	Rank	Mode	Average	Rank	Mode
Commercial Sites	3.94	1	5	3.67	2	4	2.91	8	4
Hospitals	2.43	9	1	2.25	10	1	3.50	1	4
Industrial Sites	3.64	2	5	3.55	3	5	3.08	6	4
Open Spaces	2.00	11	#N/A	2.86	7	1	0.00	0	#N/A
Public Facilities	3.33	4	3	3.17	6	4	3.50	1	5
Residential Areas	2.55	8	1	2.13	11	1	3.17	5	5
Roads, Bridges, Railroads	3.25	5	4	2.82	8	2	2.96	7	3
Utility Facilities	2.96	7	3	3.46	5	4	2.45	9	2
Schools and Churches	2.40	10	2	2.45	9	2	3.25	4	5
Sports/Entertainment Arenas	3.00	6	3	3.89	1	5	3.36	3	5
Central Business District	3.53	3	5	3.50	4	5	2.34	10	1

Agenda

Date: November 29, 2011

RE: **Second Advisory Committee Meeting**
Oakland County Hazard Mitigation Plan Update (ASTI File No. 7685)

Agenda

Item #	Subject
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1. **Overview** - 9:00 A.M.
2. **Review of Hazard Identification Process** (see summary sheets)
 - Hazards Ranking
 - Top Hazards for Consideration
 - Critical Assets
3. **Mitigation Goals and Objectives**
 - Workgroups (see worksheets)
 - Overall Selection
4. **Evaluation Criteria**
 - Workgroups (see worksheet)
5. **Mitigation Survey Results**
 - Results of Surveys
 - Top Mitigation Strategies (see summary sheets and Attachments)
 - Discussion of Additional Mitigation Strategies
6. **Mitigation Selection**
 - Combining Mitigation Strategies with Goals and Objectives and Evaluation Criteria
7. **Action Plan Selection**
 - Specific Strategies to Address
 - Development of Action Plan (see example worksheet)
 - Roles and Responsibilities
8. **Homework**
 - **Action Plans due December 16**
 - **Next Meeting December 20**

Summary of Hazard Evaluation – Initial Advisory Committee Meeting
 Oakland County
 Hazard Mitigation Plan Update
 From Workshop of September 20, 2011

Criteria

- Population Impacted (weighted at 9)
- Environment and Services Impacted (weighted at 5)
- Economic Impact (weighted at 4)

Hazard Ranking

(see below and attached worksheet)

Notes from Advisory Committee Meeting			
2011 Hazards to Consider	Highest Advisory Listing Rank	Highest Comm. Listing Rank	Highest Historic Rank
High Winds and Tomadoes	3	1	7
Hazmat Incidents - Transportation	3	7	30
Winter Hazards - Ice and Sleet	1	8	11
Winter Hazards - Snowstorms	2	6	11
Hazmat Incidents - Fixed	12	11	4
Infrastructure Failure All	3	3	10
Transportation Acc. All	7	9	6
Flooding	22	22	17
Public Health Emergencies	6	4	28
Petroleum and Natural Gas Pipeline Accide	15	14	11
Meeting			
Preliminary List	Vote	Rank	Notes
High Winds and Tomadoes		#N/A	consider impacts of ash borer on trees
Transportation – Air		#N/A	Combined in Transportation Acc. All
Transportation – Rail		#N/A	Combined in Transportation Acc. All
Transportation – Road		#N/A	Combined in Transportation Acc. All. Include bridges, roads and overpass failure
Hazmat Incidents - Transportation		#N/A	
Infrastructure Failure – Communications		#N/A	Combined in Infrastructure All
Winter Hazards - Ice and Sleet		#N/A	
Winter Hazards - Snowstorms		#N/A	
Hazmat Incidents - Fixed		#N/A	Considerations for future development, how to respond, how to coordinate
Infrastructure Failure – Electrical Failure		#N/A	Combined in Infrastructure All
Infrastructure Failure – Storm and Sanitary		#N/A	Combined with Infrastructure All. Include urban flooding
Infrastructure Failure – Water		#N/A	Combined in Infrastructure All
Infrastructure All		#N/A	
Transportation All		#N/A	
Flooding		#N/A	
Public Health Emergencies		#N/A	Handled under another program but may have additional needs
Petroleum and Natural Gas Pipeline Accidents		#N/A	
Considered Next Tier			
			Notes
Thunderstorms - Hail and Lightening			Handled under high winds
Covered Under Other Programs			
			Notes
Terrorism and Sabotage			Include cyber crimes

Oakland County Hazard Mitigation Plan Update Hazard Evaluation Ranking

Hazard	Advisory Committee				Community Representatives			Workshop Consideration	
	Historic Rank	Open Ended Question Rank	Listing Rank	Mode	Open Ended Question Rank	Listing Rank	Mode		
Natural Hazards	Drought	32	37	30	2	28	30	2	
	Earthquakes	35	40	31	1	30	31	1	
	Erosion - Shoreline		27	0	0	30	0	0	
	Extreme Temperatures: Extreme Cold		22	14	3	21	19	3	
	Extreme Temperatures: Extreme Heat	11	27	16	3	21	20	3	
	Fires - Wildfires	9	30	27	3	30	27	2	
	Flooding - Riverine	17	27	22	2	26	22	3	
	Flooding - Shoreline	36	32	0	0	26	0	0	
	Fog	18							
	Invasive Species	21							
	Subsidence - Natural	36	17	29	2	30	26	3	
	Thunderstorms - Hail		3	18	5	4	21	3	2
	Thunderstorms - Lightning	7	1	17	4	4	17	3	2
	Thunderstorms - Severe Wind		2	3	5	2	2	4	1
	Tornadoes	15	8	10	4	1	1	4	1
	Winter Hazards - Ice and Sleet		19	1	5	6	8	4	2
	Winter Hazards - Snowstorms	11	25	2	5	11	6	4	2
Technological Hazards	Fires - Scrap Tire	25	22	26	3	30	28	2	
	Fires - Structural	2	22	19	4	21	16	3	
	Flooding - Dam Failure	5	32	28	2	30	29	1	
	Flooding - Urban	11	19	0	0	30	0	0	
	Hazmat Incidents - Transportation	30	7	3	5	6	7	4	1
	Hazmat Incidents -Fixed	4	8	12	5	11	11	4	2
	Infrastructure Failure - Bridges, Roads, Overpass	18							
	Infrastructure Failure - All			3	5		3	4	1
	Infrastructure Failure - Communications	18	10			6			
	Infrastructure Failure - Electrical System	10	10	0	0	3	0	0	2
	Infrastructure Failure - Sanitary Sewer System	34	12	0	0	11	0	0	
	Infrastructure Failure - Storm Sewer System	23	12	0	0	11	0	0	
	Infrastructure Failure - Water System	31	21	0	0	6	0	0	3
	Nuclear Power Plants	36	32	24	3	28	24	2	
	Oil and Gas Well Accidents	26	30	25	3	30	25	1	
	Petroleum and Natural Gas Pipeline Accidents	11	32	15	4	20	14	3	
	Subsidence - Mining		37	0	0	30	0	0	
Subsidence - Technical		32	22	3	30	23	3		
Human Related Hazards	Civil Disturbance	32	25	21	3	25	18	3	
	Criminal Acts (Vandalism and Arson)	1	12	20	5	19	13	3	
	Criminal Acts (Mass Shootings)								
	Gas/Oil Shortages or Supply Disruptions	26							
	Public Health Emergencies		12	6	4	6	4	4	2
	Pandemics and Epidemics	28							
	Contaminated Food/Water	28							
	Terrorism and Sabotage	24	12	8	5	21	5	5	2
	Transportation Acc. - Highway	6	4	7	5	15	9	4	1
	Transportation Acc. - Rail	16	4	11	4	16	12	4	2
	Transportation Acc.-Air	8	4	9	5	16	15	3	1
	Transportation - Surface Roads								
	Transportation - Marine	36							
	Transportation Accidents - Rail/Highway Crossings		17	0	0	16	0	0	
	Weapons of Mass Destruction	36	37	13	5	30	10	5	3

Notes

Indicates new hazard for 2011 Evaluation

Indicates change in naming convention

Not broken down in questionnaire

Summary of Hazard Evaluation – Initial Advisory Committee Meeting
 Oakland County
 Hazard Mitigation Plan Update
 From Workshop of September 20, 2011

Workshop Hazard Impact Ranking

2011 Workshop Results

Hazard Event	Workshop Rank	Hazard Risk Rank	Action Plan Needed
High Winds and Tornadoes	5	1	1
Infrastructure Failure All	1	2	1
Winter Hazards - Ice and Sleet	2	3	1
Winter Hazards - Snowstorms	4	4	1
Petroleum and Natural Gas Pipeline Accidents	7	5	2
Public Health Emergencies	2	10	3
Hazmat Incidents - Transportation	7	6	4
Flooding	6	7	4
Hazmat Incidents - Fixed	10	8	4
Transportation Acc. All	7	9	4

2004 Workshop Results

Hazard	Survey Rank (Pair Wise Sum)	Community Rank (Number of Responses)	Hazard History Rank (Frequency * Consequence)
Criminal Acts (Vandalism and Arson)	16	14	1
Fires (Structural)	18	8	2
Flooding (Non-Dam)	24	4	13
Hazmat Incidents - Transportation	10	2	9
Infrastructure Failure (All Categories)	2	13	3
Public Health Emergencies	3	21	25
Tornadoes	8	1	15
Transportation Acc. - Rail	14	6	16
Winter Hazards	22	9	16

Note: Yellow highlighted Hazards were considered highest priority

Summary of Hazard Evaluation – Initial Advisory Committee Meeting
 Oakland County
 Hazard Mitigation Plan Update
 From Workshop of September 20, 2011

Assets at Risk from Hazards

2011 Workshop Results

	Criticality Rank	Asset Risk Rank	Vulnerability
Critical Asset			
Roads, Railroads, Bridges	4	1	1
Central Business Dist.	5	3	1
Commercial Sites	1	5	1
Industrial Sites	6	2	2
Utility Facilities	10	3	2
Public Facilities	3	9	3
Sports/Entertainment Arenas	2	9	3
Residential Areas	8	6	4
Schools, Churches	9	7	4
Hospitals/Response Facilities	11	8	4
Open Space	7	11	4

2004 Workshop Results

	Asset Rank	VA Quad.
Utility Facilities	1	1
Hospitals	2	1
Sports/Entertainment Arenas	3	1
Schools, Churches	4	3
Industrial Sites	5	3
Public Facilities	6	4
Commercial Sites	7	2
Central Business Dist.	8	4
Roads, Railroads, Bridges	9	4
Residential Areas	10	4
Open Space	11	4

Vulnerability Assessment		
	Criticality	
Risk	1-5	6-11
1-5	1	2
6-11	3	4

Goals Worksheet

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Objective: To identify the top goals for hazard mitigation in Oakland County.

Thought Questions: What are the top five priorities for the community when considering hazard mitigation? What do the community leaders represent as important? Consider the types of hazards that are most important, and the assets and locations that are most vulnerable. Your answer should reflect your best estimate of the administration or your organization's constituency.

Individual Worksheet

1	
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Group Worksheet

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Goals from 2005 Plan (see attached expanded list)

- Improve public and private organizational preparedness
- Improve public and private organizational response capabilities
- Improve public education and awareness

Goals Worksheet

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Goals from 2005 Plan

Goals and Objectives

The following three goals, with objectives listed for each, were selected by the Advisory Committee to focus mitigation activities under this Plan¹:

1. Improve public and private organizational preparedness
 - Reduce injuries and loss of life from hazards
 - Identify infrastructure, land use, and population vulnerabilities through both the public and private sector
 - Establish a continuous improvement program

2. Improve public and private organizational response capabilities
 - Motivate appropriate governmental entities to identify and mitigate the hazard
 - Inventory and identify deficiencies of existing response capabilities for all emergency responders
 - Correct deficiencies for training, coordination, and distribute equipment
 - Implement mutual aid pacts with all responders (public and private) through researching mutual aid laws.
 - Develop an Oakland County search and rescue team
 - Identify, train, and equip volunteers to serve on the search and rescue team
 - Seek methods of addressing vulnerabilities
 - Establish a continuous improvement program
 - Support public and private response organizations

3. Improve public education and awareness
 - Improve the public's hazard response awareness
 - Establish a continuous improvement program
 - Support public and private response organizations

¹ Goals and objectives presented here represent revisions made during the third workshop, held September 1, 2004 at the Palace of Auburn Hills

Goals Worksheet

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Example Goals

Improve, Encourage, Enhance, Maintain, Protect, or Preserve...

- ... commercial areas
- ... community participation
- ... critical assets
- ... critical response facilities
- ... cultural resources
- ... economic growth
- ... elderly or infirmed population
- ... emergency response capabilities
- ... existing plans and programs
- ... existing structures
- ... farmlands
- ... historical resources
- ... historical structures
- ... industrial areas
- ... infrastructure
- ... lives of citizens
- ... municipal services
- ... natural areas
- ... natural features
- ... open space areas
- ... personal responsibility
- ... public health
- ... public participation
- ... public safety
- ... public transportation
- ... quality of life
- ... recreational facilities
- ... residential areas
- ... roads and highways
- ... schools
- ... tax base
- ... well head protection
- ... wetlands
- ... youth
- ... youth programs

Identify, Create...

- ... changes to emergency response systems
- ... community projects
- ... funding sources
- ... grant opportunities
- ... hazard mitigation zoning for new construction
- ... local mitigation initiatives
- ... projects to mitigate damage
- ... public outreach projects

Evaluation Criteria Worksheet

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Objective: To identify five criteria, consistent with County Goals, to be used to evaluate mitigation strategies.

Thought Questions: Based on the Goals and Objectives, how will mitigation strategies be evaluated? What are the key considerations in choosing a strategy for Oakland County?

Individual Worksheet

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Group Worksheet

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2005 Plan Criteria

- Technical Feasibility
- Cost Effectiveness
- Ability to Accomplish
- Protection of Critical Response Resources
- Community and Public Acceptance

Evaluation Criteria Worksheet

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Example Criteria

Ability to accomplish

Availability of outside funding

Community acceptance

Consistency with existing plans and programs

Consistency with mitigation goals

Cost effectiveness (FEMA Requirement)

Downside risk

Equitable distribution of services

Economically Justifiable

Environmentally Sound

Leadership effort required

Non-discriminatory (EO12898 compliant)

Protection of Critical Response Facilities

Socially Equitable

Specific mitigation goals

Technical feasibility (FEMA Requirement)

Definitions for Mitigation Evaluation Criteria
Oakland County
Hazard Mitigation Plan Update
Workshop of November 29, 2011

Be technically feasible. (The project must use design and construction methods and materials that are approved, codified, recognized, fall under standard or accepted level of practice, or otherwise are determined to be generally accepted by the design and construction industry.)
Be cost-effective and substantially reduce the risk of future damage, hardship, loss, or suffering resulting from a major disaster. This must be demonstrated by documenting that the project:

1. Addresses a problem that has been repetitive, or a problem that poses a significant risk if left unsolved;
2. Will not cost more than the anticipated value of the reduction in both direct damages and subsequent negative impacts to the area if future disasters were to occur;
3. Has been determined to be the most practical, effective, and environmentally sound alternative after consideration of a range of options;
4. Contributes, to the extent practicable, to a long-term solution to the problem it is intended to address; and
5. Considers long-term changes to the areas and entities it protects, and has manageable future maintenance and modification requirements.

Mitigation Strategies

Oakland County

Hazard Mitigation Plan Update

Workshop of November 29, 2011

Objective: To finalize the list of mitigation strategies to include in the Plan. To preserve access to funding, this list should be as complete as possible. (Refer to Table at end of handout)

Thought Questions: Have the most significant hazards been addressed? Have specific vulnerable areas been adequately considered? Have mitigation strategies that are eligible for FEMA funding been considered? Are there general strategies that are part of the County's overall plans that are not included? Are there some categories (see list below) that have not been adequately applied?

Individual Worksheet

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Group Worksheet

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Example Categories

- Administrative Programs
- Codes and Regulations
- Preventative Measures
- Property Protection
- Resource Protection
- Emergency Response
- Infrastructure Projects
- Public Communication
- Incentives

Items Funded By FEMA - Hazard Mitigation Grant Program (HMGP) Project Eligibility

Projects may be of any nature that will result in protection to public or private property. Eligible projects under the HMGP include, but are not limited to:

1. **Property Acquisition** and **Structure Demolition/Relocation** for floodplain protection;
2. **Structure Elevation** in compliance with federal, state, and local ordinances;
3. **Mitigation Reconstruction** of damaged buildings, outside of the floodway or high-risk erosion areas, to minimize future damage;
4. **Dry Floodproofing** of residential and non-residential buildings;
5. **Minor Flood Control** projects to reduce the frequency or severity of flooding (e.g., modification of culverts or creation of stormwater detention/retention);
6. **Localized Flood Control** projects to protect specific critical facilities;;
7. **Structural and Nonstructural Retrofitting** of facilities to eliminate the risk of future damage and to protect inhabitants;
8. **Safe Room Construction** for protection from tornadoes, hurricanes, or other high wind events;
9. **Infrastructure Retrofits** to reduce risks to utilities, roads and bridges;
10. **Vegetative Management** and programs such as:
 - Defensible space for wildlife;
 - Ignition-resistant construction;
 - Hazardous fuels reduction;
11. **Post-Disaster Code Enforcement** that supports reconstruction efforts;
12. **State discretionary projects** (5% set aside funding), that fund mitigation actions consistent state goals and objectives and local mitigation plans, but that otherwise may be difficult to prove cost effectiveness using standard benefit cost analysis.

Funding Options Worksheet
Oakland County
Hazard Mitigation Plan Update
Workshop of November 29, 2011

Objective: To identify applicable funding options for implementing the Action Plans.

Thought Questions: How will these projects be funded? What public and private alternatives are available for funding? Can Action Plans be funded under existing programs?

Individual Worksheet

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Group Worksheet

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Funding Examples

- FEMA Grant
- Public/Private Partnership
- County General Funds
- Private Grant
- Private Initiative (supported by Public Education)
- User Fees
- New Construction Fees
- State Grant
- Federal Grant (non-FEMA)

Action Plan Worksheet
 Oakland County
 Hazard Mitigation Plan Update
 Workshop of November 29, 2011- **Due December 16, 2011**

Mitigation Strategy Description (What do you want to accomplish?):

-

Specific Hazards Addressed:

Primary Responsibility (Person and Department):

Initiatives Needed (What changes must be made, or new programs started, to make this work?):

<u>Item</u>	<u>By Date</u>
•	
•	

Implementation (What milestone tasks will you need to accomplish to get it done?):

<u>Task</u>	<u>Date</u>
•	
•	

Assessment (Provide a general description of the economic costs and benefits.):

<u>Costs (List categories: example – staff time, printing, etc.)</u>	<u>Benefits</u>
•	•
•	•

Anticipated Funding Sources (How will you cover the costs?):

-

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

Mitigation Strategy	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Strategies for Consideration																		
1 Encouraging residents to receive immunizations against communicable diseases					✓													
2 Coordinate mutual aid assistance for failures in utility and communications systems (including 911)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 Assure training, planning and preparedness for hazardous material incidents along roadways and railways						✓												
4 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites																✓		
5 Utilize public warning systems for public health communications					✓													
6 Utilize public warning systems and networks						✓												
7 Improve communications between municipalities (local, state, regional) in event of mass event	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
8 Adopt and enforce appropriate building codes														✓				
9 Provide transportation for elderly and disabled to shelters															✓			
10 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites																	✓	
11 Encourage residents to create family escape plans and disaster supply kits																	✓	
12 Real estate disclosure laws																		✓
13 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites							✓											
14 Make sure warming and cooling centers have adequate backup															✓			
15 Outreach to vulnerable populations during periods of extreme															✓			
16 Preplan escape routes and fire alert responses																✓		
17 Utilize public early warning systems and networks	✓								x	x				x			x	
18 Perform tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines	✓	x																
19 Encourage residents to create family escape plans and disaster supply kits	✓	x	x						x	x			x	x	x		x	
20 Require compliance with all industrial, fire, and safety regulations							✓											
21 Train, plan, and prepare for mass-casualty incidents involving all modes of transportation								✓										
22 Obtain communication boosters for deficient areas in Open Sky Network	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
23 Improve and continue training for emergency responders and the provide adequate equipment																✓		
24 Obtain adequate supply of generators for emergency temporary power			✓															
25 Install additional tornado sirens in communities	✓									x				x			x	
26 Create public information material (newsletters, pamphlets, news articles, educational programs, website links, contact persons) to explain tornado and severe wind hazards, self and property protection measures, current warning and response systems currently in place	✓	x							x					x				
27 Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	✓	✓	✓	x	x	✓	✓	✓	x	x	x	x	x	x	x	x	x	x
28 Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	⊖	⊖	⊖	x	x	⊖	⊖	⊖	x	x	x	x	x	x	x	x	x	x

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

		High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Mitigation Strategy																			
29	Provide additional manpower to assist during and following storms	✓	x							x									
Optional Strategies																			
30	Improve coordination of agencies in response planning and activities	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
31	Use surge protectors on critical electronic equipment	✓	x								x							x	
32	Maintain adequate road and debris clearing capabilities		✓																
33	Keep roads and driveways accessible to vehicles and fire	✓	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
34	Establish tree-trimming programs to protect utility wires from falling branches			✓															
35	Educate residents on the dangers of natural gas leaks in homes and businesses and the proper way to monitor natural gas levels				✓														
36	Maintain a community public health system with sufficient disease monitoring and surveillance capabilities to adequately protect the					✓													
37	Prevent public contact with contaminated sites or waters (including floodwaters)					✓													
38	Educate and enforce on proper location, installation, cleaning, monitoring, and maintenance of septic tanks					✓													
39	Improve driver education, traffic law enforcement, and transportation planning to balance the needs of hazardous material transporters with							✓											
40	Encourage residents to create family escape plans and disaster supply kits							✓											
41	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	✓	✓	✓	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x
42	Assure training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials							✓											
43	Encourage brownfield cleanup activities							✓											
44	Encourage residents to create family escape plans and disaster supply kits							✓											
45	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both	✓	✓	✓	x	x	✓	✓	x	x	x	x	x	x	x	x	x	x	x
46	Assess current training programs to determine adequate knowledge and capacity of teams to respond to civil disturbances										✓								
47	Establish measures or ordinances to prioritize or control water use (in order to maintain fire-fighting capacity)												✓						
48	Maintain emergency water stores (focusing on human needs first)												✓						
49	Provide public information before extreme temperatures occur (fall & spring)														✓				
50	Increase coverage and use of NOAA Weather Radio (public notification)														✓				
51	Enforce heating and cooling requirements for landlords, especially those serving vulnerable populations														✓				
52	Encourage residents to create family escape plans and disaster supply kits																✓		
53	Maintain mutual aid pacts with neighboring communities																✓		
54	Prevent arson by reducing blight																✓		
55	Enforce firework restrictions, including bans during drought episodes																✓		
56	Create defensible space around structures in fire-prone open or forest																✓		
57	Take measures to reduce blighted structures as targets for arson																✓		
58	Assure control of civil disturbances and criminal activities that could lead to arson																✓		
59	Eliminate clandestine methamphetamine laboratories through law enforcement and public education																✓		

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Mitigation Strategy																		
60 Provide community awareness of designated shelters and accident warning systems																	✓	
61 Provide community awareness of subsidence risks and effects																		✓
Other Strategies																		
62 Identify transportation bottlenecks to ensure emergency vehicle access and access to region's hospitals	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
63 Mutual aid agreements for responding to incidents	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
64 Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health					✓													
65 Comply with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport							✓											
66 Create evacuation plans and community awareness of them							✓											
67 Provide public warning systems and networks for hazardous material releases within and between jurisdictions								✓										
68 Establish airport maintenance, security, and safety programs																		✓
69 Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles,	✓	✓	✓	x	x	✓	✓	✓	✓	x	x	x	x	x	x	x	x	x
70 Increase coverage and use of NOAA Weather Radio (public notification)									✓									
71 Require proper anchoring of manufactured homes and exterior structures such as carports and porches	✓																	
72 Include safety strategies for severe winter weather events in driver education classes and materials		✓																
73 Perform tree-trimming and maintenance to prevent limb breakage and safeguard nearby utility lines		✓																
74 Encourage residents to create family escape plans and disaster supply kits	✓	✓	x						x	x		x	x	x		x		
75 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites					✓													
76 Utilize proper pipeline design, construction, maintenance, and inspection				✓														
77 Improve management of high-risk areas using Crime Prevention Environmental Design (CPTED)										✓								
78 Establish law enforcement mutual aid, including state police and national guard										✓								
79 Utilize quarantines where applicable					✓													
80 Increase coverage and use of NOAA Weather Radio (public notification)							✓											
81 Work with utility companies to allow special arrangements for those unable to pay heating bills															✓			
82 Utilize state and federal programs that assist low income families in home improvements that protect from extreme temperatures and increase efficiency															✓			
83 Give residents information on emergency response preparedness including the use of battery-operated radios and self-preservation and escape techniques																✓		
84 Encourage safe and responsible use of electric and "space" heaters																✓		

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

		High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Mitigation Strategy																			
85	Develop preventative programs similar to "Angels Night" in areas of concern																	✓	
86	Encourage communities to acquire generators for backup power at critical facilities	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	
87	Plan outreach to vulnerable populations to assure water access/conservation													✓					
88	Educate the community about responsible water use													✓					
89	Communicate drought conditions to public													✓					
90	Encourage residents to create family escape plans and disaster supply kits	✓	✓	✓						x	x			x	x	x		x	
91	Require community and operator compliance with industry safe regulations and standards				✓														
92	Encourage residents to create family escape plans and disaster supply kits				✓														
93	Maintain contact lists for operators and response crews				✓														
94	Enforce basic building code requirements related to flood mitigation									✓									
95	Create inter-hospital mutual aid pacts to assure communication and service delivery should quarantine or outbreak occur					✓													
96	Enforce weight and travel restrictions for truck traffic							✓											
97	Locate schools, nursing homes, and other special facilities away from major hazardous material transportation routes							✓											
98	Assure compliance with and enforcement of Resource Conservation and Recovery Act standards								✓										
99	Eliminate clandestine methamphetamine laboratories through law enforcement and public education								✓										
100	Augment existing state and federal environmental databases by identifying unlisted hazardous sites (abandoned gas stations, dump sites, contaminated fill, etc.)								✓										
101	Assure proper separation and buffering between industrial sites and other land uses								✓										
102	Increase coverage and use of NOAA Weather Radio (public notification)								✓										
103	Include safety strategies for severe weather events in driver education classes and materials	✓	x							x									
104	Pre-plan for debris management staging and storage areas	✓	x							x									
105	Organize outreach to isolated, vulnerable, or special-needs populations		✓																
106	Develop programs/networks for contacting elderly or homebound persons during periods of infrastructure failure			✓															
107	Increase accountability to utility companies tree trimming/maintenance			✓															
108	Encourage residents to create family escape plans and disaster supply kits				✓														
109	Increase public awareness and widespread use of the "MISS DIG" utility damage prevention services				✓														
110	Dredge and clear sediment and debris from drainage channels									✓									
111	Enforce stream and wetland dumping regulations									✓									

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

Mitigation Strategy	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
112	Ensure readiness at critical facilities by requiring facilities to perform regular maintenance and equipment checks, preplan for fuel needs of existing and backup power sources (including gas stations and key facilities)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
113	Produce and distribute family emergency preparedness information relating to thunderstorm hazards	√	x	x					x					x				
114	Provide public education and awareness of thunderstorm dangers	√	x						x					x				
115	Increase public awareness of radon dangers and the prevention efforts than can be taken to reduce concentrations of radon in homes					√												
116	Stockpile vaccines and antidotes in case of epidemic, chemical emergency, or biological or chemical weapons attack					√												
117	Continue to fund adequate food and sanitation inspections					√												
118	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	√	√	√	x	x	√	x	x	x	x	x	x	x	x	x	x	x
119	Make improvements in driver education, traffic law enforcement, and transportation planning that balance needs of public transportation conveyers with the safety of the general public							√										
120	Educate the public on safe home and office use of space heaters														√			
121	Encourage safe use and inspection/maintenance/cleaning of fireplaces and chimneys															√		
122	Utilize GIS mapping of vegetative cover for use in planning decisions and through comparison with topography, zoning, developments,															√		
123	Provide public education and school programs on fire hazards and response techniques															√		
124	Encourage safe use and inspection/maintenance/cleaning of fireplaces and chimneys															√		
125	Encourage residents to create family escape plans and disaster supply kits															√		
126	Obtain insurance when/where possible															√		
127	Increase coverage and use of NOAA Weather Radio (detection and public notification)		√												x			
128	Establish heating centers/shelters for vulnerable populations		√															
129	Equip public safety officers with hazmat detection equipment, provide additional equipment to cleanup a chemical spill, upgrade and	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
130	Pre-plan for debris removal and management	√	x						x									
131	Utilize techniques of erosion control								√									
132	Encourage residents to create family escape plans and disaster supply kits	√	√						√	x			x	x	x		x	
133	Regional/watershed cooperation								√									
134	Design and plan water systems in anticipation of water shortages												√					
135	Increase coverage and use of NOAA Weather Radio (public notification)																√	
136	Evaluate potential for foundation/road damage due to shrinking of soils under extreme drought conditions																	√
137	Undertake brownfield and urban blight clean-up activities					√												

Oakland County
 Hazard Mitigation Plan Update
 Mitigation Strategies Worksheet

		High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Mitigation Strategy																			
138	Ensure road closures and traffic control in accident areas						✓												
139	Provide frequent (2x/yr) drop off centers for residential hazardous materials							✓											
140	Provide additional training to emergency workers for accidents at local industrial facilities, gas lines, or pumping stations							✓											
141	Maintain trained, equipped, and prepared search and rescue teams								✓										
142	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	✓	✓	x	x	✓	✓	✓	x	x	x	x	x	x	x	x	x	x
143	Address locations where trains block emergency routes for extended periods								✓										
144	Implement road improvements to prevent washouts									✓									
145	Pre-plan for debris removal and management staging and storage areas	✓	✓							x					x				
146	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
147	Create awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers				✓														
148	Develop site-specific emergency plans for high risk and surrounding facilities										✓								
149	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
150	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
151	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	✓	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
152	Locate pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas				✓														
153	Increase public awareness of pipeline locations and appropriate emergency procedures				✓														
154	Encourage community support of free and reduced-expense clinics and school health services					✓													
155	Require pollution control, enforcement, and cleanup; proper disposal of chemicals and scrap materials					✓													
156	Improve design, routing, and traffic control at problem roadway areas						✓												
157	Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain hazardous material hazards, self and property protection measures, warning and response systems currently in place						⊖												
158	Create emergency response system to provide bus transportation away from sites of hazmat incidents						✓												
159	Hold facility and community training and exercise programs							✓											
160	Create evacuation plans and community awareness of them							✓											
161	Enforce weight and travel restrictions								✓										
162	Develop engineering plans to address floodprone areas									✓									

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
Mitigation Strategy																		
163	Preserve farmland and open space								✓									
164	Maintain trained, equipped, and prepared search and rescue teams								✓									
165	Assure that each site slated for construction has a building area above flood levels								✓									
166	Require safe disposal of yard and house waste rather than through open burning															✓		
167	Install and maintain smoke detectors and fire extinguishers (and in some cases sprinklers or fire suppression wells) within and															✓		
168	Hold training sessions and exercises for response personnel															✓		
169	Plan and implement prescribed burns and fuel management techniques, including fuel breaks in high-risk areas															✓		
170	Single Point dispatch for region's police & fire departments															✓		
171	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles,															✓		
172	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency															✓		
173	Require proper workplace procedures, training and exercises on the handling of explosive and flammable materials and substances															✓		
174	Enforced fireworks regulations															✓		
175	Support and adequately fund fire inspection programs															✓		
176	Create programs that provide free fire alarms/batteries/or alarm installation for low-income residents															✓		
177	Develop contingency plans for worker and public protection, including the inclusion of rescue and evacuation procedures for well hazard areas in the local emergency operations plan				✓													
178	Create public and private cooperation pacts for emergency response				✓													
179	Anticipate and plan for incidents, including video documentation (where authorized) of events for later study/use									✓								
180	Train, staff, and provide resources for law enforcement									✓								
181	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	✓	✓	✓	x	x	✓	✓	✓	x	✓	x	x	x	x	x	x	x
182	Establish condominium-type associations for maintaining safety in attached housing/building units or multi-unit structures										✓							
183	Reduce blight										✓							
184	Improve ventilation techniques in areas/facilities prone to crowding, or that may involve exposure to contagion or noxious atmospheres					✓												
185	Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain public health hazards, self and property protection measures, current warning and response systems currently in place					○												
186	Maintain trained, equipped, and prepared site and local hazardous material emergency response teams as well as search and rescue							✓										
187	Perform railroad inspections and improve designs at problem railway/roadway intersections																	✓

Oakland County
Hazard Mitigation Plan Update
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Mitigation Strategy	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
188 Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain transportation hazards, self and property protection measures, current warning and response systems currently in place								◊										
189 Implement system to provide heavy equipment for storm debris cleanup	✓	x							x									
190 Provide additional medical and confined space entry equipment	✓		x	x		x	x	x		x				x	x	x	x	x
191 Include discussion of safety strategies for flooded areas in driver education classes and materials									✓									
192 Elevate mechanical and utility devices above expected flood levels									✓									
193 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and									✓									
194 Establish plan to eliminate repetitive loss properties									✓									
195 Prepare drought contingency plans for areas of high-impact (schools, public facilities, large residential sites)													✓					
196 Encourage residents to develop Family Disaster Plans and prepare Disaster Supply Kits														✓				
197 Establish and build awareness of accessible heating/cooling centers in the community														✓				
198 Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain nuclear power plant hazards, self and property protection measures, current warning and response systems currently in place																	◊	
199 Develop public education materials to explain property protection measures and insurance options	✓	✓							x					x		x		
200 Utilize buried/protected power and utility lines		✓																
201 Pre-plan for debris removal and management staging and storage areas		✓																
202 Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and				✓														
203 Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain petroleum and natural gas pipeline hazards, self and property protection measures, current warning and response systems in place				◊														
204 Create and enforce zoning ordinances that restrict development in areas directly adjacent to pipelines				✓														
205 Utilize buried/protected power and utility lines	✓																	
206 Pre-plan for debris removal and management staging and storage areas	✓	x							x					x				
207 Hold railroad inspections and improve designs at problem railway/roadway intersections						✓												
208 Use ITS/IHS (intelligent highway systems) technology						✓												
209 Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	✓	✓	x	x	✓	✓	x	x	x	x	x	x	x	x	x	x	x
210 Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain hazardous material hazards, self and property protection measures, warning and response systems currently in place							◊											

Oakland County
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	211												✓					
212												✓						
213															✓			
214																✓		
215																✓		
216																⊖		
217																✓		
218																✓		
219																✓		
220																✓		
221																✓		
222									✓									
223									✓									
224									✓									
225									✓									
226									✓									
227	✓	✓	✓	x	x	✓	✓	✓	✓	x	x	x	x	x	x	x	x	x
228									✓									
229									⊖									
230									✓									
231		✓																
232			✓															
233			✓															
234										✓								
235											✓							

Oakland County
Hazard Mitigation Plan Update
Mitigation Strategies Worksheet

Mitigation Strategy	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
	236	Require maintenance of private properties and strict policies on blight removal											✓					
237	Download "Crimestat" software in order to calculate "hotspots" (areas of high crime risk) in the community: http://www.icpsr.umich.edu/NACJD/crimestat.html											✓						
238	Hold "Day in Court" program in High Schools											✓						
239	Develop public education materials to explain property protection measures and insurance options	✓	x						x					x		x		
240	Utilize buried/protected power and utility lines	✓																
241	Demolish and clear vacant/condemned structures to prevent rodent infestations					✓												
242	Continue to monitor local hazardous material sites (e.g. Demode Road site)							✓										
243	Require proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.		✓															
244	Use snow fences or "living snow fences" to limit blowing and drifting snow over critical roadway segments		✓															
245	Separate and/or expand sewer system to handle anticipated stormwater volumes			✓														
246	Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain oil and gas well hazards, self and property protection measures, current warning and response systems currently in place				⊖													
247	Train and increase the use of weather spotters	✓																
248	Use structural bracing, window shutters, laminated glass in window panes, and hail-resistant roof shingles to minimize damage to public	✓																
249	Woody debris removal in flood prone areas								✓									
250	Provide for road closures and traffic control in flooded areas								✓									
251	Require anchoring manufactured homes to a permanent foundation (but with an option of being readily moveable if necessary)								✓									
252	Prepare county-wide drought contingency plans												✓					
253	Encourage water preservation measures by consumers (lawn watering)												✓					
254	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles,													✓				
255	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency													✓				
256	Perform hydrological monitoring of groundwater levels in subsidence-prone areas																	✓
257	Encourage residents to create family escape plans and disaster supply kits																	✓
258	Establish policies stressing the importance of safety above other considerations																	✓
259	Identify radioactive soils and high-radon areas																	✓
260	Provide funding & training for water rescue																	✓
261	Conduct long-term planning that provides more connector roads for reduced congestion of arterial roads																	✓

Oakland County
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Mitigation Strategy	High Winds & Tornadoes	Winter Hazards	Infrastructure Failure	Petroleum & Natural Gas Pipeline A	Public Health Emergencies	Hazmat Incidents - Transportation	Hazmat Incidents - Fixed Sites	Transportation Accidents	Flooding	Terrorism	Civil Disturbance	Criminal Acts	Drought	Earthquakes	Extreme Temperatures	Fire - Natural & Structural	Nuclear Power Plant Accidents	Subsidence
	262	Create insulation standards to protect from extreme heat & cold and to increase efficiency (especially in buildings used to house vulnerable populations)														✓		
263	Minimize temperature impacts on utilities and infrastructure (incl. substations)														✓			
264	Perform a study to assure for redundancies in the water systems														✓			
265	Provide public education on smoking hazards and recreational fires															✓		
266	Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning.														✓			
267	Give preference to or require that designs that include the use of firewalls and sprinkler systems														✓			
268	Install and maintain smoke detectors and fire extinguishers (and in some cases sprinklers) within and surrounding residential, commercial and industrial buildings														✓			
269	Post fire emergency telephone numbers in accessible places														✓			
270	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways														✓			
271	Produce and distribute family emergency preparedness information relating to severe winter weather hazards	✓																
272	Create "rolling blackouts" in electrical systems that will otherwise fail due to overloading			✓														
273	Consider emergency and security needs in new development									✓								
274	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency	✓	✓	✓	x	x	✓	✓	✓	x	✓	x	x	x	x	x	x	x
275	Require warning systems including fire and security for all commercial centers (recommend them for residences)										✓							
276	Establish safe and appropriate locations for temporary debris disposal items	✓	x						x				x					
277	Participate in structural projects to channel water away from people and property								✓									
278	Monitor water levels with stream gauges and trained monitors								✓									
279	Purchase or transfer of development rights to discourage development in floodplain areas								✓									
280	Use check valves, sump pumps and back flow prevention in homes and buildings								✓									
281	Establish fill standards to protect from erosion, including the use of native vegetation								✓									
282	Provide additional equipment and protective clothing for chemical spill response						✓											
283	Commercial operator training and skill enhancement programs							✓										
284	Utilize alternative 911 access through radio operators whose homes are identified through special markings			✓														
285	Establish procedures to protect cable/broadband internet systems			✓														

Oakland County
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Mitigation Strategy																			
286	Use buffer strips to segregate wells, storage tanks, and other production facilities from transportation routes and adjacent land uses, in accordance with state regulations and consistent with level of risk				✓														
287	Implement public awareness policy/campaign regarding the threat of tornadoes and other severe storms	✓	x							x									
288	Secure loose materials, yard and patio items indoors or where winds cannot blow them about	✓																	
289	Encourage construction of concrete safe rooms to retrofit existing single and multi-family homes and shelter areas in mobile home parks, fairgrounds, shopping malls, and other vulnerable public areas	✓													x				
290	Develop public education materials to explain property protection measures and insurance options	✓													x		x		
291	Construct or elevate existing roads or plan alternative roads that are unaffected by flooding, or making roads more flood resistant through better drainage, and/or stabilization/armoring of vulnerable shoulders and embankments									✓									
292	Improve security and maintenance at/of area's municipal wells, water treatment plants, and key locations in water distribution systems										✓								
293	Enforce water restriction requirements													✓					
294	Establish a program to address pavement buckling in extreme cold or extreme heat															✓			
295	Provide public education on effects of inappropriate cigarette disposal																	✓	
296	Educate on the practice of safe cigarette handling and disposal																	✓	
297	Require safe installation, maintenance, and use of electrical outlets and wiring																	✓	
298	Establish condominium-type associations for maintaining safety in attached housing/building units or multi-unit structures																	✓	
299	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways																		✓
300	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency																		✓
301	Identify, map, and prevent or limit development in old mining areas or geologically unstable terrain																		✓
302	Keep roads and driveways accessible to vehicles and fire equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways																		✓
303	Establish emergency routing procedures for emergency vehicles to avoid road or bridge closures due to construction or emergency																		✓
304	Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain subsidence hazards, self and property protection measures, current warning and response systems currently in place																		⊖
305	Establish a program to identify and properly abandon unused/abandoned water wells					✓													
306	Hold hazardous material public awareness and worker education programs																		✓
307	Locate industrial areas away from schools, nursing homes, etc.																		✓

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Mitigation Strategy																		
308 Evaluate purchase of a mass casualty trailer to assist in multiple vehicle accidents								✓										
309 Obtain equipment to detect hydrogen sulfide			✓															
310 Provide funding for Self-Contained Breathing Apparatus and to replace other outdated/aging equipment																✓		
311 Maintain adequate water supplies for emergency fire fighting including water access at homes and remote buildings																✓		
312 Hold controlled burns if/where necessary																✓		
313 Provide additional training and expansion of building inspections and fire code enforcement																✓		
314 Form a, or strengthen existing, watershed council(s)									✓									
315 Control and secure debris, yard items and stored objects in flood plains that may be swept away, damaged, and pose a hazard when flooding occurs									✓									
316 Backup groundwater supply wells													✓					
317 Utilize MSU Extension to recommend and educate on drought-resistant native vegetation for public and private properties													✓					
318 Assure proper awareness of, training on, and implementation of radiological emergency procedures (to include both primary and secondary Emergency Planning Zones, as appropriate)																	✓	
319 Facilitate farmer preparedness to address livestock needs/problems		✓																
320 Hire emergency management coordinator or liaison to be contact person and coordinate recognition, warning and response activities within the community and with regional officials	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
321 Establish a program to identify and properly abandon unused/improperly abandoned oil and gas wells				✓														
322 Public awareness of the need for permits for building in flood plain areas									✓									
323 Obtain insurance coverage when/where possible								✓										
324 Use ITS/IHS (intelligent highway systems) technology																		✓
325 Provide additional training and equipment for responding to plane crashes																		✓
326 Elevate flood-prone structures above the 100-year flood level									✓									
327 Train local officials on flood fighting, floodplain management, flood proofing...etc.									✓									
328 Hire emergency management coordinator or liaison to be contact person and coordinate recognition, warning and response activities within the community and with regional officials	x	x	✓	x	x	✓	x	x	x	x	x	x	x	x	x	x	x	x
329 Properly maintain and separate power lines. Power company should monitor branches that surround power lines																✓		
330 Post fire emergency telephone numbers																✓		
331 Require construction of concrete safe rooms for new construction of single and multi-family homes and shelter areas in mobile home parks, fairgrounds, shopping malls, and other vulnerable public areas	✓																	

Oakland County
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Mitigation Strategies Worksheet

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Mitigation Strategy																		
332	Require new developments to include detention and retention basins								√									
333	Evaluate water department emergency response plan(s) to assess above-ground water capacity relative to drought												√					
334	Fill or buttress subterranean open spaces (such as abandoned mines) to discourage their collapse																	√
335	Hire emergency management coordinator or liaison to be contact person and coordinate recognition, warning and response activities within the community and with regional officials	x	x	√	x	x	√	√	x	x	x	x	x	x	x	x	x	x
336	Provide funding for additional traffic barricades							√										
337	Establish higher engineering standards for drain and sewer capacity								√									
338	Maintain all roadways at no more than one foot below the flood elevation								√									
339	Evaluate existing pipes for "brittleness" and replace as necessary and prudent													√				
340	Distribute spare keys and/or bolt cutters for gates and locks to emergency responders															√		
341	Require proper storage and use of flammables, including the use of flammable substances. Store gasoline, oily rags and other flammable materials and approved containers. Stack firewood at least 100 feet away and uphill from homes															√		
342	Assure code existence and enforcement															√		
343	Provide funding for additional test equipment to detect gas leaks				√													
344	Dry flood-proof structures within known flood areas								√									
345	Enlist Michigan State University Extension to recommend protective vegetation	√														x		
346	Require proper maintenance and storage of motorized equipment to reduce fire risk															√		
347	More user-friendly fire record management system to retrieve information from county-wide servers															√		
348	Adequately fund a community SERA coordinator position to monitor and enforce standards							√										
349	Create public information material (newsletters, pamphlets, news-articles, educational programs, website links, contact persons) to explain thunderstorm hazards, self and property protection measures, current warning and response systems currently in place	Ö																
350																		
351																		
352																		
353																		
354																		
355																		
356																		

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357	Mitigation Strategy																			
358																				
359																				
360																				
361																				
362																				
363																				
364																				
365																				
366																				
367																				
368																				
369																				

Community Responses		
Survey Responses		
Workshop Responses		

Third Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Third Advisory Committee Meeting



Oakland County
Hazard Mitigation Plan Update




December 20, 2011

Meeting Agenda

- Review of Hazards and Mitigation Process
- Review of Mitigation Strategies
- Evaluation of Action Plans

Hazard Ranking Criteria

Criteria	Weighting
Population Impacted	9
Env./Services Impacted	5
Economic Impact	4



Hazard Identification
Advisory Committee Meeting of September 20, 2011

Workshop Hazard Impact Ranking

Hazard Event	Workshop Rank	Hazard Risk Rank	Action Plan Needed
High Winds and Tornadoes	5	1	1
Infrastructure Failure All	1	2	1
Winter Hazards - Ice and Sleet	2	3	1
Winter Hazards - Snowstorms	4	4	1
Petroleum and Natural Gas Pipeline Accidents	7	5	2
Public Health Emergencies	2	10	3
Hazmat Incidents - Transportation	7	6	4
Flooding	6	7	4
Hazmat Incidents - Fixed	10	8	4
Transportation Acc. All	7	9	4

Hazard Identification
Advisory Committee Meeting of September 20, 2011

Mitigation Goals

- Protection of public health and safety/ Prevention and reduction of loss of life and injury
- Improve and support public and private organizational response capabilities
- Prevention and reduction of damage to public/private property and infrastructure

Advisory Committee Meeting of November 29, 2011

Mitigation Goals

- Protect critical assets - hospitals, nursing homes, schools
- Increase awareness and preparedness of public, business, non-profit, government, etc. about hazards
- Encourage personal responsibility

Advisory Committee Meeting of November 29, 2011

Third Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Mitigation Strategies Evaluation Criteria

	Sum
Technical Feasibility	12
Cost Effectiveness	10
Ability to Accomplish, Fund, Measure and Sustain	13
Protection of Critical Resources	15
Community and Public Acceptance (environmental sound, socially equitable, etc.)	10

Advisory Committee Meeting of November 29, 2011

Mitigation Strategies

1	Encouraging residents to receive immunizations against communicable diseases	180	1
2	Provide resources for development of Develop site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums and recreation areas, and other appropriate sites	180	1
3	Utilize public warning systems for public health communications	180	1
4	Obtain communication boosters for deficient areas in Open Sky Network	180	1
5	Improve and continue training for emergency responders and the provide adequate equipment	180	1
6	Provide MUTUAL AID PACTS TO PROVIDE PERSONNEL AND RESOURCES additional manpower to assist during and following storms	180	1
7	Increase public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies	180	1
8	Establish PREARRANGE heating/COOLING centers/shelters for vulnerable populations, STRADED MOTORISTS, ETC.	180	1

Selected Strategies
Advisory Committee Meeting of November 29, 2011

Mitigation Strategies

9	Pre-plan for debris management staging and storage areas	165	9
10	Coordinate mutual aid assistance for failures in utility and communications systems (including 911)	155	10
11	Encourage residents to create family escape plans and disaster supply kits	150	11
12	Outreach to vulnerable populations during periods of extreme temperatures	150	11
13	Utilize public Enhance and maintain early warning systems and networks	150	11
14	Train, plan, and prepare for mass-casualty incidents involving all modes of transportation	150	11
15	Create public information material (newsletters, pamphlets, news articles, educational programs, website links, contact persons) to explain tornado and severe wind hazards, self and property protection measures, current warning and response systems currently in place	150	11
16	Encourage communities to Obtain adequate supply of generators for emergency temporary power	143	16

Selected Strategies
Advisory Committee Meeting of November 29, 2011

Mitigation Strategies


17	Assure Provide baseline training, planning and preparedness for hazardous material incidents along roadways and railways and pipelines	142	17
18	Adopt and enforce appropriate building codes	139	18
19	Keep roads and driveways accessible to vehicles and fire-EMERGENCY equipment—bridges should be able to support emergency vehicles, roads should be adequate for vehicles to turn around and cross both ways	134	19
20	Utilize public warning systems and networks	132	20
21	Provide transportation for elderly and disabled to shelters	132	20
22	Make sure warming and cooling centers have adequate backup power generators	130	22
23	Encourage Educate residents to create prepare family escape-disaster plans and disaster supply kits (72 hour go kits)	127	23
24	Improve communications between municipalities (local, state, regional) in event of mass event	105	24

Selected Strategies
Advisory Committee Meeting of November 29, 2011


Mitigation Strategies Redux

Are all Key Hazards Addressed?
Does Each Strategy Support an Overall Mitigation Goal?
Will the Strategy Mitigate Hazards?
Is it Achievable?

Action Plans



Oakland County
Hazard Mitigation Plan Update




Third Advisory Committee Workshop Oakland County Hazard Mitigation Plan Update

Action Plan Evaluation


Is it a County Action Plan?
Can the County Implement the Plan?
Does it Describe Measurable Outcomes?

Action Plans

Questions?



Oakland County
Hazard Mitigation Plan Update



Appendix E

Example Community Resolution for Plan Adoption

Resolutions Documenting Community Adoption

Oakland County Hazard Mitigation Plan

SAMPLE Resolution No. _____

ADOPTION OF THE OAKLAND COUNTY HAZARD MITIGATION PLAN

WHEREAS, the mission of (insert community name here) includes the charge to protect the health, safety, and general welfare of the people of (insert name of community here); and

WHEREAS, (insert community name), Michigan is subject to flooding, tornadoes, winter storms, and other natural, technological, and human hazards; and

WHEREAS, the Oakland County Local Emergency Planning Committee, comprised of representatives from the County, municipalities, and stakeholder organizations, has prepared a recommended Hazard Mitigation Plan that reviews the options to protect people and reduce damage from these hazards; and

WHEREAS, (insert community name) has participated in the planning process for development of this Plan, providing information specific to local hazard priorities, encouraging public participation, identifying desired hazard mitigation strategies, and reviewing the draft Plan; and

WHEREAS, the Oakland County Homeland Security Division (HSD), with the Oakland County Local Emergency Planning Committee (LEPC), has developed the OAKLAND COUNTY HAZARD MITIGATION PLAN (the "Plan") as an official document of the County and establishing a County Hazard Mitigation Coordinating Committee, pursuant to the Disaster Mitigation Act of 2000 (PL-106-390) and associated regulations (44 CFR 210.6); and

WHEREAS, the Plan has been widely circulated for review by the County's residents, municipal officials, and state, federal, and local review agencies and has been revised to reflect their concerns; and

NOW THEREFORE BE IT RESOLVED by the (insert community name and governing body here) that:

1. The Oakland County Hazard Mitigation Plan (or section(s) of the Plan specific to the affected community) is/are hereby adopted as an official plan of (insert Community name here).
2. The (insert name of position) is charged with supervising the implementation of the Plan's recommendations, as they pertain to (insert community name here) and within the funding limitations as provided by the (insert community governing body) or other sources.
3. The (insert name of position) shall give priority attention to the following action items recommended in portions of the Plan specific to (insert community name):
 - a. _____ (Recommendation _____, Section _____, page _____)
 - b. _____ (Recommendation _____, Section _____, page _____)
 - c. _____ (Recommendation _____, Section _____, page _____)

Passed by the (insert community name and governing body here) on (insert date).

Signature

Signature

Vote:

Yes _____

No _____

APPENDIX A:

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan’s strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Oakland County, MI	Title of Plan: Oakland County Hazard Mitigation Plan	Date of Plan: July 26, 2012
Local Point of Contact: Sara Stoddard	Address: 1200 N. Telegraph Rd, Bldg 47 West Pontiac MI 48341-0410	E-Mail: stoddards@oakgov.com
Title: Emergency Management Chief		
Agency: Oakland County Homeland Security Div		
Phone Number: 248 858-5080		

State Reviewer: Mike Sobocinski	Title: Local Hazard Mitigation Specialist, MSP	Date:
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FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region (insert #)		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

**SECTION 1:
REGULATION CHECKLIST**

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT A. PLANNING PROCESS				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Sections 1.1.2, 2.2, 2.3 & 2.4 pgs 1-31			
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2.3 pgs 30-32			
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Sections 2.3 & 2.3.5 pgs 30-32			
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Sections 2.3 & 2.2.3 pgs 27-28			
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 2.6 pg 36			
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 2.6 pg 36			
ELEMENT A: REQUIRED REVISIONS				

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4 pgs 45-106			
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 4 & 5 pgs 45-154			
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Sections 4 & 5 pgs 45-154			
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Sections 4.7.2 & 5.5.1 pgs 63-66;142-151			
ELEMENT B: REQUIRED REVISIONS				
ELEMENT C: MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 6 pgs 155-198			
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 4.7.2 pgs 63-66			
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Sections 2.1 & 6.1 pgs 26-27; 155-156			
C4. 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? (Requirement §201.6(c)(3)(ii))	Section 6 pgs 155-198			
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 7 pgs 199-209			
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 6.3.1 pgs 157-187			
ELEMENT C: REQUIRED REVISIONS				

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT D: PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Sections 3.3, 3.5, 3.6 pgs 40-42			
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Sections 6 & 7 pgs 155-209			
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Sections 5.1 & 6 pgs 107-110			
<u>ELEMENT D: REQUIRED REVISIONS</u>				
ELEMENT E: PLAN ADOPTION				
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Section 2.5 pgs 35-36			
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Table 1 pgs 37-38			
<u>ELEMENT E: REQUIRED REVISIONS</u>				
ELEMENT F: ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)				
F1.				
F2.				
<u>ELEMENT F: REQUIRED REVISIONS</u>				
d				