



Gladwin County Hazard Mitigation Plan

FINAL FEMA REVIEW VERSION

2016

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CHAPTER 1: INTRODUCTION

Gladwin County is in the mid-section of the lower peninsula of Michigan. Gladwin County is bordered by Roscommon and Ogemaw Counties on the north, Clare County on the west, Midland County on the south and Arenac and Bay Counties on the east. According to the US Census, the County covers an approximate area of 321,152 acres or about 502 square miles. Using the 2010 US Census population figure of 26,023, the population density of the county is roughly 51 people per square mile. The County consists of fifteen townships and two cities. The county seat is located in the City of Gladwin.

The main river in the County is the Tittabawassee River, which flows in the middle of the County north to south into the Saginaw River and eventually into the Saginaw Bay of Lake Huron. Major tributaries for the Tittabawassee River are the Cedar River in the northwest, Tobacco River in the southwest, Molasses River in the east central, and Sugar River in the central north area of the County. Forests, inland waters, and wetlands comprise over 63 percent of the County's surface area. Agricultural uses account for approximately 21 percent of the area.

North-south access is provided by M-30 in the middle portion and M-18 in the western portion of the County. M-18 travels through the two cities, Beaverton and Gladwin. East-west access is provided by M-61, which goes through the middle of the County.

What is Hazard Mitigation?

Hazard Mitigation is any action taken before, during, or after a disaster to permanently eliminate or reduce the long term risk to human life, and property from natural, societal, and technological hazards. Hazard mitigation, along with preparedness, response, and recovery comprise the four phases of emergency management. There is a cyclical relationship between these four phases of emergency management: a community prepares for disaster, including hazard mitigation activities, and then responds to a disaster when it occurs. Following the response, there is a transition into the recovery process, during which hazard mitigation measures can be evaluated and adopted. This in turn, improves the resilience of the community for the next incident, and so on. When successful, hazard mitigation will lessen future impacts to such a degree that succeeding occurrences will remain incidents and not become disasters.

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resources, programs, and authorities so that, at the very least, communities do not contribute to the increasing severity of the problem. When repairs and reconstruction are completed as quickly as possible to pre-disaster conditions, then pre-disaster conditions may simply result in a cycle of repeated damages. However, post-disaster repairs and reconstruction provide an opportunity to strengthen a community's resilience. Recovery projects can rebuild things in a safer manner, informed by the lessons of past disasters, so that future disasters will not have as much of an impact.

Hazard mitigation is needed to ensure that such cycles are broken, that post-disaster repairs and reconstruction take place after damages are analyzed, and that sounder, less vulnerable conditions are produced. Through a combination of regulatory, administrative, and engineering approaches, losses can be limited by reducing susceptibility to damage. Hazard mitigation provides the mechanism by which communities and individuals can break the cycle of damage, reconstruction, and damage again.

Recognizing the importance of reducing community vulnerability to natural and technological hazards, Gladwin County is actively addressing the issue through the development and subsequent implementation of this plan. The many benefits to be realized from this effort – protection of the public health and safety, preservation of essential services, prevention of property damage, and preservation of the local economic base, to mention just a few – will help ensure that Gladwin County remains a vibrant, safe, and enjoyable place in which to live, raise a family, and conduct business.

Under the Disaster Mitigation Act of 2000, state and local governments are required to develop local hazard mitigation plans in order to be eligible for pre- and post-disaster funding from the federal government. The Plan was prepared in accordance with the Federal Emergency Management Agency (FEMA) documents: Local Mitigation Handbook and the Local Mitigation Plan Review Guide, and the Michigan State Police Emergency Management Homeland Security Division (MSP/EMHSD) publication 207: Local Hazard Mitigation Workbook.

The Gladwin County Hazard Mitigation Plan (“Plan”) serves as the foundation for hazard mitigation activities within the community. Implementation of the plan’s recommendations will assist in the reduction of injuries, loss of life, and destruction of property due to natural and technological hazards. The Plan provides a path toward continuous, proactive reduction of vulnerability to the most frequent hazards that result in repetitive and often severe social, economic and physical damage. The ideal end-state would be the total integration of hazard mitigation activities, programs, capabilities, and actions into normal, day-to-day governmental functions and management practices.

Gladwin County Emergency Management Director and the Gladwin County Advisory Committee (GCAC) worked with the East Michigan Council of Governments (EMCOG) and the MSP/EMHSD to develop this Plan. The intent of the Plan is to work with those familiar with Gladwin County to describe the County, and to create an action plan to protect the health, safety, and economic interests of residents through hazard mitigation, planning, awareness, and implementation.

In the Plan, the hazard analysis section describes the major categories of hazards that affect Gladwin County (and provides some additional information about lesser hazards). The analysis of hazards makes use of community profile information that includes a description of community organization and potential resources. The major hazards have been identified as severe weather, geological threats, fires, floods/drought, hazardous materials, infrastructure problems, public health emergencies, transportation incidents, seasonal population shifts, and civil unrest and war. For each of the major hazards, the following is provided:

- Description of the hazard;
- Explanation of how it affects the County;
- Requirements/Rules affecting the County;
- Hazard mitigation Goal(s) that have been identified; and
- Description and explanation of the Action Item proposed.

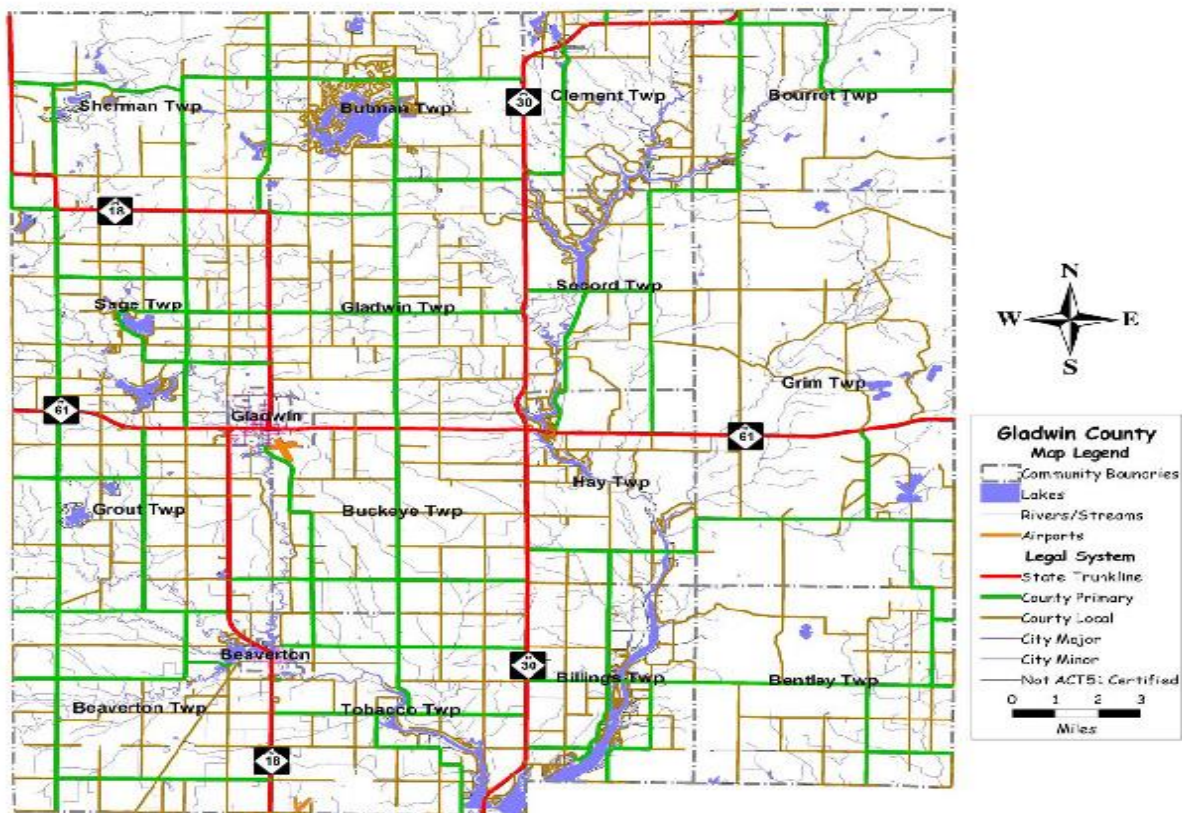
This new Plan updates the previous Gladwin County Hazard Mitigation Plan that was approved in 2007. This process began in 2012, as recertification of the Hazard Mitigation Plan shall take place at least once every five (5) years. It has been modified so that it is easier to find and use information contained within it. This should be helpful for stakeholders to more easily find and review the information that is most relevant for their jurisdictions and areas of expertise/interest.

Certain information that is considered confidential or too sensitive for widespread public distribution has been kept out of this document, and will only be distributed at the discretion of the Gladwin County Office of Emergency Management.

This plan is the culmination of our interdisciplinary and interagency planning effort that required the assistance and expertise of numerous agencies, organizations, and individuals. Without their technical assistance and contributions of time and ideas this plan could not have been completed.

Gladwin County Municipalities

MAP 1.1



Executive Summary

The Plan was created to protect the health, safety, and economic interests of the Gladwin County residents and businesses by reducing the impacts of natural and technological hazards through hazard mitigation planning, awareness, and implementation. The plan serves as the foundation for hazard mitigation activities and actions within Gladwin County. Implementation of recommendations will reduce loss of life, destruction of property, and economic losses due to natural and technological hazards. The plan provides a path toward continuous, proactive reduction of vulnerability to hazards which result in repetitive and oftentimes severe social, economic, and physical damage. The ideal end state is full integration of hazard mitigation concepts into day-to-day governmental and business functions and management practices.

This plan employs a broad perspective in examining multi-hazard mitigation activities and opportunities in Gladwin County. Emphasis is placed on hazards which have resulted in threats to the public health, safety and welfare, as well as the social, economic and physical fabric of the community. This plan addresses such hazards as floods, tornadoes, windstorms, winter storms, forest fires, structural fires, hazardous material incidents and secondary technological hazards which result from natural hazard events. Each hazard is analyzed from a historical perspective, evaluated for potential risk, and considered for possible mitigative action. The plan also lays out the legal basis for planning and the tools to be used for its implementation.

Local Units of Government

While the Hazard Mitigation Plan was performed by Gladwin County, it involved the participation of the communities within the County. Gladwin County's communities consist of two cities and 15 Townships. The communities are listed below:

Cities

Beaverton, Gladwin

Townships

Beaverton, Bentley, Billings, Bourret, Buckeye, Butman, Clement, Gladwin, Grim, Grout, Hay, Sage, Secord, Sherman, Tobacco

In addition to the cities, places, and townships, there exists a large Amish Community within Gladwin County. Numbering about 400 in population, the Amish inhabit areas mainly in the western half of Gladwin County.

Gladwin County Municipal Information

TABLE 1.1

Community name	2000 pop.	2012 pop.	Change	Participated in 2006 plan?	A participant in 2016 plan	NFIP Digitalized Map Available	NFIP participant	NFIP map date
Gladwin County	26,023	25,736	-1.1%	YES	YES			
Beaverton Twp	1,815	1,893	4.3%		YES			
Bentley Twp	859	782	-9.0%	YES				
Billings Twp	2,715	2,172	-20.0%	YES	YES			
Bourret Twp	471	484	2.8%		YES			
Buckeye Twp	1,333	1,544	15.8%		YES			
Butman Twp	1,947	2,111	8.4%		YES		Yes	7/30/99
Clement Twp	994	798	-19.7%	YES	YES			
Gladwin Twp	1,044	1,262	20.9%		YES			
Grim Twp	129	144	11.6%					
Grout Twp	1,869	2,184	16.9%		YES			
Hay Twp	1,402	1,341	-4.4%		YES	Yes	Yes	9/22/99
Sage Twp	2,617	2,397	-8.4%	YES	YES			
Secord Twp	1,140	1,084	-4.9%	YES	YES		Yes	1/29/97
Sherman Twp	1,029	981	-4.7%		YES			
Tobacco Twp	2,552	2,566	0.5%		YES			
City of Beaverton	1,106	1,052	-4.9%	YES	YES			
City of Gladwin	3,001	2,941	-2.0%	YES	YES			

Source: 2000 U.S. Census and American Factfinder 2012 Estimates.

CHAPTER 2: THE PLANNING PROCESS

In 2013, the Gladwin County Emergency Management staff began the update process by hosting a meeting at the Gladwin County Building with the East Michigan Council of Governments (EMCOG) staff and the Michigan State Police Emergency Management and Homeland Security Division (EMHSD) Staff. The purpose of the meeting was to advise the public and Gladwin County representatives of the need to update the 2007 Gladwin County Hazard Mitigation Plan (Plan) and the process that would be utilized.

This update was made possible after the County, along with four other counties were awarded a grant from the Federal Emergency Management Agency (FEMA) through the Michigan State Police to update their hazard mitigation plans. EMCOG staff worked with the Gladwin County Emergency Management Director (EMD), Marianne Hill and the Gladwin County Advisory Committee (GCAC) who was designated as the steering committee for the Plan update.

The GCAC was formed when invitations were sent to local municipalities, county departments, local police department, local fire departments, and regional agencies and inviting them to send a representative(s) to the meetings. The GCAC is composed of volunteers and professionals from county municipalities and various agencies located throughout the county/region, including the Michigan State Police, American Red Cross, and Michigan Department of Health and Human Services. It should be noted that despite numerous invitations, representatives from the sheriff's department, local police departments, and local fire departments have not attended the meetings.

To further promote the update and municipal participation, questionnaires were sent to the municipal governments for their input on the update process. The questionnaire sought information on the hazards and how they impacted the County. A follow-up interview with municipal representatives sought information on the mitigation measures to address the hazards and what measures would be most beneficial for each municipality. A copy of the questionnaire is included in Appendix B, which also includes a summary of the questionnaire and interview responses. The EMCOG regional planner conducted the interview with Gladwin County municipal officials before and after several monthly GCAC meetings to follow-up on the initial questionnaire responses and to obtain the information on the mitigation measures. The responses from the municipal governments were incorporated into the final mitigation actions found in Chapter 5.

Through a series of open meetings to the public, the EMD and EMCOG staff directed the GCAC through an assessment of the Plan in order to determine what changes, if any, would be necessary for the update. The GCAC and municipal officials were provided meeting agendas and any accompanying memos regarding the Plan update the week before each meeting, at which time the agendas were also posted on the public bulletin board at the Gladwin County Building. The following table (Table 2.1) identifies the meeting dates, locations, and subject matter for the GCAC and township association meetings. At the end of this chapter are two tables identifying the agencies represented at the meetings (Table 2.2) and the individuals at each meeting (Table 2.3). Appendix A includes the sign-in sheets for all the public meetings for this update.

Gladwin County Advisory Committee Meeting Schedule/Discussion Topic

TABLE 2.1

Meeting Date	Meeting Location	Discussion Topic(s)
5-6-13	Gladwin County Building 401 W. Cedar Ave., Gladwin	Kick-off meeting to provide information to the public on the Hazard Mitigation Plan (Plan) update process.
9-9-14	Gladwin County Building	Initial meeting of GCAC, they were provided an overview of the process and a copy of the Community Profile to review. A discussion was held on what hazards occur in Gladwin County.
10-14-14	Gladwin County Building	Discussion on the hazards and added several new hazards: seasonal population changes and non-motorized vehicles. Determined the vulnerability criteria for hazard assessment table.
11-12-14	Gladwin County Building	Discussion on Community Profile, and hazard assessment to determine what hazards have the greatest impact in Gladwin County.
12-10-14	Gladwin County Building	Completed hazard assessment and vulnerability assessment. Initiated discussion on goals and objectives for the Plan update and the community questionnaire.
1-14-15	Gladwin County Building	Completed discussion on goals and objectives, began a discussion on the status of the Plan's Strategy Table. Distributed the community questionnaire to the local municipalities for their input. Discussed high and significant risk dams.
2-11-15	Gladwin County Building	Initiated the discussion on the status of the projects identified in Plan's Strategy Table. Distributed Chapter 1: Introduction to members for proofing purposes.
3-24-15	Gladwin County Building	Initiated discussion on the status of mitigation actions from the 2007 plan.
4-15-15	Gladwin County Building	Initiated discussion on notable events and criteria to define notable events. Completed the discussion on the status of the 2007 mitigation actions. Began identifying mitigation strategies to address hazards for the plan update.
5-13-15	Gladwin County Building	Clarified the definition of non-motorized vehicles and changed the hazard to horse-drawn vehicles. Discussed the hazard events in greater detail (more clearly defined the hazard and impact) and began discussion on mitigation strategies for the hazard events.
6-23-15	Gladwin County Building	Discussion on the mitigation strategies for the plan update (major discussion on the 2007 strategies and the need to combine duplicate strategies for different events).

7-15-15	Gladwin County Building	Discussion on mitigation strategies and the need to reduce the overall number of action items for the plan update. Also began discussion on the priority criteria in order to place the action items into the high or medium priorities.
8-26-15	Gladwin County Building	Completed the categorization of hazards into high, medium, and moderate criteria. This would assist in categorizing action items into high, medium, and moderate action list items.
9-16-15	Gladwin County Building	Initiated a discussion for the action list items and the need to prioritize them based on benefits and impact of action list items.
10-14-15	Gladwin County Building	Met with municipal representatives to discuss hazards and measures to mitigate them (this was the follow-up survey). Meetings were designed to secure the follow-up survey information in a quicker manner. Discussed potential projects and priorities.
11-10-15	Gladwin County Building	Discussed the project priorities, project information and the classification of project to the action list (high and medium priority projects) or projects for the appendices only.
1-13-16	Gladwin County Building	Finalized the action list item information and their priorities.
3-9-16	Gladwin County Building	Based on feedback from the MSP and FEMA representatives, additional information was provided on the action list items, action list items were added to the plan, and the approval process was discussed.
4-13-16	Gladwin County Building	Sought comments on the final draft from the GCAC. Discussed the approval process, which included getting public comments and attending the County Board meeting on 4-26, when the Plan will be presented. Also discussed the FEMA NFIP maps being updated for the County as well as the participation status of the municipalities.

Through the meetings above, the chapters of the Plan were evaluated and modified accordingly. Below are the results of the chapter reviews for each chapter in the Plan.

- Reviewed and updated Chapter 1: Introduction. Reviewed and updated information on Gladwin County, as well as on the process. Information is included in Chapters 1: Introduction and Chapter 2: Planning Process of the update.
- Reviewed and updated Chapter 2: Environment. Reviewed and updated information on the physical characteristics of Gladwin County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 3: Social Features. Reviewed, updated, and modified the social and demographic data of Gladwin County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 4: Land Use Characteristics. Reviewed land use characteristics of Gladwin County. Information is included in Chapter 4: Hazard Analysis of the update.

- Reviewed and updated Chapter 5: Public Facilities and Services. Updated and reviewed the public services being available in Gladwin County. Information is included in Chapter 3: Community Profile of the update.
- Reviewed and updated Chapter 6: Advanced Analysis. Reviewed and updated the analyses for the hazards identified in Gladwin County. Information is included in Chapter 4: Hazard Analysis of the update.
- Reviewed and updated Chapter 7: Risk and Vulnerability Assessment. Reviewed and updated the risk and vulnerability assessments for Gladwin County. Information is included in Chapter 2: Planning Process of the update. Table for hazard mitigation priority included in chapter (see below);
- Reviewed and updated Chapter 8: Goals and Objectives. Reviewed and updated the goals and objectives for Gladwin County. Updated goals and objectives are found in Chapter 6: Action Items.
- Reviewed and updated Chapter 9: Mitigation Strategies and Priorities. Reviewed the mitigation strategies and priorities for Gladwin County. Status of the mitigation strategies is found in Chapter 5: Evaluation of Alternatives. Updated priorities are found in Appendix C.
- Reviewed and updated Chapter 10: Approval and Implementation. Reviewed and updated the approval and implementation schedule for Gladwin County. The revised implementation process is included in Chapter 7: Follow-up.

Gladwin County Model Hazard Preliminary Priority Chart

TABLE 2.2

	Hazard Type	Likelihood of Occurrence	Final Ranking of Hazard Risk Assessment	Final Determination of Vulnerability	Overall Priority
1	Severe Winter Weather	10	8.50	High	High
2	Major Population Changes	10	8.10	Medium	Moderate
3	Severe Summer Weather	10	7.95	High	High
4	Infrastructure Failure	10	7.70	High	High
5	Riverine Flooding	10	7.10	High	High
6	Horse-drawn Vehicles	10	7.05	Low	Medium
7	Scrap Tire and Structural Fires	10	6.80	High	High
8	Nuclear Attack	1	6.40	High	Moderate
9	Public Health Emergencies	10	6.10	Medium	Medium
10	Wildfires	9	5.70	Medium	High
11	Fixed Site Hazmat/Pipeline/Oil & Gas Well Accidents	3	4.85	Medium	Medium
12	Transportation/Hazmat Incident	5	4.25	Medium	Medium
13	Dam Failures	2	3.70	Low	Medium
14	Drought	1	3.40	Low	Medium
15	Nuclear Power Plant Accident	1	3.00	Low	Moderate
16	Civil Disturbances	1	1.00	High	Moderate
17	Earthquakes	1	1.00	Low	Moderate
18	Subsidence	1	1.00	Low	Moderate
19	Terrorism/Sabotage	1	1.00	High	Moderate

This update process included the review of the Gladwin County Master Plan, the 2014 Michigan Hazard Mitigation Plan, county maps and studies, municipal master plans, as well as ongoing planning activities. This included the review of informational sources such as: U.S. Census, National Weather Services, master plans, emergency management plans, Michigan Department of Transportation, Michigan Department of Natural Resources, and local health departments.

In January 2016, the action list was sent to the EMHSD staff for their review and comment. This list was then sent to FEMA staff for their comments. In February, the EMD and EMCOG staff were notified that FEMA staff suggested that a larger proportion of action items involve mitigation activities rather than education and preparedness activities.

In March 2016 the EMD and the EMCOG regional planner discussed the proofing of the draft document and the scheduling for the approval of the Plan. This scheduling included the timing for the public hearing, the approval of the plan by EMHSD staff, FEMA staff, and the adoption of the Plan by the County Board and other municipal agencies.

The EMD and EMCOG regional planner met to discuss the suggestions of FEMA staff. As a result of the meeting, a meeting with the GCAC to discuss the additional action items (mitigation activities) was scheduled and held on March 9, 2016. After reviewing these items and proofing the document the GCAC then recommended to meet for a final time on April 13, 2016 for approval of the draft document and recommended to schedule a public hearing to present the document to the public and seek additional input. The public hearing took place on April 26, 2016 before the County Board of Commissioners as part of their regularly scheduled meeting. There were approximately 30 persons in attendance, including 5 members of the GCAC. The presentation kicked off the 30-day comment period for the review of the draft.

In addition to the public hearing before the County Board of Commissioners, the Plan was also available for review on the home page of the Gladwin County Emergency Management website, with copies available for review at the Gladwin County Commissioners' Office, the Gladwin City Hall, the Beaverton City Hall, and the Office of Emergency Management. Notices of the hearing and invitations to review the plan were sent to the township halls, and to the neighboring counties' emergency management directors.

The 30-day comment period was held to allow ample time to submit comments to the Emergency Management Director. These comments were then reviewed and the following items were addressed:

- Several comments were submitted to advise of spelling errors;
- The hazard priority chart was included in the planning process chapter, based on a suggestion from a neighboring county emergency management director; and
- The Enhanced Fujita Scale for Tornado Intensity was used rather than the Fujita Scale based on a comment that was received on another plan.

On April 28, 2016, the draft plan was sent to the MSP/EMHSD staff for comments and reviews. Based on their suggestions, changes included the following: the addition of frequency and probability to the natural hazards in Chapter 3; more information was provided on NFIP participation and FIRM maps, additional information was provided on the action list prioritization, and the process to include reference to the Hazard Mitigation Plan in other county documents.

Gladwin County Advisory Committee
Attendance Table-Agency
TABLE 2.3

Participating Agency or Jurisdiction	Survey (S) returned and Interview (I) held		Meeting Attended																	
		5- 13	9- 14	10- 14	11- 14	12- 14	1- 15	2- 15	3- 15	4- 15	5- 15	6- 15	7- 15	8- 15	9- 15	10- 15	11- 15	1- 16	3-9	4-13
East Michigan Council of Governments	NA	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Gladwin County	NA	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
City of Gladwin	S	X	X	X									X			X		X	X	
City of Beaverton					X															
Beaverton Township	S				X							X		X	X	X	X	X		X
Bentley Township	S I																			
Billings Township	S I	X	X						X		X	X	X	X	X	X	X	X	X	X
Bourret Township	S			X				X	X		X	X	X	X	X	X	X	X	X	
Buckeye Township			X	X																
Butman Township	S I	X		X	X	X		X				X	X	X		X				X
Clement Township	S I		X		X	X			X			X					X			
Gladwin Township	S I		X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	
Grim Township	S																			
Grout Township	S I			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Hay Township	S I		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Sage Township	S I				X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
Secord Township	S I	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X
Sherman Township	S I			X		X	X	X	X		X	X	X	X	X	X	X	X	X	X
Tobacco Township	S		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
American Red Cross	NA		X			X	X				X					X				
Beaverton Fire Dept.	NA																			
Beaverton Police Dept.	NA																			
Billings Fire Dept.	NA																			
Butman Fire Dept.	NA																			

Central Michigan District Health Department	NA				X															
Clement Fire Dept.	NA																			
Gladwin County 911	NA														X					
Gladwin County Building and Codes	NA																			
Gladwin County Drain Commission	NA		X	X		X	X	X	X		X			X		X	X	X	X	
Gladwin County Road Commission	NA		X								X								X	
Gladwin County Sheriff's Department	NA																			
Gladwin County Treasurer	NA																			
Gladwin Fire Dept.	NA																			
Gladwin Police Dept.	NA																			
Michigan State Police	NA									X										
Secord Fire Dept.	NA																			
Wildwood Fire Dept.	NA																			

Jurisdictions in bold font have contributed to the Plan update.

**Gladwin County Advisory Committee
Attendance Table-Individuals**

TABLE 2.4

Person	Agency	Hazard Mitigation Advisory Committee Member	Number of Meetings Attended
Joe Beauchamp	American Red Cross	X	3
Don Birgel	Gladwin County Board	X	8
J. Mike Brosier	Hay Township	X	17
Mike Brubaker	Gladwin County Central Dispatch	X	1
Connie Bruce	Bourret Township		1
Terry Bruce	Bourret Township		1
William Clark	Tobacco Township	X	16
Colin Combs	Secord Township	X	1
Keith Cousineau	Grim Township	X	
Byron Dell	Beaverton Township	X	
Melissa DeRoche	Central Michigan District Health Dept.	X	1
Barb Drudi	Beaverton Township		4
Justin Eastman	Hay Township	X	
Bill Ernat	EMCOG	X	17
Bob Evans	Gladwin County Drain Commission	X	12
Gerald George	Grout Township	X	9
Shirley George	Grout Township	X	16
Onalee Greer	Gladwin Township	X	12
Rollin Greer	Gladwin Township	X	12
Larry Grell	Billings Township	X	
Linda Hart	Sherman Township		1
Walter Hart	Sherman Township	X	14
Marianne Hill	Gladwin County EMD	X	16
Karon Hoffman	Clement Township	X	6
Madalyn Hubble	Beaverton Township	X	8
Dee Jungman	City of Gladwin		1
Shirley Kyle	Butman Township	X	5
Carl Malott	Billings Township	X	13
Anthony Marshall	Bourret Township	X	1
Laura Maveal	Gladwin County		1
John Mella	Gladwin Township		2
Ruth Messer	Sherman Township		1
Bob Moffit	City of Gladwin	X	2
Larry Nelson	Billings Township	X	11
Bradley Neumeyer	Bentley Township	X	
Cheryl Partle	American Red Cross	X	1
Dave Pattersch	Gladwin County Road Commission	X	3
Amy Pfenninger	Gladwin County Board		4
Kerry Posey	City of Beaverton	X	1

Dan Provosta	Sage Township		1
Gayle Reid	Gladwin County Board		1
Bill Rhodes	Gladwin County		1
Justin Schneider	Gladwin County Building	X	2
Fred Shaver	Secord Fire Department		1
Mike Shea	Gladwin County Sheriff's Department		1
William Shearer	Grout Township	X	8
Mike Stumpfig	Sage Township	X	15
Steve Surowiec	Butman Township	X	4
Annette Swain	American Red Cross	X	1
Dale Taylor	Bourret Township	X	12
Christy VanTiem	Gladwin County	X	2
Kevin VanTiem	Buckeye Township	X	1
Bruce Wagner	Emergency Management		1
Terry Walters	Gladwin County Board	X	9
Robert Weaver	Gladwin Township	X	1
Kathy Wilton	Secord Township	X	15
James Wyniemko	Gladwin County Road Commission		1
Tom Winarski	City of Gladwin	X	5
Donald Zackett	Tobacco Township		1
Renee Zelt	Sage Township	X	

Bold print denotes a person not on the GCAC

CHAPTER 3: COMMUNITY PROFILE FOR GLADWIN COUNTY



NATURAL FEATURES OF GLADWIN COUNTY

Gladwin County, organized in 1875, is located in a rural forested area in the middle of the Lower Peninsula of the State of Michigan on the edge of what is commonly thought of as the state's northern recreational area(s). The counties surrounding Gladwin County are: Arenac to the east, Bay County to the southeast, Midland County to the South, Clare to the west, Ogemaw and Roscommon to the north.

Gladwin County is composed of 516 square miles or some 329,971 acres. Of this area, approximately 20% is devoted to agricultural production. Another major land use is forestland, which covers 53% of the county. The Tittabawassee State Forest makes up the largest portion of this forested area.

Less than 8.7 percent of the county is wetland or water, but water-based recreation and recreational developments are an important economic and developmental force in the county. The Tittabawassee River and its impoundments, Pratt Lake, Wiggins Lake and the Molasses and Cedar Rivers are important water resources. The Tittabawassee River and its impoundments, Pratt Lake, Wiggins Lake and the Molasses and Cedar Rivers are important water resources. The Tittabawassee River and its impoundments of Secord Lake, Smallwood Lake and Wixom Lake are important water resources. The Cedar River and its impoundments of Lake Contos, Pratt Lake, and Wiggins Lake as well as the Molasses and Cedar Rivers are also important water resources. Lake and riverfront residential developments are also a major land use feature in the County.

The most highly developed areas of the county are concentrated along the M-18, M-30 and M-61 corridors. The major concentrations of population and housing are found in the cities of Beaverton and Gladwin.

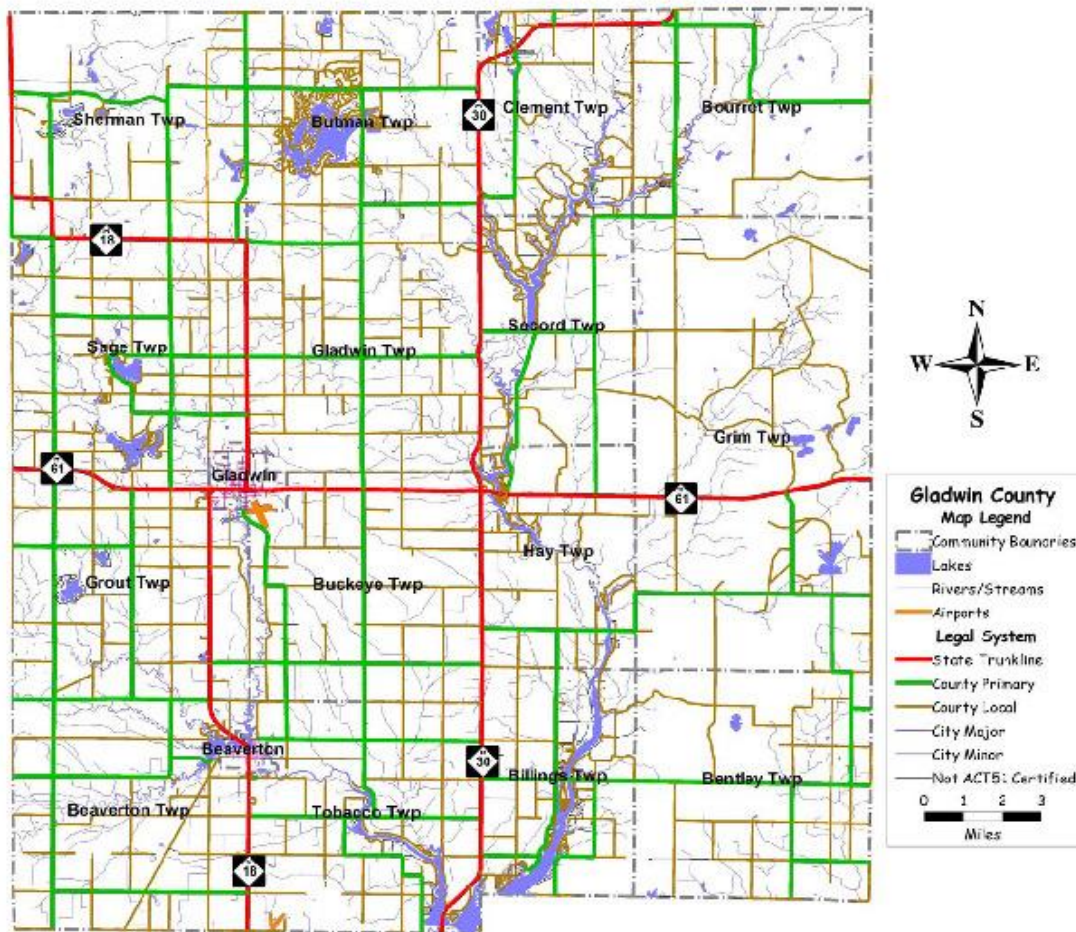
Gladwin County contains fifteen (15) townships. There are large concentrations of population found in several townships primarily along the River, its tributaries and their impoundments. River basins are deep and dams installed at Edenville, Smallwood, Secord, Beaverton, Chappel and Sugar Springs have created sizeable impoundments. The City of Gladwin is the County Seat and had a 2010 population of 2,933. Its sister city, Beaverton, eight miles south had a population of 1,071. Both are incorporated cities and

governed by a Mayor and City Council. In 2010 the overall county population was 25,692 and covering 52 square miles.

Gladwin County is covered by District 3 of the Emergency Management & Homeland Security Division of the Michigan State Police.

Gladwin County

MAP 3.1



Gladwin County Population

TABLE 3.1

	2000 Population	2012 Population	% Change in Population
Gladwin County	26,023	25,736	-1.1%
Townships			
Beaverton	1,815	1,893	4.3%
Bentley	859	782	-9.0%
Billings	2,715	2,172	-20.0%
Bourret	471	484	2.8%
Buckeye	1,333	1,544	15.8%
Butman	1,947	2,111	8.4%
Clement	994	798	-19.7%
Gladwin	1,044	1,262	20.9%
Grim	129	144	11.6 %
Grout	1,869	2,184	16.9%
Hay	1,402	1,341	-4.4%
Sage	2,617	2,397	-8.4%
Secord	1,140	1,084	-4.9%
Sherman	1,029	981	-4.7%
Tobacco	2,552	2,566	0.5%
Cities			
Beaverton	1,106	1,052	-4.9%
Gladwin	3,001	2,941	-2.0%

Source: U.S. Census 2000 and American Factfinder 2012 Estimates

The township populations of Beaverton and Gladwin do not include the populations of the cities of Beaverton and Gladwin.

Gladwin County Top Employers

TABLE 3.2

Company Name	Location	# of Employees
Mid-Michigan Physician's Group	Gladwin	214
Mid-Michigan Medical Center	Gladwin	207
Brown Machine	Beaverton	150
Lyle Industries, Inc.	Gladwin	150
Mid-Michigan Gladwin Pines	Gladwin	150
Homestead Products, Inc.	Gladwin	100
Saint-Gobain Performance Plus	Beaverton	85
Family Fare	Gladwin	76
Gladwin Nursing & Rehab Community	Gladwin	75
Gladwin City Housing	Gladwin	70

Source: Region 7B Michigan Works – Top Employers

Land Use

Land use planning or a lack of same consistently ranks as one of the most difficult issues facing many county and township governments. The focus of most planning efforts is the provision of economic development and public services which generally results in a lack of consistent implementation of those land use policies and regulations defined within local comprehensive plans.

The eastern portion of Gladwin County consists primarily of public forest lands with residential concentrations around recreational lakes. The western portion of the county is comprised primarily of agricultural lands. Urbanized areas are centered in the cities of Beaverton and Gladwin with scattered commercial and industrial development along M-18, M-30 and M-61 corridors. There are no metropolitan areas within Gladwin County.

Gladwin County Open Space
TABLE 3.3

Total Land Area	330,240 acres
Total Water Area	6,848 acres
Land Surface	323,392 acres
State Forest area	85,732 acres
Publicly or privately owned forest land	186,900 acres
Public recreation land	86,470 acres
Number of inland lakes greater than 50 acres in size	14

Source: Michigan Information Resource System (MIRIS)

The majority of development in Gladwin County is in the communities of Gladwin and Beaverton. Urbanized areas consume up approximately 2.3 percent of the County's land area. The development is also centered along the County's major highway corridors, rivers and lakeshores and involves second home/cottages and tourist/resort attractions.

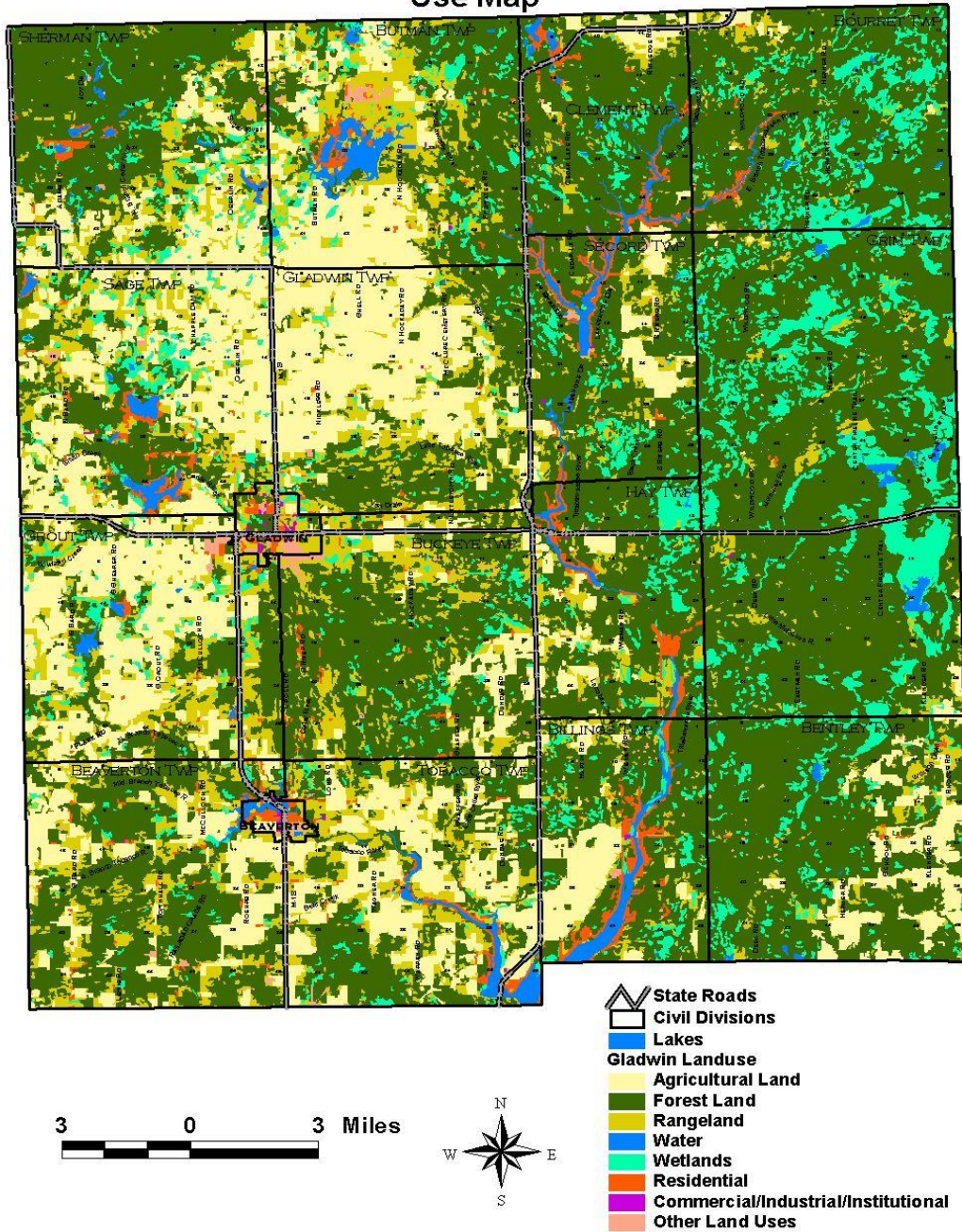
Approximately 53.1 percent of Gladwin County is forested. Much of this land is held in the Tittabawassee State Forest. These land holdings represent significant recreational resources for the County. Inland waters and wetlands comprise 8.7 percent of the County's surface.

Agriculture uses account for approximately one-fifth of the land use in the County.

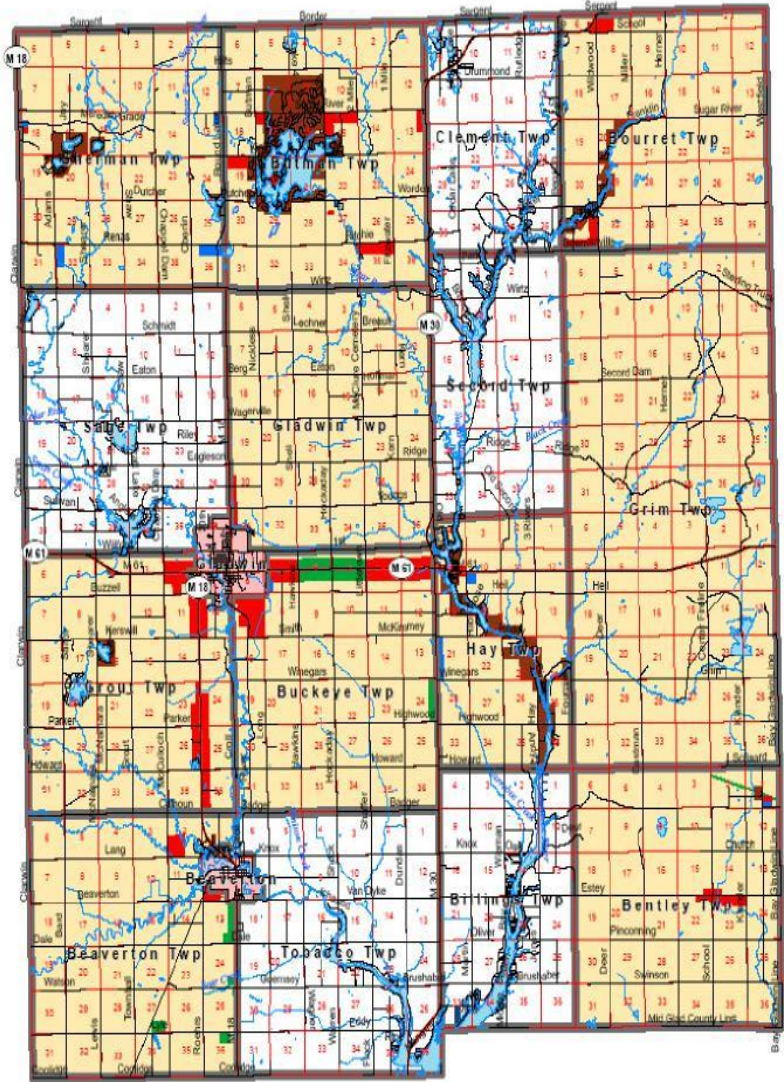
Gladwin County Land Use
TABLE 3.4

Category	Acreage	% of County
Agriculture	67,698	20.5
Forest	175,233	53.1
Wetland	28,863	8.7
Urban	7,745	2.3
Other	50,694	15.4
Total	330,233	100.0

Gladwin County Existing Use Map



Gladwin County Future Land Use MAP 3.3

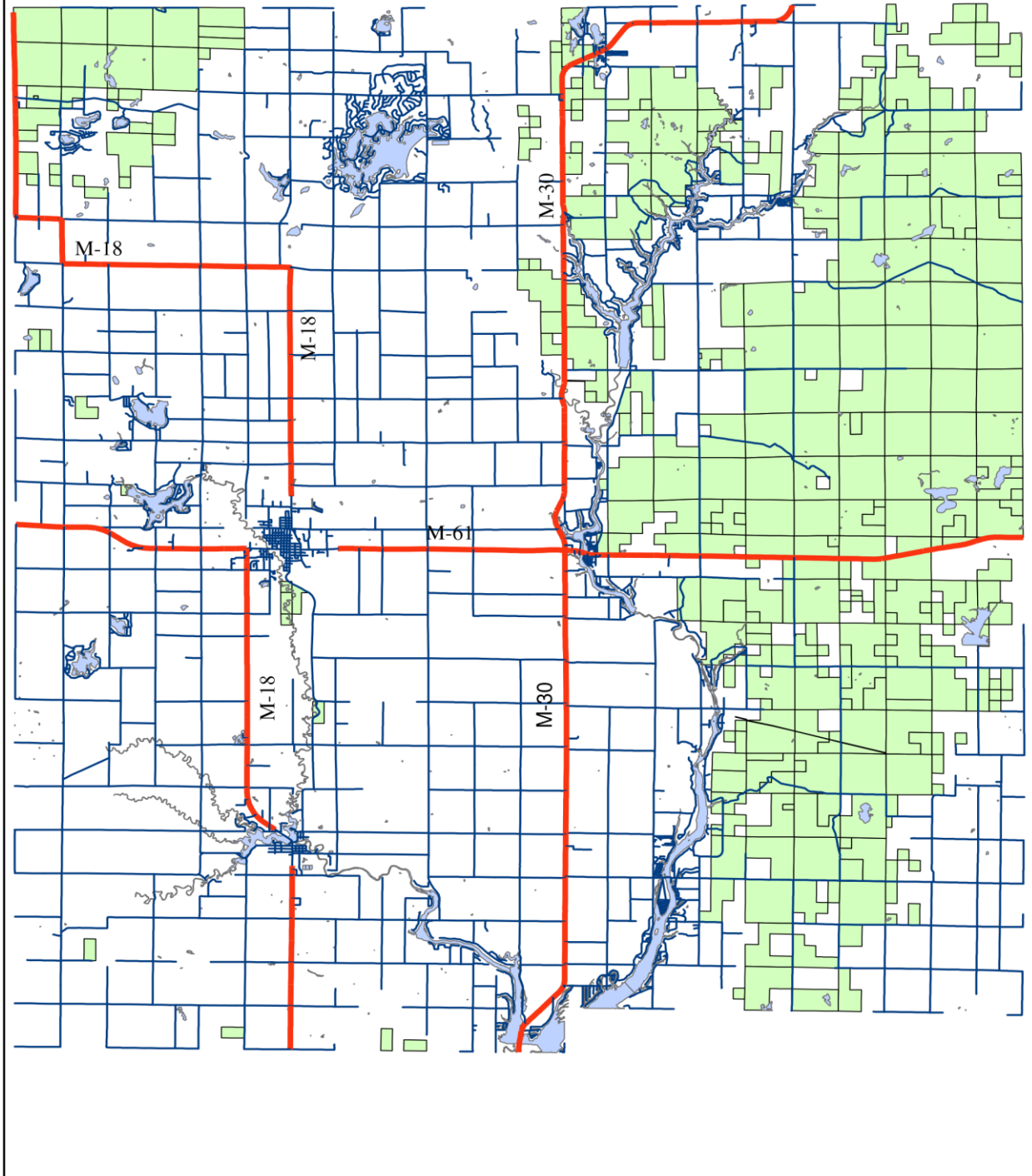


Gladwin County State-Owned Lands

MAP 3.4

GLADWIN COUNTY

2015 STATE OWNED LANDS (highlighted green)



TOPOGRAPHY

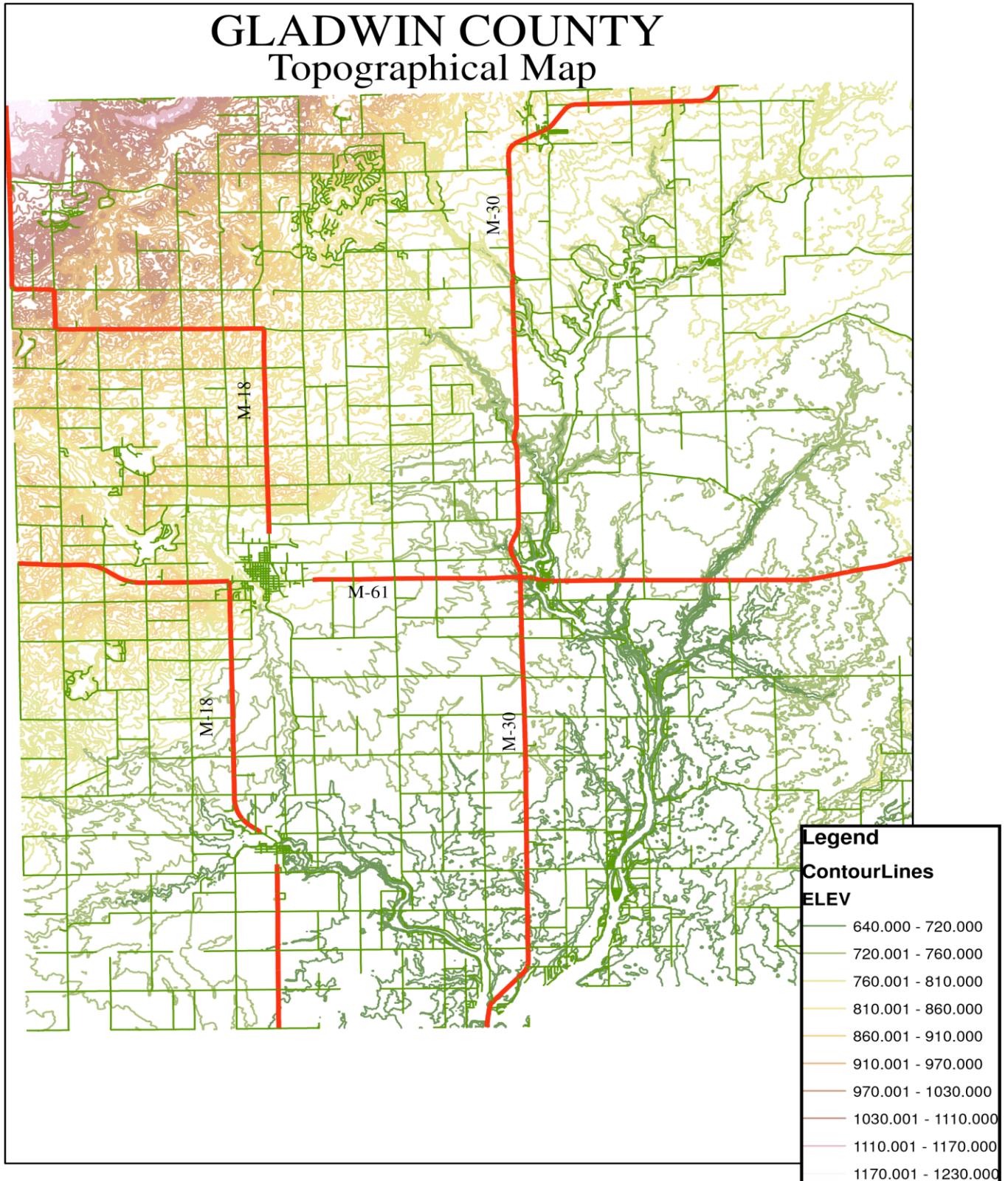
Gladwin County's topography will indicate a total relief of about 557 feet with the lower points being at the southeast corner with an elevation of 656 ft. Elevations increased moving in towards the northwestern corner of the county with an area of steeper slopes and an elevation of 1,213 feet. Generally speaking, the terrain in the county varies from flat areas to gently rolling or hilly areas. The most significant relief and topographic features can be seen in the northwestern area of the county.

The land surface of Gladwin County was shaped by glaciation. The County is split nearly in half by two types of glacier related landforms. The southern portion of the county is the northern edge of a post glacial lake that has the characteristics of being flat land (elevations between 700' to 1,000' above sea level) with soils made up in clay and silt materials. The northern portion of the County is the southern edge of the glacial moraine area that makes up most of northern Michigan. This area is made up of gently rolling to steeply sloping terrain (elevations between 1,000' to 1,400') and consists of soils of sand and gravel material. The highest elevation is located in Sherman Township at 1240' above sea level and the lowest elevation is located in Billings Township at 685' above sea level.

Gladwin County Topographic Map

MAP 3.5

GLADWIN COUNTY Topographical Map



SOILS

Three basic types of soil formations exist in Gladwin County. These are (1) moraine, (2) outwash and (3) till plain. The moraine is composed of undifferentiated Punctino sand, clay-gravel and silt; outwash being comprised of sand and gravel and till-plain is clay and silt. Old channel and lake beds are scattered throughout. Soils vary from clay to sand. Eight different soil types make up the County. They are:

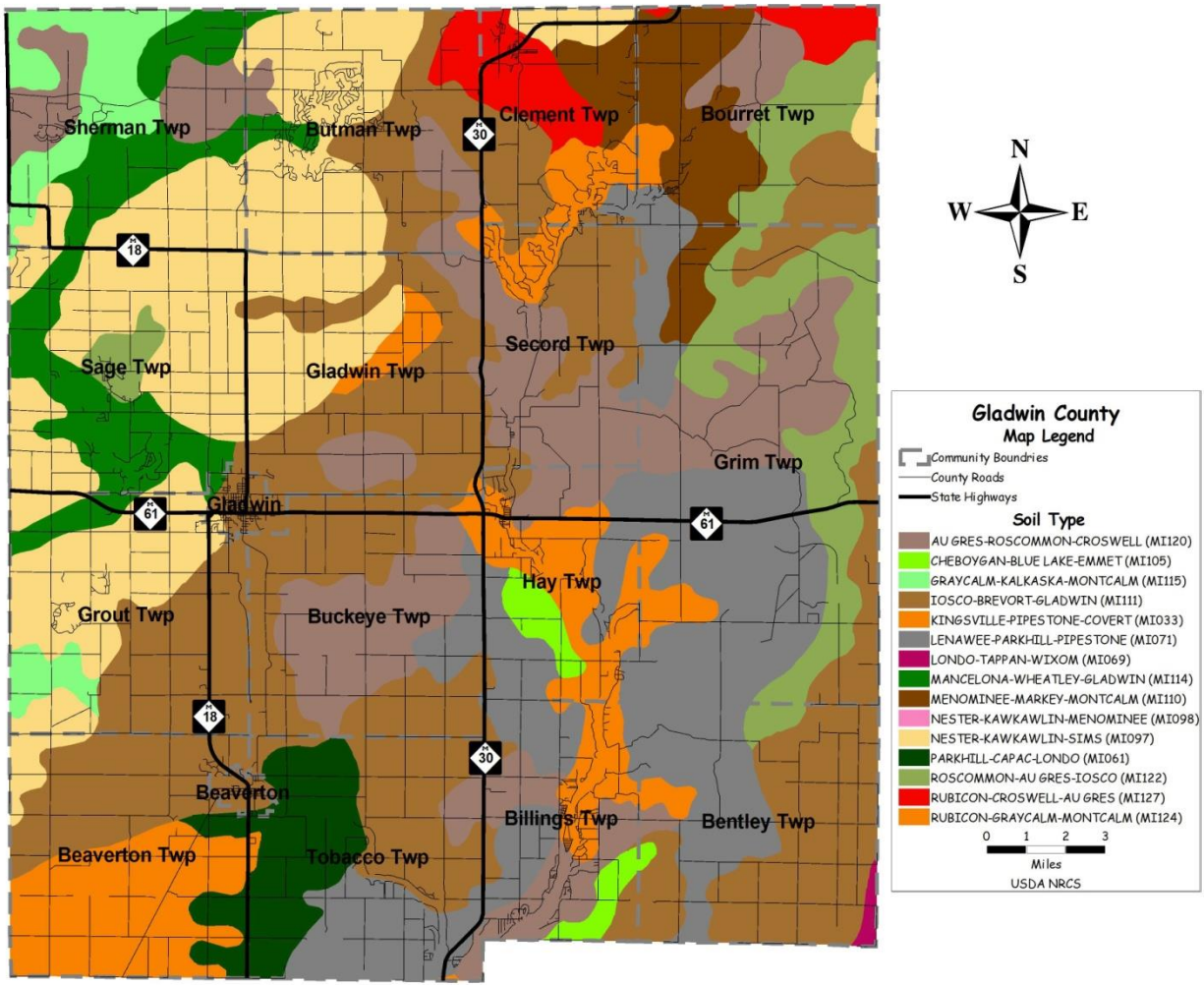
1. Mancelona-Gladwin-Wheatly- Nearly level to gently rolling, somewhat excessively drained and somewhat poorly drained to very poorly drained soils that have sandy and loamy subsoil or a sandy and gravelly substratum. **5% of the County**
2. Montcalm-Menominee-Nester- Nearly level to rolling soils, well drained and moderately well drained soils that have sandy and loamy subsoil. **15% of the County**
3. Menominee-Iosco-Kawkawlin – Nearly level to gently rolling, well drained to somewhat poorly drained soils that have sandy and loamy subsoil. **11% of the County**
4. Nester-Kawkawlin-Sims – Nearly level to rolling, well drained to very poorly drained soils that have loamy subsoil. **14% of the County**
5. Graycalm-Moncalm – Nearly level to steep, somewhat excessively drained and well drained soils that also have sandy and loamy subsoil. **29% of the County**
6. Grayling – Nearly level to steep, excessively drained soils that have sandy subsoil. **8% of the County**
7. Rubicon-Croswell-AuGres – Nearly level to rolling, excessively drained, moderately well drained, and somewhat poorly drained soils that have sandy subsoil. **9% of the County**
8. Lupton-Markey – Nearly level, very poorly drained soils that have mucky subsoil. **9% of the County**

The majority of development in Gladwin County is located near the City of Gladwin, City of Beaverton, and the Tittabawassee River. Urbanized areas take up approximately 2.8% of the County's land area. The majority of development in urbanized areas involves tourist and resort attractions. Inland waters and wetlands comprise over 10.4% of the County's surface area.

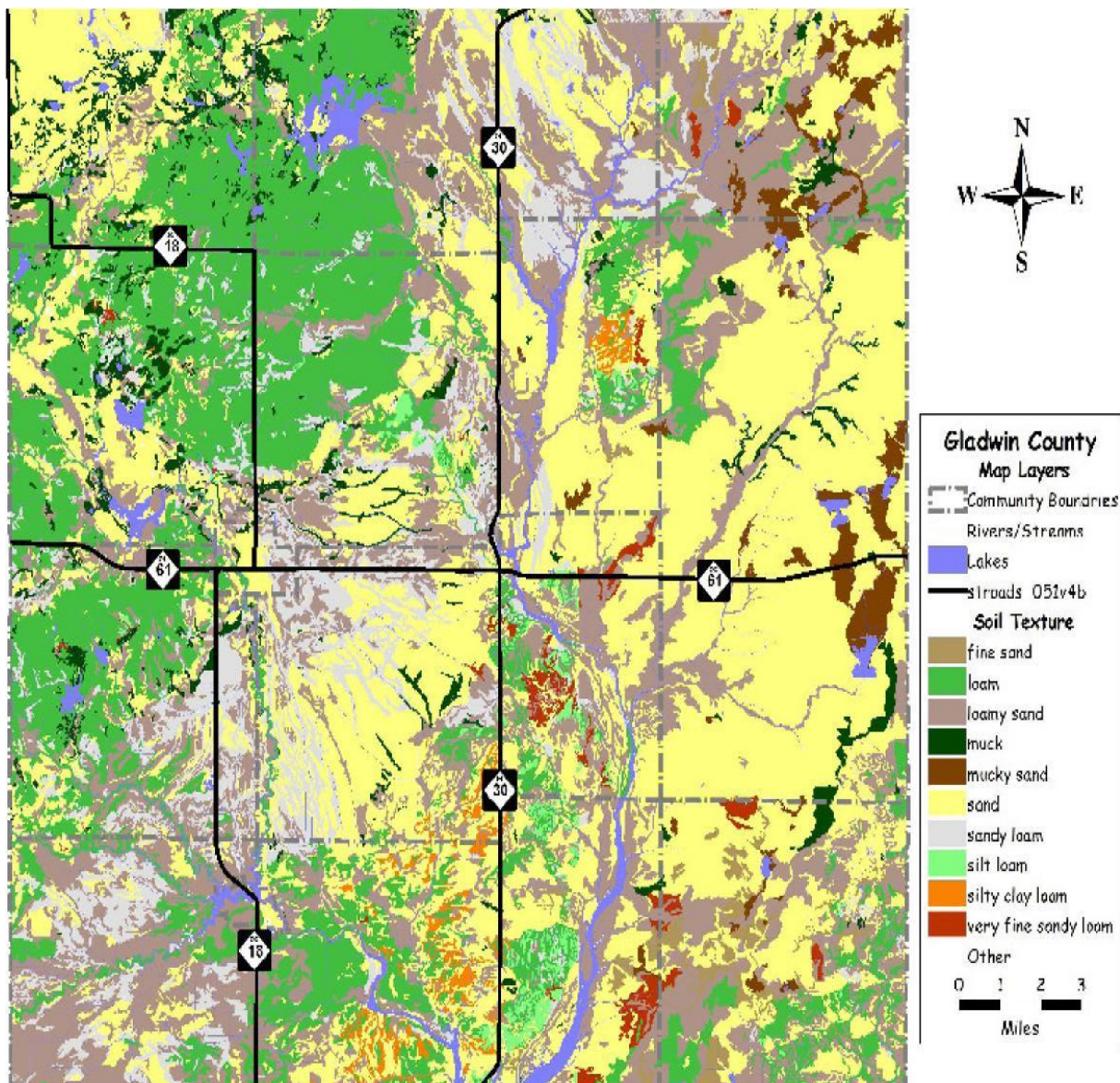
All of the townships and cities in Gladwin County have prepared Land Use and/or Zoning Ordinances. Gladwin County has a Planning Commission that oversees zoning for Beaverton Township, Bentley Township, Bourret Township, Buckeye Township, Butman Township, Gladwin Township, Grim Township, Grout Township, Hay Township, and Sherman Township. Individual zoning is done by the City of Gladwin, City of Beaverton, Billings Township, Clement Township, Sage Township, Secord Township and Tobacco Township.

Gladwin County Soil Types

MAP 3.6



Soil Texture
MAP 3.7



CLIMATE

Climate has a strong influence on the way of life and the activities of the people of Gladwin County. It is considered a continental type of climate which is characterized by larger temperature ranges than in areas at the same latitude near the Great Lakes which have moderated temperatures. As a result of the prevailing westerly winds, this region experiences some lake effect snow. Like the rest of the State, the County has four distinct seasons that allow for a wide variety of outdoor activities. Generally, January is the coldest month (23.7 degrees F average daily maximum temperature) while July is the warmest month (83.7 degrees F average daily maximum temperature). Average precipitation for Gladwin County stands at 30.48 inches per year, with most occurring as rainfall between April 1 and September 30. Snowfall

averages slightly less than 44 inches per year but is subject to wide variations from year to year. Prevailing winds are from the southwest and are generally strongest in March.

Gladwin County enjoys a relative mild continental climate which is moderated by the proximity of the Great Lakes (SCS, 1972).

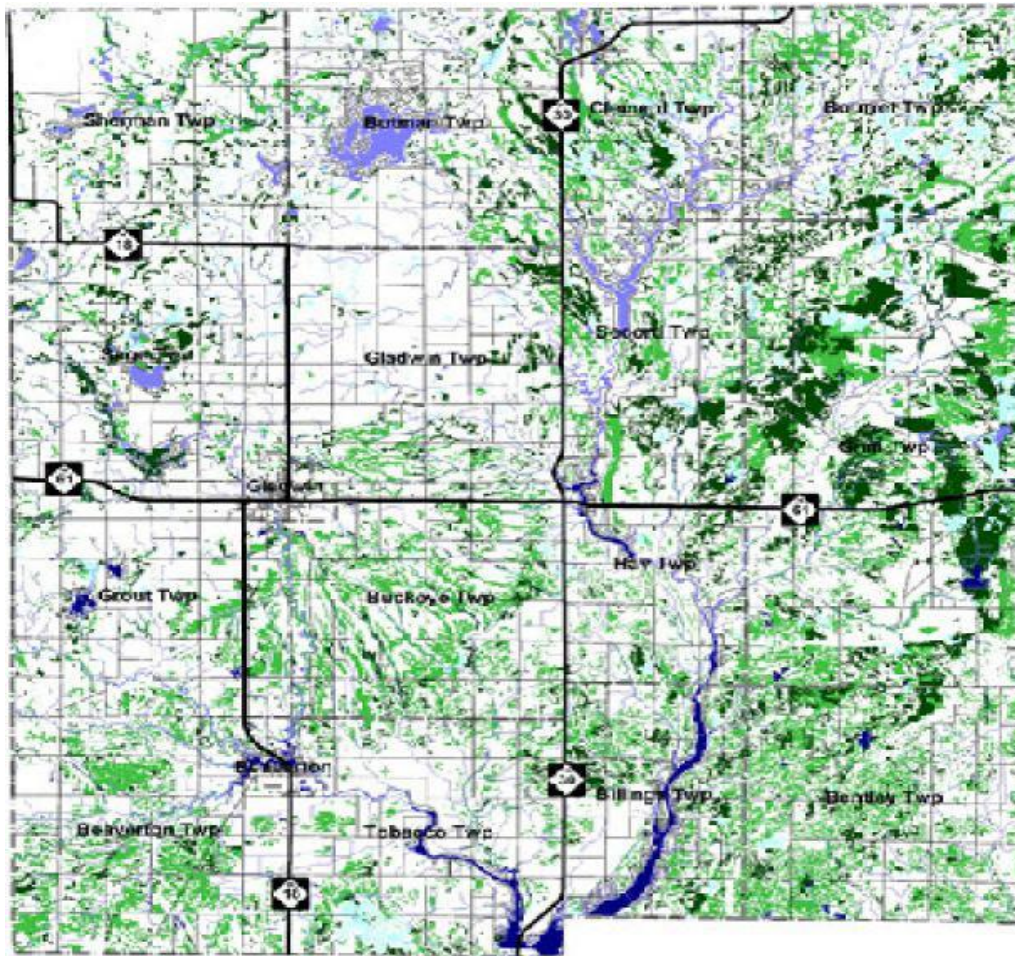
WATER FEATURES AND WETLANDS

Gladwin County has a variety of water features such as rivers, streams, lakes and wetlands. The County has more than 6,000 acres of lake surface area and 20,000-acres-of wetlands. Together they account for approximately eight (8) of the County's total acreage-

There are 14 lakes that occupy 50 or more acres within the County. These lakes, along with the Tittabawassee and Cedar Rivers provide ample opportunity for water-related activities, such as fishing and boating. The most significant lakes include: Wixom Lake, Secord Lake, Lancer/Lancelot Lake, Wiggins Lake, Ross Lake, Smallwood Lake, and Pratt Lake.

Wetlands are defined by the existence of water, either on or near the surface for a portion of the year and by the type of vegetation present. Wetlands may have many names and are often referred to as bogs, marshes, and swamps. Wetlands are an important resource to the people of Gladwin County. They improve the water quality of lakes and streams by filtering polluting nutrients and chemicals. More importantly, wetlands recharge aquifers, support wildlife and vegetation, and protect shorelines from erosion. See following table for detail.

Gladwin County Wetlands MAP 3.8



Native Vegetation

Originally, Gladwin County was covered with a dense mixture of coniferous (white pine) and deciduous (oak and maple) forests. In the late 1800's the County's forests were cleared leaving an open landscape littered with stumps. Much of the land was converted to farmland or as ranch land.

Current Vegetation

Today, Gladwin County has a mixture of open farmland and forested areas. The southern portion of the County is predominantly farmland with smaller forest areas found along rivers, streams, and wetlands. The northern portion of the County is predominantly forest land with some open farmland. The Pere Marquette State Forest encompasses a large area in northwest Gladwin County and is the current location of the Kirtland Warbler habitat area. The area was either burned or clear cut and replanted naturally or by humans with jack pine, which the Kirtland Warble requires for nesting and breeding.

Forest Cover

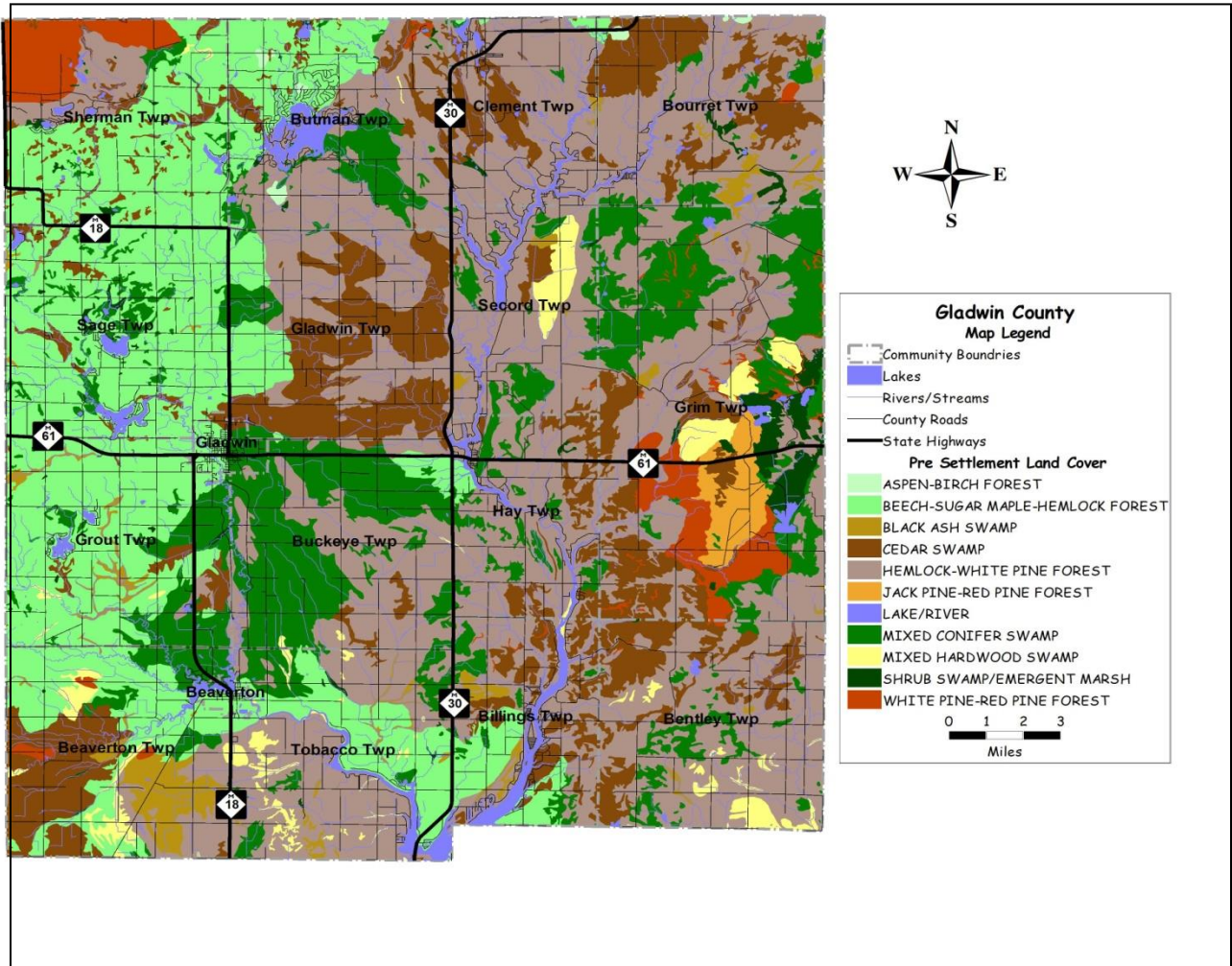
About 53 percent of the county is forested and, an analysis of forest types will assist in defining vulnerable areas and populations. The Michigan Resource Information Systems (MIRIS) 1978 land use inventory compiled land cover maps that depict forest types in the county (Map 3.10). Tree species vary depending

upon the soils, moisture and past activities such as logging, fires and land clearing. Aspen-Birch, central hardwoods, and pine are the most common forest types. Under dry spring conditions forest fires can occur in any forest type. However some forest types have higher risks. Jack and red pine forests have a high risk for wildfires. Oak and white pine forests have a moderate risk for wildfires. Draughty, low fertility sandy soils, found in outwash plains and channels, supported pre-settlement pine forests that for thousands of years were perpetuated by wildfires. Today, residential development has occurred within the same wildfire prone areas. There is a concentration of pine forest types in Grim, Bentley, Billings, Tobacco, Buckeye, Gladwin, and Sherman Townships.

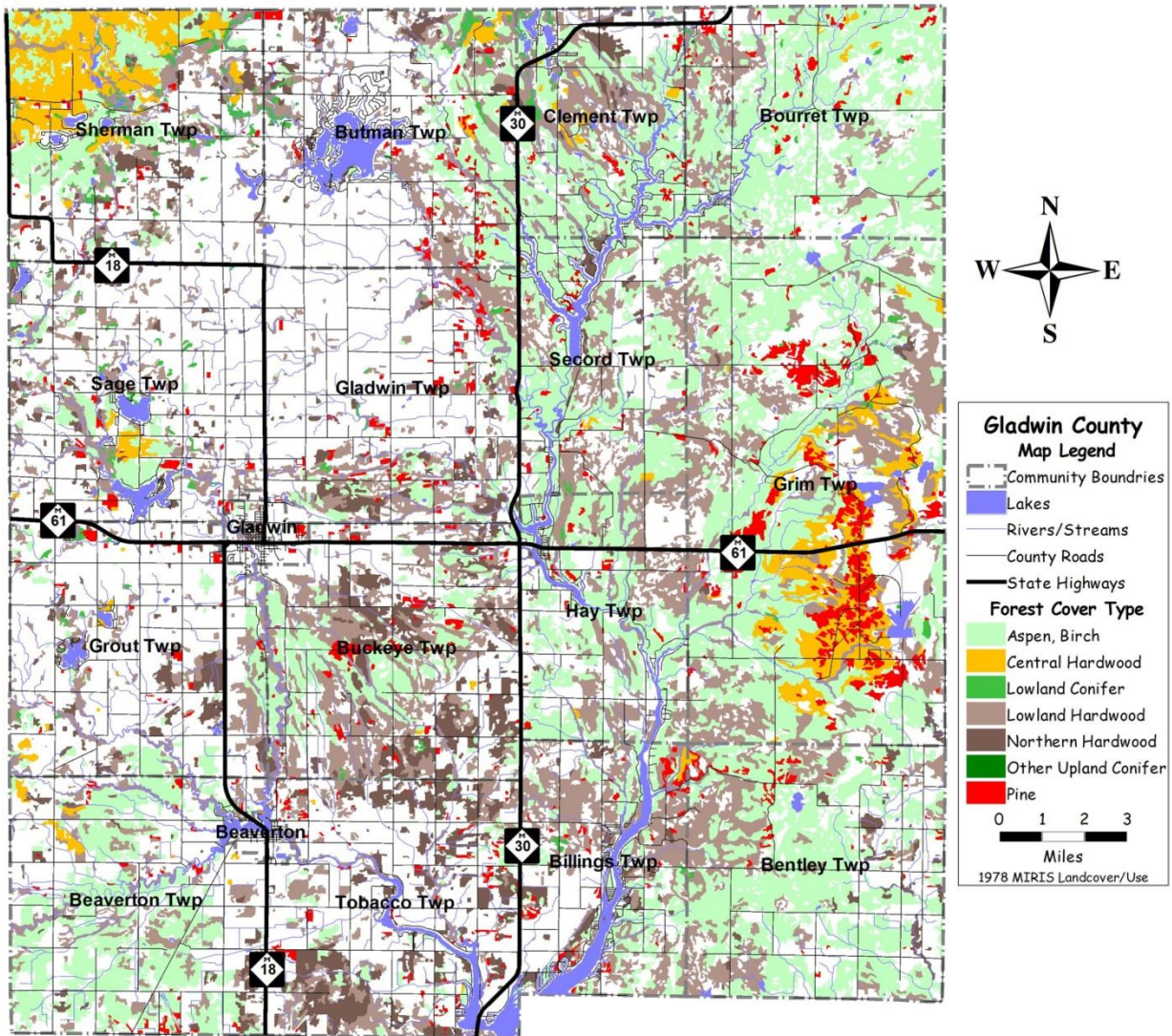
Red jack and white pine forest types are included in the pine forest category. Bigtooth aspen, quaking aspen, white birch, red maple and red oak are the primary tree species found in the aspen-birch type. Red oak, white oak, black oak and northern pin oak are the primary species growing in the oak forests. Northern hardwoods include species such as sugar maple, red maple, American beech, basswood and yellow birch.

Poorly drained, lowland areas support northern white cedar, tamarack, balsam fir, black spruce, eastern hemlock, white pine, balsam poplar, trembling aspen, paper birch, black ash, speckled alder and shrub willows. Northern white cedar dominates the wetland areas where there is good lateral water movement and the soils are high in organic content. Lowland forests are typically located adjacent to water features and function as riparian forests and water quality buffers. The network of lowland forests, associated with rivers and creeks, also function as wildlife corridors and are the backbone of large regional ecological corridors. Lowland forests adjacent to the Great Lakes are prone to flooding during periods of high lake levels. Lowland forests adjacent to rivers and streams are prone to flooding during the spring snowmelt, particularly when combined with heavy spring rains. Extensive areas of lowland forests can be found along the Tittabawassee River with large areas scattered throughout the county.

Gladwin County Pre-Settlement Land Cover
MAP 3.9



Gladwin County Existing Forest Cover Type
MAP 3.10



COMMUNITY ORGANIZATION AND RESOURCES FOR HAZARD MITIGATION including County and Local Community Agencies, Departments and organizations potentially relevant for Hazard Mitigation.

Emergency Services

Emergency services are very important for the Hazard Mitigation Process. These services help serve the public in times of natural disasters and other emergency situations. It is crucial for the public to know where these services exist and how to reach them in times of need.

PUBLIC SAFETY

Emergency Operations Plan

Gladwin County has an official Emergency Operations Plan in effect. The County has an Office of Emergency Management and an Emergency Management Director.

Gladwin County Office of Emergency Management

555 West Cedar
Gladwin, MI 48624
989-426-6871
FAX: 989-426-0555

This office was established under the provisions of the Michigan Emergency Management Act, PA 390 of 1976, as amended, to ensure a coordinated public response in the event of a natural or man-made disaster. The purpose of Emergency Management is to plan and prepare for high impact, low probability events. The Gladwin County Emergency Management office assesses local capabilities to respond to emergency and disaster situations, and advocate emergency preparedness in both the public and private sectors and works to assure a comprehensive approach is used involving a range of public and private agencies including local police, fire and EMS agencies, the Michigan State Police Emergency Management and Homeland Security Division, the Michigan Department of Environmental Quality, the Homeland Security Board and the National Weather Service. Other agencies coordinating with emergency management include the American Red Cross, local and state health departments, educators and amateur radio operators. This office tends to be central for all major threats and incidents within the county. This office also handles all 211 Services, NOAA Weather alerts, Broadband, and Homeland Security matters.

Warning Sirens or System

Gladwin County has five (5) active warning sirens; one in Billings Township, one in Butman Township, one in Secord Township, one in the City of Gladwin and one in the City of Beaverton.

Police

The Gladwin County Sheriff Department is located in the City of Gladwin. There are two (2) local police departments in the county that have certified officers with the power to arrest. The County jail is the only lock-up facility in the county and is used by local police departments.

Gladwin County Sheriff's Department
501 W. Cedar Ave.
Gladwin, MI 48624
989-426-9284

Gladwin City Police Department
109 S. Park
Gladwin, MI 48624
989-426-7879
police@gladwin.org

Beaverton Police Department
126 W. Brown Street
Beaverton, MI 48612
989-435-9111
beavertonpolice@yahoo.com

Fire

All units of government within Gladwin County depend on volunteer fire departments. In addition the County has an unwritten/mutual aid policy with all surrounding out-of-county fire districts and all fire districts are included in the E-911 system.

Health Care

Central Michigan District Health
103 N. Bowery Ave.
Gladwin, MI 48624
989-426-9431

Community Mental Health for Central Michigan
343 W. Cedar Ave.
Gladwin, MI 48624
989-426-9295

Mid-Michigan Medical Center – Gladwin
515 Quarter St.
Gladwin, MI 48624
989-426-9286
25 Beds

Medical Examiner
401 W. Cedar Ave.
Gladwin, MI 48624

Drain Commission

555 W. Cedar Ave.
Gladwin, MI 48624
989-426-7561

County Parks

Calhoun Campground
3908 Roehrs Rd.
Beaverton, MI 48612
989-435-2100

Gladwin City Park
100 S. Cayuga St
Gladwin, MI 48624
989-426-8126

Gladwin County Recreational Area
(Old Sportmans Club)
1365 N. Shaw Rd.
Gladwin, MI 48624

Leo Ross Memorial Park
Knox and Third Streets
Beaverton, MI 48612

Ross Lake Park
M-18
Beaverton, MI 48612

Government Facilities

Government facilities may have a large impact on how emergencies are handled. They provide services to the public such as shelter in times of natural disasters. They also serve as a way to distribute information on how to handle emergency circumstances.

Government Offices and Facilities (Main Office Locations)

Gladwin County
401 W. Cedar Ave.
Gladwin, MI 48624
989-426-4821

Cities

City of Beaverton
124 West Brown Street, P.O. Box 477
Beaverton, MI 48612
989-435-9343
FAX – 989-435-3223

City of Gladwin
1000 W. Cedar Ave.
Gladwin, MI 48624
989-426-9231

Townships

Beaverton Township
Corner of Dale and Townhall Roads
989-435-3602

Bentley Township
4013 Estey Road
Rhodes, MI 48652
989-879-2531

Billings Township
1050 Estey Rd.
Beaverton, MI 48612
989-435-8430

Bourret Township
School Road
Alger, MI 48610
989-345-2833

Buckeye Township
1498 S. Hockaday Rd.
Gladwin, MI 48624
989-426-7782

Butman Township
5005 N. Hockaday Rd.
Gladwin, MI 48624
989-426-4351

Clement Township
1497 East M-30,
Alger, MI 48610
989-345-3915

Gladwin Township
2001 Wagarville Road
Gladwin, MI 48624
989-426-0588

Grim Township
6399 Bay-Gladwin Line Rd.
Bentley, MI 48613
989-846-6754

Grout Township
1490 S. Grout Rd.
Gladwin, MI 48624
989-246-0871

Hay Township
1220 E. Highwood Rd.
Beaverton, MI 48612
989-426-1821
989-246-3112

Sage Township
1831 North Pratt Lake Road
Gladwin, MI 48624

Secord Township
1507 Secord Dam Rd.
Gladwin, MI 48624
989-426-7445

Sherman Township
4013 Oberlin Rd.
Gladwin, MI 48624
989-246-2276

Tobacco Township
1826 Dale Road
Beaverton, MI 48612
989-435-3921

AMBULANCE

There is one ambulance service covering Gladwin County. That service is operated by the Mid-Michigan Medical Center and is support by a county-wide millage.

Mid-Michigan Medical Center – Gladwin
515 Quarter St.
Gladwin, MI 48624
989-426-9286
989-426-9305 (Ambulance Service)

HEALTH CARE

Gladwin County has one hospital, Mid-Michigan Medical Center - Gladwin a 25-bed acute care facility with ten (10) physicians (MD's and DO's). The hospital provides a range of services that include hospital care, outpatient care, urgent care, home care, nursing home care, and wellness. There is also a county health department, a community mental health department and two (2) extended care facilities located in the county. The hospital is fully accredited by the Joint Commission on Accreditation of Healthcare Organizations. There are also a number of dentists, optometric centers, chiropractors and related medical services available to residents. The nearest large medical center in Midland is 35 miles away.

Mid-Michigan Medical Center-Gladwin
515 Quarter St.
Gladwin, MI 48624
989-426-9286

Central Michigan District Health
103 N. Bowery Ave.
Gladwin, MI 48624
989-426-9431

Community Mental Health for Central Michigan
343 W. Cedar Ave.
Gladwin, MI 48624
989-426-9295

EDUCATIONAL FACILITIES

There are six (6) school districts serving Gladwin County with two schools districts serving the majority of Gladwin County residents. The Beaverton Rural Schools and the Gladwin Community Schools serve the majority of the County, with Harrison Community Schools, Pinconning Area Schools, Standish-Sterling Community Schools, and West Branch-Rose City Area Schools serving smaller pockets of residents throughout the County. There are four (4) private schools in Gladwin County; Christian Word Center, Skeels Northern Christian School and the Charter school Creative Learning Academy. There are nine (9) public schools in Gladwin County serving an estimated 3,312 students.

Limited vocational training is offered at both high schools. Advanced vocational training can be obtained from Mid-Michigan Community College in Harrison and Kirtland Community College in Roscommon, and Delta College, University Center, Michigan. Adult education classes are offered throughout the County in area schools. Four year colleges, within commuting distance of the County, are Northwood Institute in Midland, Saginaw Valley State University in Saginaw, Central Michigan University in Mount Pleasant, and Ferris State College in Big Rapids.

The School System

Gladwin Elementary School
600 West 1st
Gladwin, MI 48624-1212
989-426-7771

Gladwin Intermediate School
780 West 1st Street
Gladwin, MI 48624-1009
989-426-4531

Gladwin Community Schools
401 N. Bowery, 2nd floor
Gladwin, MI 48624
989-426-9255
FAX: 989-426-5981
www.gladwinschools.net

Beaverton Junior-Senior High School
3090 Crockett Road
Beaverton, MI 48612
989-246-3010
www.brs.cgresd.net

Gladwin High School
1400 N. Spring Street
Gladwin, MI 48624
989-426-7341
www.gladwinschools.net

Creative Learning Academy
540 Lang Road
Beaverton, MI 48612
989-435-8252

Skeels Christian School (Private)
3956 N. M-13
Gladwin, MI 48624
989-426-2054
(Pre-school through grade 12)
www.skeelschristian.net

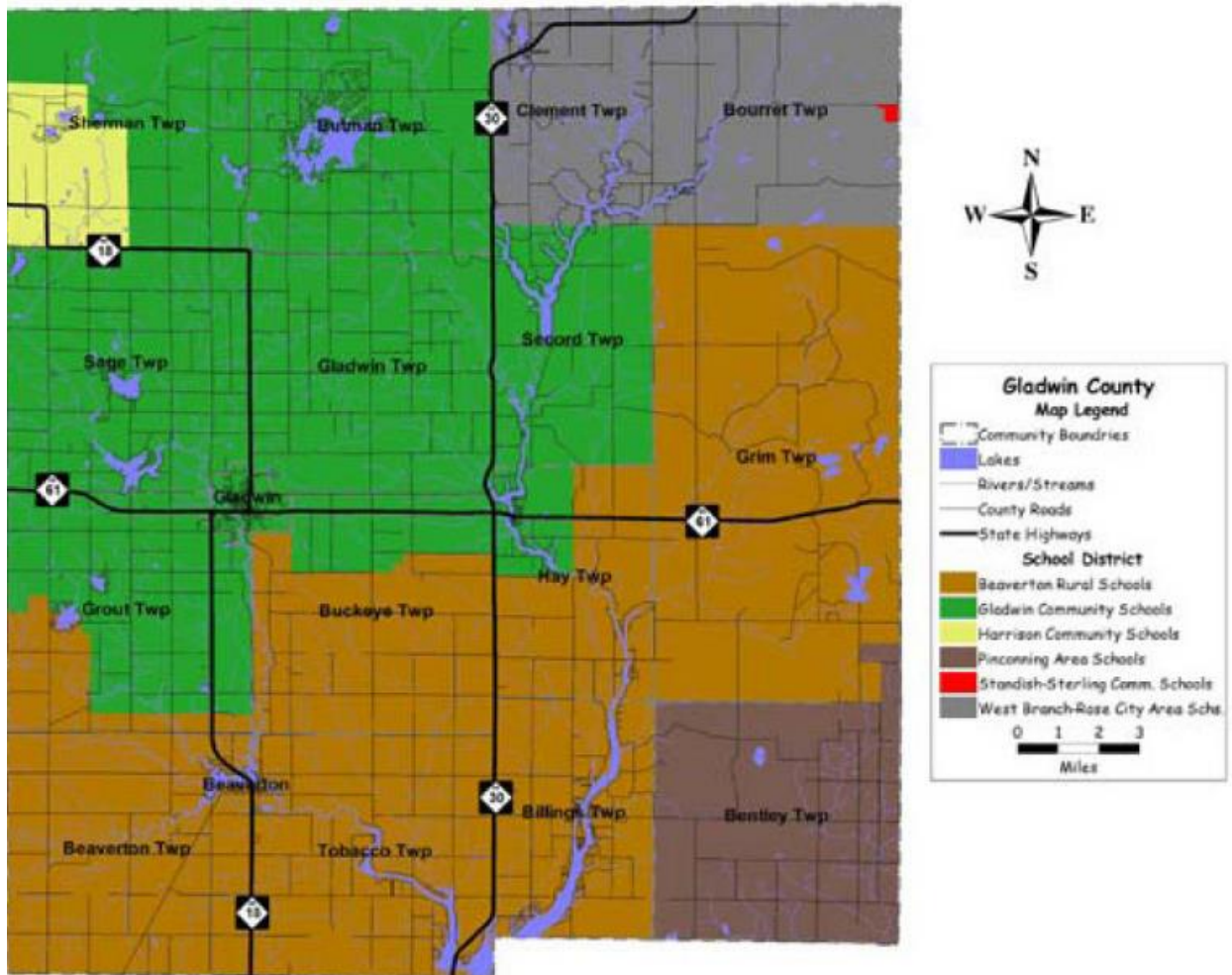
Clare-Gladwin RESD
4041 E. Mannsiding Road
Clare, MI 48627
989-386-3851
Fax: 989-386-3238
www.cgresd.net

Gladwin County School Enrollment

TABLE 3.5

School	Enrollment	Grades
Beaverton Junior Senior High School	560	7-12
Beaverton Elementary School	560	K-6
Creative Learning Academy	60	K-8
Gladwin Community Alternative High School	38	9-12
Gladwin Elementary	391	K-2
Gladwin High School	560	9-12
Gladwin Intermediate	436	3-5
Gladwin Junior High	431	6-8

Gladwin County School Districts MAP 3.11



HUMAN SERVICES

There are six (6) Senior Centers serving individuals in the cities of Gladwin and Beaverton. The County is also served by the Salvation Army.

There are a number of financial institutions in the county, including Chemical Bank-Michigan in Beaverton with two (2) branches in Gladwin and one (1) in Edenville; Comerica-Midland branch in Beaverton, and the PNC Bank.

Gladwin has several civic and business associations that contribute greatly to the area; i.e., Chambers of Commerce, Lion's Club, Kiwanis, Knights of Columbus, Eastern Star, Masons, etc.

The Gladwin County Fairgrounds leases 24.5 acres from the Airport. The Fair and Fairgrounds serve key roles in the County in agriculture enhancement and recreation.

UTILITIES, SEWER & WATER

Consumers Energy supplies most of the county with natural gas and electricity. Michigan Consolidated Gas Company serves Butman and Sherman Townships. Ameritech (SBC) provides all telephone service.

Both the City of Gladwin and the City of Beaverton provide water and sewer service to city residents utilizing a municipal well-based system. Billings and Butman Townships also provide sewers to limited areas.

TRANSPORTATION

There are three major state-owned highways in Gladwin County. M-18 and M-30 are north/south trunk lines while M-61 is a major east/west trunk line. The county and local governments maintain the remaining road networks. The county has 83 miles of state trunk lines, 264 miles of paved county roads, and 616 miles of gravel and fall under the purview of the Gladwin County Road Commission.

Gladwin County Road Commission

301 S. State St.

Gladwin, MI 48624

989-426-7441

Info@gladwinroads.com

www.gladwinco/road

Railroads

Currently, there are no active rail lines within Gladwin County. No new service to any portion of Gladwin County is foreseen in the future.

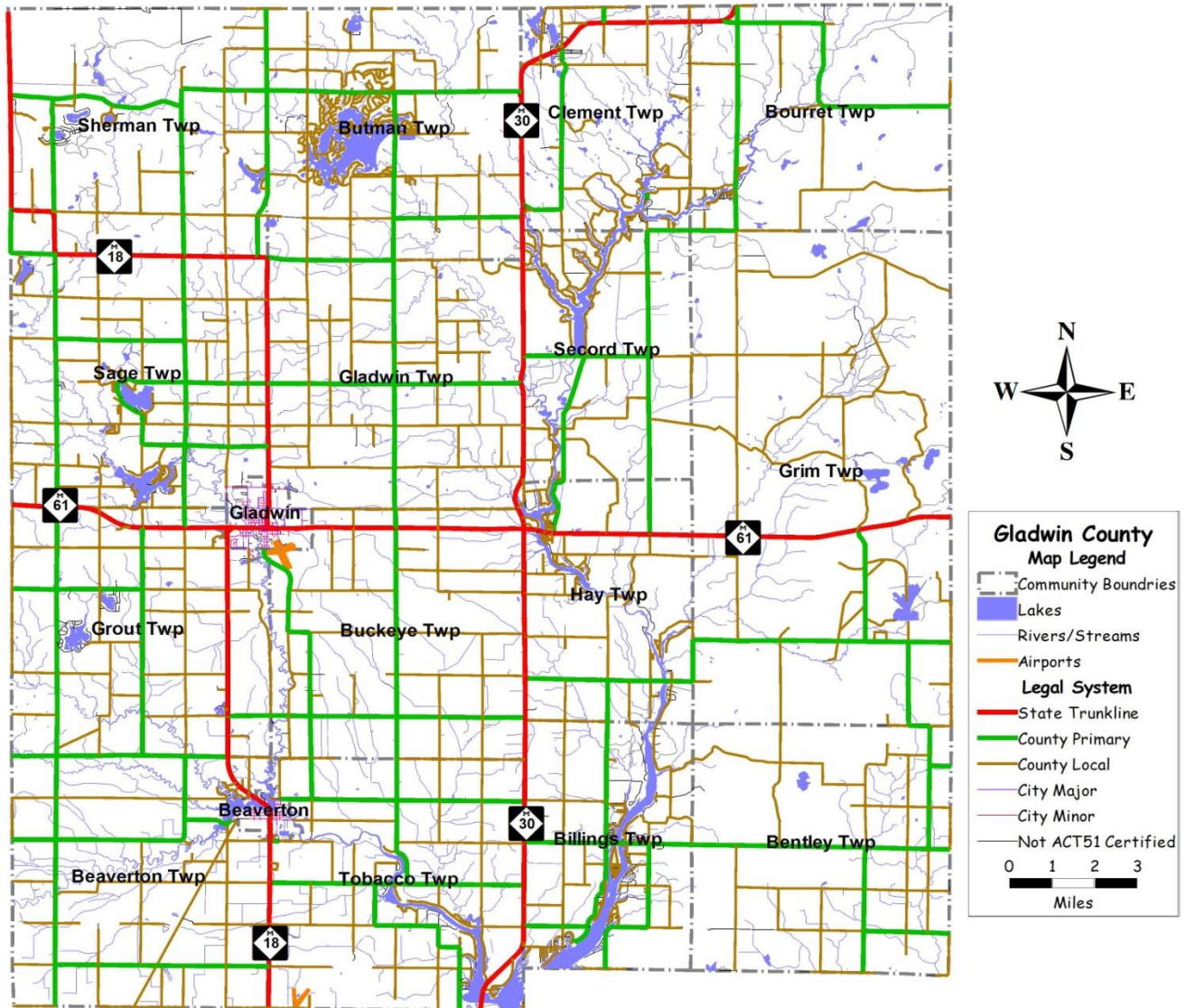
Shipping Ports

The nearest shipping port is located in Bay City and Saginaw (Lake Huron) with Ludington being the closet port on Lake Michigan.

Airports

General aviation and or freight air service is available at the airport outside of Gladwin. The Gladwin Zettel Memorial Airport is a public use airport located one nautical mile southeast of the central business district of the City of Gladwin. The airport is owned by the city and the county. The airport covers an area of 300 acres. It has two runways; one with an asphalt surface and one with a turf surface. The Airport is located at 735 South State Street, Gladwin, Michigan 48624. The telephone for the airport is (989) 426-4201. The nearest major airport service is at the MBS International Airport located in Freeland, MI.

Gladwin County Road System MAP 3.12



Public Transportation

The Gladwin City/County Transit System operates within the city limits of Gladwin and serves the cities of Gladwin and Beaverton as well as the total county. In addition, it has an agreement with Clare County to transport riders to and from Gladwin County to Mid-Michigan Community College in Harrison.

There are no interstate bus services available within the county. Indian Trails is available along the I-75 and US-23 corridor and Greyhound lines along the US-10 and US-27 corridor.

Gladwin City/County Transit

615 Weaver

Gladwin, MI 48624

989-426-6514

<http://www.gladwin.org/housing/transit.htm>

GLADWIN COUNTY (2010 population: 25,692)

Gladwin County Drain Commissioner

444 West Cedar, Gladwin, MI 48624

989-426-7561

<http://www.gladwinco.com/draincom.htm>

The mission of this office is to provide for the health, safety and welfare of Gladwin County citizens, the protection of surface waters and the environment, and to promote the long-term environmental sustainability of Gladwin County by providing storm water management, flood control, soil erosion controls and education. The office is particularly relevant for hydrological hazards.

Central Michigan District Health

255 West Main, Harrison, MI 48625

989-539-6731

<http://www.cmdhd.org/>

The mission of the Central Michigan District Health Department exists to promote health and physical well-being by providing preventive health care, education and environmental safety to all members of the community and to become recognized by the public as the local advocate in promoting, assessing and safeguarding public health and the environment. This will be done through coordinated planning, resource development, and service delivery. The human impacts of hazards may require their involvement. Public health emergencies threatening the area would certainly involve this department.

Michigan State University Extension – Gladwin Office

555 West Cedar, Ste. A, County Library Building, Gladwin, MI 48624

989-426-7741

FAX: 989-426-6781

Msue26@msu.edu

The office is involved in various educational and outreach activities involving agriculture and health. They should be valuable in events concerning such matters, such as droughts, pandemics, etc.

Gladwin County Economic Development Corporation

110 Buckeye St., Gladwin 48624

989-426-8571

FAX: 989-426-2992

<http://www.gladwincountymeansbusiness.com/>

The Gladwin County EDC provides business information and business support in Gladwin County Michigan.

Gladwin County Planning Commission

401 West Cedar, Gladwin, MI 48624

989-426-4821

FAX: (989) 426-4281

The mission of the Gladwin County Planning Commission is to assist with the creation of a healthy, safe and sustainable community of choice, through leadership, education, partnerships and stewardship of resources and assets.

Gladwin County Road Commission

301 South State Street, Gladwin, MI 48624

989-426-7441

info@gladwinroads.com

www.gladwinco/road

The Gladwin County Road Commission uses their expertise, energy, and funds to provide the safest and most convenient road system possible, and contributes to economic development and the high quality of life throughout the county. Their goal is to maintain a county road system that is safe and convenient for public travel and to manage the roadside environment, with a view toward preservation.

Gladwin County Sheriff's Office

501 West Cedar, Gladwin, MI 48624

989-426-9284

<http://www.gladwinco.com/sheriff.htm>

The Sheriff's Office provides law enforcement and services to protect the lives and property of Gladwin County citizens—enforcing State laws and local ordinances, investigating crimes, and detaining prisoners remanded to the county jail. This is accomplished in a manner that maintains the highest degree of professional excellence, integrity, and courtesy. Sheriff's Office personnel would be involved in protective actions during a serious community emergency.

Gladwin County Transit Corporation (CCTC)

615 Weaver Street, Gladwin, MI 48624

989-426-6514

<http://www.gladwin.org/housing/transit.htm>

The purpose of the Gladwin County Transit Corporation is to plan, promote, finance, acquire, improve, enlarge, extend, own, construct, operate, maintain, replace, and contract for public transportation service by means of one or more public transportation systems and public transportation facilities within the jurisdictional boundaries of the County of Gladwin. They may have resources useful for the transportation or evacuation of residents during emergency situations.

CITY OF GLADWIN (2010 population: 2,933)

1000 West Cedar, Gladwin, MI 48624

989-426-9231

Fax: (989) 426-6942

www.gladwin.org

Founded in the 19th Century, the city provides a diverse mixture of old and new. The city is one of two main population centers, transportation nodes, and urban focus within the county. The following city department is the most relevant to emergency management and hazard mitigation considerations.

Gladwin City Public Works

555 West Cedar, Gladwin, MI 48624

989-426-6943

<http://www.gladwin.org/public.htm>

The department oversees the provision of city services such as waste disposal, fresh water supply, and storm drainage systems. They would have important resources to help deal with disasters or emergencies involving debris, water, and drainage systems.

City of Beaverton Public Works

130 Saginaw Street
Beaverton, MI 48612
989-435-7073

The department oversees the provision of city services such as waste disposal, fresh water supply, and storm drainage systems. They would have important resources to help deal with disasters or emergencies involving debris, water, and drainage systems.

AUTHORITIES, CENTERS, PROGRAMS, ETC. THAT ADDRESS VARIOUS HAZARDS**Sabotage/Terrorism/Weapons of Mass Destruction (WMD)**

The federal Office of Homeland Security coordinates the many counter-terrorism functions scattered across numerous federal agencies and organizations, and works closely with state and local police and fire agencies, emergency response teams, and emergency management agencies in formulating and carrying out the National Homeland Security Strategy.

Metropolitan Medical Response System:

One of the key features of the federal response element is the formation of highly skilled and mobile Metropolitan Medical Response Systems (MMRS) to provide medical care in incidents involving nuclear, chemical or biological terrorism. The nearest MMRS facility is in Grand Rapids. In case of an incident that may involve nuclear, chemical or biological weapons, this MMRS would be mobilized to provide initial, on-site response, in addition to providing for patient transportation to hospital emergency rooms. The MMRS are self-contained and capable of providing both medical and mental health care to victims. Should local health care resources be overrun, they will assist in preparing to move victims to other regions. The U.S. Department of Health and Human Services (HHS) coordinates the MMRS program. The West Michigan Metropolitan Medical Response System in Grand Rapids has a goal of coordinating the efforts of local law enforcement, fire, HAZMAT, EMS, hospital, public health and other personnel to improve response capabilities in case of a terrorist attack.

51st WMD Civil Support Team

The Michigan National Guard, 51st Western Military District (WMD)/Civil Support Team, provides additional support for the RRTN. Stationed at Fort Custer (Battle Creek), the 51st WMD/Civil Support Team deploys to a WMD or suspected WMD incident in support of the local incident commander to: assess a suspected nuclear, chemical, biological or radiological event; advise the Incident Commander on appropriate courses of action to protect the local population; assist with appropriate requests for state additional support. They also provide informational briefings, exercises, and cross training activities with state and local first responders.

SNS – The Strategic National Stockpile Program:

Presidential Decision Directive 62, issued by President Clinton in May 1998 ordered federal agencies to take significantly expanded and better-coordinated steps to protect against the consequences of biological and other unconventional attacks, especially potential bio-terrorism directed at civilian populations. One of the major bio-terrorism initiatives of the U.S. Department of Health and Human Services (HHS) in response to this PDD is the development of the Strategic National Stockpile – a national repository of lifesaving pharmaceuticals and medical materials that will be delivered to the site of a major medical emergency in order to reduce morbidity and mortality in civilian populations. The decision to

send the SNS is a collaborative effort between local, state, and federal officials in a process whereby local health departments and emergency management officials contact the Michigan State police Emergency Management Division, and state health officials who recommend to the Governor that a formal request for the SNS is made to the CDC.

The stockpile is activated to support a local and or state response to an emergency within the US or its territories. The two major components of the stockpile are the 12 Hour Push Pack and the Vendor Managed Inventory (VMI). Push Packs contain 50 tons of medical material that will treat a variety of illnesses. The VMI will re-supply the Push Pack or supplies will be sent immediately to the emergency site if the biological agent is known.

School Safety Information Act: 102 P.A. 1999:

In response to the rash of school shootings that occurred in the late 1990s, the Michigan Legislature passed Act 102 in July 1999 – The Michigan School Safety Information Act – which requires local school districts to meet with law enforcement officials to develop emergency plans to handle violent situations. School superintendents are then required to educate local communities about the plans. The plans spell out, among other things, how to evacuate schools, bring first aid and emergency resources to the scene, and handle parents that want to pick up their children. The law also requires the development and implementation of a statewide school safety information policy, the reporting and compiling of certain school safety information, and the expulsion of pupils for certain assaults.

H.B. 4713 – Act 12 of Public Acts of 2014 February 2014:

The bill amends the Fire Prevention Code to modify school drill requirements. The bill also requires the governing body of a school to adopt and implement a school cardiac emergency response plan. The bill takes effect on July 1, 2014. Currently, a school that operates any of grades kindergarten through 12 must hold at least six fire drills and two "lockdown" drills during each school year. The bill requires a K-12 school to hold a minimum of five fire drills and three lockdown drills, according to a schedule prescribed in the bill. The Code requires a K-12 school to hold at least two tornado safety drills for each school year. Under the bill, at least one tornado safety drill would have to be held in March.

The bill would require the governing body of a K-12 school to ensure that documentation of a completed school safety drill was posted on its website (or on its intermediate school district's website) within 30 days of completing the drill, and maintained for at least three years. By September 15, the chief administrator of a K-12 school would have to give a list of scheduled drill days to the county emergency management coordinator, who would have to provide the information to the local emergency management coordinator, if any, and certain local officials. This information would be exempt from disclosure under the Freedom of Information Act. If a drill were not conducted as scheduled, it would have to be rescheduled and the chief administrator would have to notify the county emergency management coordinator of the rescheduled date. The governing body of a school that operates any of grades kindergarten through 12 would have to adopt and implement a cardiac emergency response plan for the school. The plan would have to address all of the following: use and maintenance of automated external defibrillators (AEDs), if available; activation of a cardiac emergency response team during an identified emergency; effective and efficient communication throughout the school campus; a training plan for the use of an AED and CPR techniques, in a school with grades 9 to 12; integration of the local emergency response system and emergency response agencies with the school's plan; and an annual review and evaluation of the cardiac emergency response plan.

Michigan Office of Safe Schools:

In 1998 the Michigan Legislature established the Michigan Office of Safe Schools within the Michigan Department of Education. The Office of Safe Schools began operating in October of 1999. Its mission is to collect and distribute information about school safety. The Office of Safe Schools maintains a web site that serves as a one-stop clearinghouse for information on school safety, school bus safety, food safety and current and proposed school safety legislation.

In March 2001, the Michigan Office of Safe Schools established a toll-free School Violence Hotline to provide a means for students to anonymously report specific threats of imminent school violence or other suspicious or criminal conduct. The toll-free hotline is operational 24-hours per day, 365 days a year, at 1-800-815-TIPS.

Michigan State Agencies:

Sabotage/terrorism is being addressed on a variety of other fronts within Michigan State Government. The Michigan Department of State Police oversees and coordinates state agency actions related to homeland security and terrorism response – including the investigation of suspected or potential criminal enterprises and activities that might involve sabotage or terrorism. In addition, the State Police (in conjunction with other state agencies as well as federal and local counterparts) continuously prepares for terrorist incidents through emergency planning, training, information sharing and exercising efforts.

Earthquakes

In January 1990, Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, was signed into law. This EO requires that appropriate seismic design and construction standards and practices be adopted for any new construction or replacement of a federal building or federally-funded building during or after an earthquake.

Weather Hazards (General)**National Weather Service Doppler Radar:**

The National Weather Service (NWS) has completed a major modernization program designed to improve the quality and reliability of weather forecasting. The keystone of this improvement is Doppler Weather Surveillance Radar, which can more easily detect severe weather events that threaten life and property. The lead-time and specificity of warnings for severe weather have improved significantly. Doppler technology calculates both the speed and the direction of motion of severe storms. By providing data on the wind patterns within developing storms, the new system allows forecasters to better identify the conditions leading to severe weather such as tornadoes, severe straight-line winds, lightning and damaging hail. This means early detection of the precursors to severe storms, as well as information on the direction and speed of storms once they form.

National Weather Service Watches/Warnings:

The National Weather Service issues severe thunderstorm watches for areas when the meteorological conditions are conducive to the development of severe thunderstorms. People in the watch area are instructed to stay tuned to National Oceanic and Atmospheric Administration (NOAA) weather radio and local radio or television stations for weather updates, and watch for developing storms. Once radar or a trained Skywarn spotter detects the existence of a severe thunderstorm, the National Weather Service will issue a severe thunderstorm warning. The warning will identify where the storm is located, the direction in which it is moving and the time frame during which the storm is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately. The State and local government

agencies are warned via the Law Enforcement Information Network (LEIN), NOAA weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet through the Interactive Weather Information Network (IWIN).

National Weather Service Education:

The National Weather Service issues severe thunderstorm watches and warnings when there is a threat of severe thunderstorms. However, lightning, by itself, is not sufficient criteria for the issuance of a watch or warning (every storm would require a watch or warning). The National Weather Service has an extensive public information program aimed at educating citizens about the dangers of lightning and ways to prevent lightning-related deaths and injuries.

Severe Weather Awareness Week:

Each spring, the Emergency Management Division, Michigan Department of State Police, in conjunction with the Michigan Committee for Severe Weather Awareness, sponsors Severe Weather Awareness Week. This annual public information and education campaign focuses on such severe weather events as tornadoes, thunderstorms, hail, high winds, flooding and lightning. Informational materials on lightning hazards are disseminated to schools, hospitals, nursing homes, other interested community groups, facilities, and the public.

Tornado National Weather Service Watches/Warnings:

The National Weather Service issues tornado watches for areas when the meteorological conditions are conducive to the development of a tornado. People in the watch area are instructed to stay tuned to NOAA weather radio and local radio or television stations for weather updates, and watch for developing storms. Once a tornado has been sighted and its existence is confirmed and reported, or Doppler Radar shows strong probability of the development or occurrence of a tornado, the National Weather Service will issue a tornado warning. The warning will identify where the tornado was sighted, the direction in which it is moving and the time frame during which the tornado is expected to be in the area. Persons in the warning area are instructed to seek shelter immediately.

The State and local government agencies are warned via the Law Enforcement Information Network (LEIN), National Oceanic and Atmospheric Administration (NOAA) weather radio and the Emergency Managers Weather Information Network (EMWIN). Public warning is provided through the Emergency Alert System (EAS). The National Weather Service stations in Michigan transmit information directly to radio and television stations, which in turn pass the warning on to the public. The National Weather Service also provides detailed warning information on the Internet, through the Interactive Weather Information Network (IWIN).

Tornado Warning Systems:

Outdoor warning siren systems warn the public about impending tornadoes and other hazards. Most of these systems were originally purchased to warn residents of a nuclear attack, but that purpose was expanded to include severe weather hazards as well. These systems can be very effective at saving lives in densely populated areas where the siren warning tone is most audible. In more sparsely populated areas where warning sirens are not as effective, communities are turning to NOAA weather alert warning systems to supplement or supplant outdoor warning siren systems.

Michigan Office of Fire Safety:

The Michigan Department of Licensing and Regulatory Affairs' Office of Fire Safety is responsible for conducting fire safety and prevention inspections in state-regulated facilities and certain other facilities. Specific services provided include: 1) fire safety inspections of adult foster care, correctional and health care facilities, and hotels/motels; 2) plan review and construction inspections of the regulated facilities in item (1), as well as schools, colleges, universities, and school dormitories; 3) coordination of fire inspector training programs; and 4) coordination of fire alarm and fire suppression system installation in regulated facilities. These activities are important mitigation activities designed to save lives and protect property from structural fire hazards. The State Fire Safety Board, also housed within the Michigan Department of Licensing and Regulatory Affairs, Bureau of Construction Codes and Fire Safety, promulgates rules covering the construction, operation and maintenance of schools, dormitories, health care facilities, and correctional facilities. These rules are designed to protect life and property at these facilities from fire, smoke, hazardous materials and fire-related panic.

Fire Safety Rules for Michigan Dormitories:

Even before the Seton Hall University dormitory fire in January, 2000, the State Fire Safety Board took action to enhance the fire and life safety protection of Michigan's college and university dormitories. On December 21, 1999 two new sets of rules took effect governing the construction, operation, and maintenance of school, college and university instructional facilities and dormitories. These sets of rules were updated to meet the most current nationally recognized standards from the National Fire Protection Association. The new rules adopted the 1997 edition of NFPA 101, Life Safety Code. NFPA standards provide the minimum requirements necessary to establish a reasonable level of fire and life safety and property protection from hazards created by fire and explosion.

The new rules require, among other things, that fire sprinklers be installed in newly constructed dormitories or those undergoing major renovations. However, existing dormitories don't fall under the new rules and therefore do not have to be retrofitted unless they are being renovated.

Wild Fires

Because the vast majority of wildfires are caused by human activity, the Michigan Department of Natural Resources established, in 1981, the Michigan Interagency Wildfire Prevention Group. It was the first such group in the nation (promoting wildfire prevention and awareness) that had the full involvement of the state's fire agencies. In 1993, the Michigan Interagency Wildfire Prevention Group was expanded to form the Michigan Interagency Wildland Fire Protection Association (MIWFPA). The MIWFPA promotes interagency cooperation in fire prevention, training, fire technology, and firefighting operations. Members of the MIWFPA include the: 1) MDNR Forest Management Division; 2) USDA Forest Service - Huron-Manistee, Hiawatha, and Ottawa National Forests; 3) USDI National Park Service - Pictured Rocks and Sleeping Bear Dunes National Lakeshores; 4) USDI Fish and Wildlife Service - Seney National Wildlife Refuge; 5) USDI Bureau of Indian Affairs; 6) Michigan Department of State Police - fire investigation; 7) Michigan State Firemen's Association; and the 8) Michigan Fire Chief's Association. While the risk of wildfires is low, Gladwin County can reduce its vulnerability to wildfires by: 1) participating in multi-state and interagency mitigation efforts.

Riverine and Urban Flooding**National Flood Insurance Program**

For many years, the response to reducing flood damages followed a structural approach of building dams, levees and making channel modifications. However, this approach did not slow the rising cost of

flood damage, plus individuals could not purchase insurance to protect themselves from flood damage. It became apparent that a different approach was needed. The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require a permit for any “development” within the 100-year floodplain; 2) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 3) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); and 4) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed. In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the 100-year floodplain.

The following communities within Gladwin County are recognized by FEMA as participants in the National Flood Insurance Program: Butman Township, Hay Township, and Secord Township. These communities have all had their floodplain areas officially mapped and are in compliance with the NFIP.

Michigan Flood Hazard Regulatory Authorities:

Land Division Act, 591 P.A. 1996, as amended by 87 P.A. 1997:

The Land Division Act governs the subdivision of land in Michigan. The Act requires review at the local, County and state levels to ensure the land being subdivided is suitable for development. From a flood hazards viewpoint, a proposed subdivision is reviewed by the County Drain Commissioner for proper drainage, and for floodplain impacts by the Department of Environmental Quality, Water Resources Division.

Provisions of the Act and its Administrative Rules require that the floodplain limits be defined and prescribe minimum standards for developments for residential purposes and occupancy, within or affected by the floodplain. Restrictive deed covenants are filed with the final plat which stipulates that any building used, or capable of being used, for residential purposes and occupancy within or affected by the floodplain shall meet the following conditions:

- Be located on a lot having a buildable site of 3,000 square feet of area at its natural grade above the floodplain limit. (Lots with less than 3,000 square feet of buildable area may be filled to achieve that area.)
- Be served by streets within the proposed subdivision having surfaces not lower than one foot below the elevation defining the floodplain limits. Have lower floors, excluding basements, not lower than the elevation defining the floodplain limits. Have openings into the basement not lower than the elevation defining the floodplain limits.
- Have basement walls and floors below the elevation defining the floodplain limits, watertight and designed to withstand hydrostatic pressures. Be equipped with a positive means of preventing sewer backup from sewer lines and drains serving the building. Be properly anchored to prevent flotation. Floodplain Regulatory Authority, found in Water Resources, Part 31 of the Natural Resources and Environmental Act, 451 P.A. 1994, as amended.

The State's Floodplain Regulatory Authority found in Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Part 31) restricts residential occupation of high-risk flood hazard areas and ensures that other occupations do not obstruct flood flows. A permit is required from the Department of Environmental Quality for any filling, grading, or occupation of a riverine 100-year floodplain. In general, construction and fill may be permitted in the portions of the floodplain that are not floodway, provided local ordinances and building standards are met. (Floodways are the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the 100-year flood. These are areas of moving water during floods.) New residential construction is specifically prohibited in the floodway. Non-residential construction may be permitted in the floodway, although a hydraulic analysis may be required to demonstrate that the proposed construction will not harmfully affect the stage-discharge characteristics of the watercourse. The Act does not apply to watersheds that have a drainage area of less than two square miles. Those small watersheds are considered to be local drainage systems, and do not fall under Part 31.

Soil Erosion and Sedimentation Control, Part 91 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act seeks to control soil erosion and protect the waters of the state from sedimentation. A permit is required for all earth changes that disturb one or more acres of land, as well as those earth changes that are within 500 feet of a lake or stream. The Act itself does not address flood hazards, per se. However, if sedimentation is not controlled, it can clog streams, block culverts, and result in continual flooding and drain maintenance problems.

Inland Lakes and Streams, Part 301 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act regulates all construction, excavation and commercial marina operations on the State's inland waters. It ensures that proposed actions do not adversely affect inland lakes, streams, connecting waters and the uses of all such waters. Structures are prohibited that interfere with the navigation and/or natural flow of an inland lake or stream. Though reduction of flooding is not a specific goal of this Act, minimizing restrictions on a stream can help to reduce flooding conditions.

Wetlands Protection, Part 303 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

This portion of the Act requires a permit from the Department of Environmental Quality for any dredging, filling, draining or alteration of a wetland. This permitting process helps preserve, manages, and protect wetlands and the public functions they provide – including flood and storm water runoff control. The hydrologic absorption and storage capacity of the wetland allows wetlands to serve as natural floodwater and sedimentation storage areas. The Act recognizes that the elimination of wetland areas can result in increased downstream flood discharges and an increase in flood damage. Permits for wetland alterations are generally not issued unless there is no feasible alternative and the applicant can demonstrate that the proposal would not have a detrimental impact upon the wetland functions.

Natural Rivers Program, Part 305 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

The Natural Rivers Act was originally passed in 1970, and has been incorporated as Part 305 of the Natural Resources and Environmental Protection Act. The purpose of this program is to establish and maintain a system of outstanding rivers in Michigan, and to preserve, protect, and enhance their multi-faceted values. Through the natural rivers designation process, a Natural River District is established (typically

400 feet either side of the riverbank) and a zoning ordinance is adopted. Within the Natural River District, permits are required for building construction, land alteration, platting of lots, cutting of vegetation, and bridge construction. Not all of the zoning ordinances on the natural rivers have the same requirements, but they all have building setback and vegetative strip requirements. Although the purpose is not specifically to reduce flood losses, by requiring building setbacks (in many cases prohibiting construction in the 100-year floodplain), flood hazard mitigation benefits can be realized.

Dam Safety, Part 315 of the Natural Resources and Environmental Protection Act, 451 P.A. 1994, as amended:

The Dam Safety Unit within the Water Resources Division, Department of Environmental Quality, has the primary responsibility to ensure dam safety within the state. Following the September, 1986 flood in central Lower Michigan, the current Dam Safety Act was passed to ensure that dams are built and maintained with necessary engineering and inspections for safety of the public and the environment. The Department of Environmental Quality is required to review applications involving construction, reconstruction, enlargement, alteration, abandonment and removal for dams that impound more than five acres of water and have a height of six feet or more.

Manufactured Housing Commission Act, 96 P.A. 1987, as amended:

The Michigan Manufactured Housing Commission Act and its implementing Administrative Rules provide regulation on the placement of manufactured homes and establishes construction criteria. Manufactured homes are prohibited from being placed within a floodway, as determined by the Department of Environmental Quality. In addition, manufactured homes sited within a floodplain must install an approved anchoring system to prevent the home from being moved from the site by floodwaters (or high winds), and be elevated above the 100 year flood elevation.

Local River Management Act, 253 P.A. 1964:

Enacted in 1964, the Local River Management Act provides for the coordination of planning between local units of government in order to carry out a coordinated water management program. Implementation of the water management program occurs via the establishment of watershed councils. These councils conduct studies on watershed problems, water quality and the types of land uses occurring within the watershed. Watershed councils have the authority to develop River Management Districts for the purpose of acquisition, construction, operation and the financing of water storage and other river control facilities necessary for river management. The provision to allow acquisition of land adjacent to the river for the purpose of management aids in regulating development of land prone to flooding.

Floodplain Service Program:

The need to identify a flood hazard area before construction is essential to the goal of flood hazard mitigation. The Department of Environmental Quality regularly provides floodplain information to public and private interests as part of its Floodplain Service Program under the Water Resources Division. The goal of the program is to provide 100-year floodplain information to interested parties so that informed purchase or development decisions can be made.

Dam Failures

Both the MDEQ and the Federal Energy Regulatory Commission (FERC) classify and regulate dams in Michigan. Under state and federal legislation, certain dam owners are required to develop a survey of the downriver area, develop flood-prone area maps and develop emergency action plans (EAPs). Furthermore, the FERC requires the owners of such dams to exercise these plans; the MDEQ has initiated an effort to encourage owners of state-regulated dams to voluntarily perform exercises of their EAPs. In

Michigan, well over 100 dams are covered by Emergency Action Plans. Dams in Michigan are regulated by Part 315 of The Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Part 315, Dam Safety provides for the inspection of dams. This statute requires the MDEQ to rate each dam as either "high," "significant," or "low" hazard potential, according to the potential downstream impact if the dam were to fail (not according to the physical condition of the dam). The MDEQ has identified and rated over 2,400 dams. Dams over 6 feet in height that create an impoundment with a surface area of 5 acres or more are regulated by this statute. Dam owners are required to maintain an EAP for "high" and "significant" hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dams regulated by FERC, such as hydroelectric power dams, are generally exempt from this statute. The FERC licenses water power projects (including dams) that are developed by non-federal entities, including individuals, private firms, states and municipalities. Under provisions of the Federal Power Act and federal regulations, the licensee of the project must prepare an EAP. This plan must include a description of actions to be taken by the licensee in case of an emergency. Inundation maps showing approximate expected inundation areas must also be prepared. Licensees must conduct a functional exercise at certain projects, in cooperation with local emergency management officials.

Shoreline Flooding and Erosion

There are concerns with erosion along rivers, especially on state-owned land,

Drought

U.S. Geological Survey:

The U.S. Geological Survey (USGS) is the primary federal agency that collects and analyzes stream flow data, another good index of the relative severity of drought. The agency provides a handy "Drought Watch" web site at <http://waterwatch.usgs.gov/>.

The site presents a map that is continually updated through an automated analysis of USGS stream gauging stations. Additional drought-related links can be accessed through the Michigan-specific web page: <http://waterwatch.usgs.gov/new/index.php?m=dryw&r=mi>) by clicking on the map (or proceeding directly to the specific web page at <http://mi.water.usgs.gov/midroughtwatch.php>).

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

Resource Conservation and Recovery Act - 42 U.S.C. s/s 6901 et seq. (1976)

RCRA (pronounced "rick-rah") gave EPA the authority to control hazardous waste from the "cradle-to-grave". This includes the generation, transportation, treatment, storage and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future. The Federal Hazardous and Solid Waste Amendments are the 1984 amendments to RCRA that required phasing out land disposal of hazardous waste. Some of the other mandates of this strict law include increased enforcement authority for EPA, more stringent hazardous waste management standards and a comprehensive underground storage tank program.

Within Gladwin County, efforts are ongoing to enhance general awareness and specialized training for HAZMAT emergencies.

Hazardous Material Transportation Incidents

Superfund Amendments and Reauthorization Act (SARA), Title III:

As explained earlier, the Bhopal, India tragedy initiated a chain of events aimed at enhancing preparedness activities to minimize the potential for a similar event to occur in the United States. On October 17, 1986 the Superfund Amendments and Reauthorization Act (SARA) was signed into law. A major SARA provision is Title III (the Emergency Planning and Community Right-To-Know Act, also known as SARA Title III), which establishes hazardous material emergency planning, reporting, and training requirements for federal, state and local governments, and private industry. In Michigan, the SARA Title III program is jointly administered and implemented by two state departments—the Michigan State Police and the Michigan Department of Environmental Quality.

Local Emergency Planning Committees (LEPC)

One of the major provisions of SARA Title III is the establishment of Local Emergency Planning Committees (LEPCs) for designated planning districts. The LEPCs are responsible for developing emergency response plans for communities that have facilities in their jurisdiction subject to SARA Title III emergency planning requirements. The LEPC is the primary mechanism through which local SARA Title III planning, training and exercising activities are implemented. Michigan has 88 designated LEPCs – one for each of the 83 counties and 5 in major cities. Nearly 2,800 facilities across the state have been identified as being subject to Title III emergency planning provisions. A facility is subject to SARA Title III provisions if extremely hazardous substances (as determined by the U.S. Environmental Protection Agency) are present at the facility in quantities at or above the minimum threshold quantities established in Section 302 of the Act. The map at the end of this section provides a breakdown of Title III (Section 302) sites by county.

Note: Many of the programs and initiatives designed to mitigate, prepare for, respond to, and recover from fixed-site hazardous material incidents have the dual purpose of also protecting against hazardous material transportation incidents.

Federal Hazardous Material Transportation Regulations:

The transportation, manufacturing, storage and disposal processes for hazardous materials are highly regulated by federal and state agencies in order to reduce risk to the public. At the federal level, the U.S. Department of Transportation, Office of Hazardous Materials Safety (USDOT/OHMS), is the regulating agency for all modes of hazardous material transportation. In addition to enforcing federal hazardous material transportation regulations, the USDOT/OHMS is also involved in a number of other areas aimed at improving the safety of hazardous material shipping. Those areas include: 1) research and development of improved containment/packaging and other technological aspects of hazardous material shipping; 2) interagency coordination efforts in hazardous material transportation planning and standards setting; 3) management of data information systems pertaining to hazardous material transportation; and 4) development of hazardous material safety training policies and programs.

In Michigan, the Motor Carrier Division, Department of State Police, oversees, coordinates and implements the commercial truck safety aspects of the USDOT regulations. The Michigan Department of Transportation oversees programs aimed at enhancing railroad safety and improving the rail infrastructure (which helps reduce the likelihood of a hazardous material rail transportation accident).

Hazardous Materials Transportation Uniform Safety Act:

The federal Hazardous Materials Transportation Uniform Safety Act (HMTUSA), enacted in 1990, provides funding for the training of emergency responders and the development of emergency response plans for

both fixed site facilities and transportation-related incidents. (This funding mechanism under the HMTUSA is referred to as Hazardous Material Emergency Preparedness [HMEP] grants.) In Michigan, the HMTUSA/HMEP program is coordinated and implemented by the Emergency Management Division, Department of State Police. Since the program's inception, over \$326,000 in grants have been allocated to 80 Michigan communities for hazardous material planning and training activities.

Federal/State Hazardous Material Response Resources:

There are numerous groups at the federal, state and local levels and in private industry that are trained to deal with hazardous material fixed-site and transportation incidents. These groups include the National Response Team (NRT), Regional Response Teams (RRTs), and state and local hazardous material response teams. The Chemical Manufacturers Association established the Chemical Transportation Emergency Center (CHEMTREC) to provide 24-hour technical advice to emergency responders. The National Response Center (NRC), which operates much like CHEMTREC, was established to provide technical advice and coordinate federal response to a hazardous material incident.

In Michigan, a 24-hour statewide notification system called the Pollution Emergency Alerting System (PEAS) was established for reporting chemical spills to the Department of Environmental Quality. As a companion to the PEAS, the Michigan Department of Agriculture (MDA) has established a 24-hour Agriculture Pollution Emergency Hotline for use by agrichemical users to report fertilizer and pesticide spills. Callers to the MDA hotline gain immediate access to appropriate technical assistance, regulatory guidance for remediation, and common sense approaches for addressing the problem.

Oil and Natural Gas Well Accidents

Local Emergency Capability:

Communities that may be affected by oil or natural gas well accidents should have adequate procedures in their Emergency Operations Plans to address the unique types of problems associated with this hazard, including rescue and evacuation. Affected communities must work closely with company officials and surrounding jurisdictions to ensure compatibility of procedures for a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around refineries and compressor stations. Michigan Department of Environmental Quality regulations provide for buffer zones around wells and treatment and storage facilities.

Pipeline Accidents (Petroleum and Natural Gas)

MPSC Pipeline Safety Inspections:

Safety engineers from the MPSC are certified by the USDOT/OPS to conduct inspections on natural gas pipelines to ensure structural and operational integrity of the systems. If violations are found, the pipeline company can be ordered to take corrective actions; in addition, the pipeline operator may be fined. The MPSC safety engineers also respond to accidents involving natural gas pipelines (to ensure compliance with federal and state law and to offer technical assistance to emergency responders).

Protection of Underground Facilities Act / MISS DIG Program:

Michigan's first line of defense against pipeline and other utility line breaks from construction excavation is The "MISS DIG" Program established with the passage of Act 53 in 1974 – The Protection of Underground Facilities. MISS DIG System, Inc., is a 24-hour utility communications system that helps contractors comply with the state law (Act 53) which requires notification of utilities at least three working

(but not more than 21 calendar) days before commencing excavation, tunneling, demolishing, drilling or boring procedures, or discharging explosives for a project. When properly administered and followed, the MISS DIG safety system does an excellent job of minimizing pipeline and utility line accidents.

Programs and Initiatives:

Pipeline jurisdiction and oversight in Michigan is complex, determined primarily by the type and function of a pipeline and its location. Agencies involved include 1) the MPSC Gas Safety Office; 2) the USDOT/OPS in Kansas City, Missouri; and 3) the Michigan Department of Environmental Quality, Geological Survey Division (MDEQ/GSD). The table below is a breakdown of jurisdictional and inspection responsibilities for the various types of pipelines present in Michigan:

Pipeline Safety Regulation in Michigan

TABLE 3.6

Pipeline Type	Jurisdiction	Applicable Code	Inspected by
Inter-state natural gas	USDOT/OPS	49 CFR Part 192	MPSC Gas Safety Intrastate
Inter-state natural gas	State of MI/MPSC	Michigan Gas Safety Standards	MPSC Gas Safety
Liquid Petroleum	USDOT/OPS	49 CFR Parts 193/195	USDOT/OPS
Gathering Lines*	MDEQ/GSD	Oil/Gas Administrative rules under Part 165, 1994 P.A. 451	
*Note: Gathering lines are run from a production facility (i.e., well) to a pre-processing plant (i.e., dehydration facility, separator, compression station). Source: Michigan Public Service Commission, Gas Safety Office			

Local Emergency Capability:

Procedures in the Emergency Operations Plans address the unique types of problems associated with this hazard, including specific functions such as rescue and evacuation. Communities work closely with company officials and surrounding jurisdictions to ensure a fast, coordinated response. Mitigation possibilities include the use of community zoning regulations to provide suitable open, unoccupied "buffer" areas around pipelines, storage fields, refineries and compressor stations.

Nuclear Power Plant Accidents

Mitigation of nuclear power plant hazards on the local County level is primarily limited to the detection of radiation, alerting the public, and providing directions for evacuation and/or housing – the latter three issues are addressed in other sections of this mitigation action item section of the mitigation plan.

Infrastructure Failures

Infrastructure Failures in Gladwin County

There have been no significant infrastructure failures in Gladwin County. Most of Gladwin County's infrastructure failures are secondary hazards caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours but in some cases power has been out for a week at a time in parts of the County. In

cases such as these, the local chapter of the American Red Cross would be called to set up temporary shelters.

Water/Electrical Infrastructure Failure

The Federal Clean Water Act regulates the discharge from community wastewater collection and treatment systems. The regulatory aspects of the Act that pertain to municipalities have been delegated to the MDEQ Surface Water Quality Division for surface water discharge facilities, and the MDEQ Waste Management Division for groundwater discharge facilities. Authority for the oversight of planning, facility design review, and construction permitting of sewerage systems collection, transportation and treatment facilities, is derived from Part 41 of the Michigan Natural Resources and Environmental Protection Act (451 P.A. 1994) and Administrative Rules promulgated under authority of Part 41. The two MDEQ divisions assist communities with the development and maintenance of their wastewater collection and treatment systems. In addition, they monitor and regulate these systems to ensure pollution abatement and health conditions are met. Although the regulatory authority vested in the MDEQ is primarily aimed at preventing pollution of waters of the state, there are requirements in place under 451 P.A. 1994 regarding the design, construction, and operational integrity and reliability of wastewater collection and treatment systems.

Electrical system

Disaster-related damage to electric power facilities and systems is a concern that is being actively addressed by utility companies across the state. Detroit Edison, Consumers Energy and other major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by wind, snow and ice, and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system components, protecting equipment from lightning strikes, and placing new distribution systems underground. The Michigan Public Service Commission (MPSC) monitors power system reliability to help minimize the scope and duration of power outages.

Telecommunications System

Like electric utility companies, telecommunications companies are concerned with the issue of protecting facilities and systems from disaster-related damage. Major telecommunications companies have programs to improve system reliability and physically protect facilities and system components from wind, snow and ice, and other hazards, utilizing many of the same techniques as the electric utility companies.

Surface Drainage Systems:

Michigan's first drain laws appeared on the books as Territorial laws – years before Michigan achieved statehood. After attaining statehood in 1837, the State passed its first drain law in 1839. Since that time, there have been 45 separate acts passed regarding drainage, up to the most recent re-codification of drain law in 1956. Since 1956, the present drain code has been amended over 200 times – an indication of how important and dynamic the issue of drainage continues to be in Michigan. The Michigan Drain Code provides for the maintenance and improvement of the vast system of intra-County (County) and inter-County drainage facilities. Each drain has a corresponding special assessment district (watershed), a defined route and course, an established length, and is conferred the status of a public corporation with powers of taxation, condemnation, ability to contract, hold, manage and dispose of property, and to sue and be sued. Drainage districts and drains are established by petition of the affected landowners and/or municipalities. County drains, with a special assessment district entirely within the County, are administered by the locally elected County Drain Commissioner. Inter-County drains, with a special assessment district in more than one County, are administered by a drainage board that consists of the

drain commissioners of the affected counties, and is chaired by the Director of the Michigan Department of Agriculture (MDA) or an MDA Deputy Director.

Water Distribution Systems:

Michigan's public water supplies are regulated under the Federal Safe Drinking Water Act. The Michigan Department of Environmental Quality (MDEQ), as a primary agency for the Federal government, provides supervision and control of Michigan's public water supplies (including their operation and physical improvements) under the Michigan Safe Drinking Water Act (399 P.A. 1976).

The MDEQ Drinking Water and Radiological Protection Division regulates, through a permit process, the design, construction and alteration of public water supply systems. Water supply construction must be conducted within the framework of the Michigan Safe Drinking Water Act, as well as the Architecture, Professional Engineering and Land Surveying Act (240 P.A. 1937, which requires professional engineering preparation of construction documents for water works construction costing over \$15,000). Most communities in Michigan, including Gladwin have, in conjunction with the MDEQ, developed water system master plans that conform to the requirements of the Michigan Safe Drinking Water Act. From a hazard mitigation standpoint, that is important because it helps ensure that all new water system construction and alterations to existing systems will conform to the minimum standards set in the Act. While not making water infrastructure "disaster-proof", the standards provide at least a basic level of design, structural and operational integrity to new or renovated portions of a community's water supply system.

Public Health Emergencies

Michigan Department of Community Health:

The Director of the Department of Community Health, and local public health officers, have the authority (under the Michigan Public Health Code—1978 PA 368, as amended) to take those steps determined necessary and prudent to prevent epidemics and the spread of hazardous communicable diseases, or to effectively mitigate other conditions or practices that constitute a menace to public health. The Director and local public health officers can issue written orders to implement the required preventive steps and/or responses, and those orders can be enforced through the imposition of civil and criminal penalties for failure to comply. State and local health departments have detailed, written emergency operations plans that address public health emergencies.

U.S. Centers for Disease Control and Prevention:

At the national level, the U.S. Centers for Disease Control and Prevention (CDC), a branch of the Department of Health and Human Services, has the responsibility and authority to investigate public health emergencies to determine their cause, probable extent of impact, and appropriate mitigation measures. The CDC can also assist state and local public health officials in establishing health surveillance and monitoring systems/programs, and in disseminating information on prevention and treatment to the general public. The CDC announced dedicated funding for bioterrorism response, and Michigan has been strengthening its surveillance and intervention infrastructures with these funds. Since 2001, the CDC has also provided dedicated funding for public health emergency preparedness programs. In 2002, the MDCH Office of Public Health Preparedness was established to oversee these cooperative agreements. In the 2009 Influenza A (H1N1) event, CDC coordinated with numerous health departments across the country, tracked influenza cases, and provided information about outbreak trends. Tests were also performed, to verify whether flu cases were indeed of the correct type.

Michigan Pandemic Influenza Plan:

In October 2009, the Michigan Department of Community Health updated the “Michigan Pandemic Influenza Plan,” to provide response guidelines for an influenza pandemic affecting Michigan. Although the plan cannot eliminate the disease, it will aid in reducing the impact by enabling state and local agencies to anticipate, prepare for, and respond efficiently and effectively to the disease. The plan, which is divided into pre-pandemic, pandemic, and post-pandemic phases, details necessary activities at the state and local level related to:

- command and management,
- crisis communications,
- surveillance,
- laboratory testing,
- community containment,
- infection control in health care facilities,
- vaccines and antivirals/medical management,
- data management,
- border/travel issues
- recovery

The Michigan Pandemic Influenza Plan is available for review and downloading at <http://www.michigan.gov/flu>

Transportation Accidents**Air Transportation:**

The Michigan Aeronautics Commission of the MDOT administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include: 1) registering aircraft dealers, aircraft, and engine manufacturers; 2) licensing airports and flight schools; 3) inspecting surfaces and markings on airport runways; and 4) assisting in removal of airspace hazards at airports. The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety. The Federal Aviation Administration (FAA) contracts with the MDOT for the inspection of the state's 238 public- use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings (see the NTSB section below).

National Transportation Safety Board:

The National Transportation Safety Board (NTSB) is an independent federal agency responsible for promoting aviation, highway, railroad, marine, pipeline, and hazardous materials transportation safety. The NTSB is mandated to investigate significant transportation accidents, determine the probable cause of such accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies that are involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations and statistical reviews. Although the NTSB has no regulatory or enforcement powers, it has nonetheless been successful in seeing the adoption and implementation of over 80% of its transportation accident recommendations.

An example of an NTSB recommendation being implemented is the agreement between the FAA and the Boeing Aircraft Company to redesign the rudder system on the company's popular 737 jetliners and to replace the rudder valve system in every one of the 737 jets in service. The rudder retrofit program cost Boeing nearly one-quarter of a billion dollars. (The 737 rudder system came under close scrutiny of the NTSB after crashes of 737s in 1991 and 1994 had resulted in over 150 deaths. The NTSB believed that the rudder system on the two jets might have been a contributing factor in the crashes.)

Bus Safety:

School bus safety programs and initiatives generally fall into two categories: 1) driver skill enhancement, competency training and 2) physical inspections of bus mechanical and safety equipment. The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

CHAPTER 4: HAZARD ANALYSIS

Natural Hazards-Severe Summer Weather

HAIL

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

Hazard Description

Hail is a product of strong thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have been reported. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

Hailstorms in Gladwin County

34 Hail events were reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 01/01/1950 and 12/31/2015. There were no damages estimated; however, the data from these events is incomplete as not all damages that occurred have been reported.

Hail Overview

Gladwin County averages approximately 30 thunderstorms per year, but only about 5-6 storms per decade produce hail. However, there has been an increase in hail storms being reported with 29 of the 34 storms occurring within the past 20 years. Gladwin County is a moderate risk county for these events to be impactful; however, the event is considered to be a severe weather activity, which was given a high priority to address.

LIGHTNING

The discharge of electricity from within a thunderstorm.

Hazard Description

Most direct impacts from lightning are relatively site-specific in scope, and therefore do not have a tremendous impact on the community as a whole. With the temperature of a bolt of lightning approaching 50,000 degrees Fahrenheit in a split second, the most common direct damage from lightning is fire. The most common indirect effect of lightning is power outages. This indirect effect can have an impact on a much larger segment of the community, leaving hundreds and sometimes thousands of homes without electricity.

Lightning is a random and unpredictable product of a thunderstorm's tremendous energy. The energy in the storm produces an intense electrical field like a giant battery, with the positive charge concentrated at the top and the negative charge concentrated at the bottom. Lightning strikes when a thunderstorm's electrical potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. Bridging that difference, lightning can jump from cloud

to cloud, cloud to ground, ground to cloud, or even from the cloud to the air surrounding the thunderstorm. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit (hotter than the surface of the sun) and speeds approaching one-third the speed of light.

Globally, there are about 2,000 thunderstorms occurring at any given time, and those thunderstorms cause approximately 100 lightning strikes to earth each second. In the United States, approximately 100,000 thunderstorms occur each year, and every one of those storms generates lightning. It is commonplace for a single thunderstorm to produce hundreds or even thousands of lightning strikes. However, to the majority of the public, lightning is perceived as a minor hazard. That perception lingers despite the fact that lightning damages many structures and kills and injures more people in the United States per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat lightning presents to their safety.

Lightning deaths are usually caused by the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. Lightning can also cut off breathing by paralyzing the chest muscles or damaging the respiratory center in the brain stem. It takes only about one-hundredth of an ampere of electric current to stop the human heartbeat or send it into ventricular fibrillation. Lightning can also cause severe skin burns that can lead to death if complications from infection set in.

Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning fatalities, injuries and damage in the United States:

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
- 3% are related to heavy equipment and machinery
- 2.4% are telephone-related
- 0.7% are radio, transmitter and antenna-related

The NLSI estimates that 85% of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. 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.

Lightning Events in Gladwin County

There was one lightning event were reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 01/01/1950 and 12/31/2015. There were no estimated damages; however, the data from these events is incomplete as not all damages that occurred were reported.

On 7/18/1996 no rain fell that day, but a single bolt of lightning struck and killed the pitcher in a men's softball game. Additionally, 6 other men were reportedly injured as a result of the lightning, with three of the men being taken to a local hospital.

Thunderstorm Hazards – Lightning Overview

The only recorded lightning event resulted in the death of a person and injuries to an additional six people. Many other lightning events may have taken place in the County during the time period, fortunately no other events were reported to result in the loss of life, injuries, or loss of property. Even though there has only been one reported event during this time period, lightning is a severe weather event that can be expected to occur every year, thus it has been given a high priority to address.

TORNADOS

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

Hazard Description

Tornadoes in Michigan are most frequent in 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. These thunderstorms often produce tornadoes. A tornado may have winds up to 300 miles per hour and an interior air pressure that is 10 to 20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks up to 200 miles have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in tremendous loss of life, with a national average of 111 deaths per year. Property damage from tornadoes is in the hundreds of millions of dollars every year in the United States.

Tornado Intensity

Tornado intensity is measured on the Enhanced Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. The Enhanced Fujita Scale rates the intensity of a tornado based on damage caused, not by its size. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be extremely strong. It is very difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed (see following page for scale.)

The Enhanced Fujita Scale of Tornado Intensity

TABLE 4.1

F-Scale Number	Intensity Description	Wind Speed (mph)	Type/Intensity of Damage
EF-0	Gale tornado	65-85 mph	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF-1	Moderate Tornado	86-110 mph	Moderate damage. The lower limit is the beginning of hurricane wind speed; roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.

EF-2	Strong Tornado	111-135 mph	Considerable damage. Roofs torn off well-constructed houses; foundation of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF-3	Severe Tornado	136-165 mph	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; foundations blown away some distance.
EF-4	Devastating tornado	166-200 mph	Devastating damage. Whole frame houses, well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF-5	Incredible Tornado	200 mph+	Incredible damage. Strong frame houses lifted off foundations and carried considerable distances; automobile sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural deformation; incredible phenomena will occur

Source: Storm Prediction Center

Tornado Events in Gladwin County

Nine TORNADO(s) were reported in Gladwin County, Michigan between 01/01/1950 and 12/31/2015. Of the reported nine tornadoes, one was an EF-3 tornado, two were EF-2 tornadoes and the remaining six were either EF-1 or EF-0 tornadoes. The combined reported damages resulting from these tornadoes did not exceed \$200,000.

On 6/9/2001 the most destructive tornado in recent history struck Gladwin County. The tornado was an EF-1 event, but damaged multiple buildings, destroyed a single building and brought down numerous trees and power lines along a six mile stretch six miles north of the City of Gladwin.

Tornadoes Overview

There has been nine reported nine tornadoes over the past 60+ years or about one every seven years in Gladwin County. However, while this number has decreased in recent years in Gladwin County, tornadoes are becoming more prevalent in mid-Michigan. With the changing climate this trend is expected to continue if not increase at a greater rate. Tornadoes are considered to be a severe weather activity, which was given a high priority to address.

SEVERE WINDS

Non-tornadic winds 58 miles per hour (mph) or 50.4 knots per hour (kph) or greater.

Hazard Description

Severe winds, or straight-line winds sometimes occur during thunderstorms and other weather systems, and can be very damaging to communities. Often, when straight-line winds, occur, the presence of the forceful winds, with velocities over 58 mph (50.4 kph) may be confused with a tornado occurrence. Severe winds have the potential to cause loss of life, property damage, and flying debris, but tend not to cause as many deaths as tornadoes do. However, the property damage from straight-line winds can be more widespread than a tornado, usually affecting multiple counties at a time. In addition to property damage

to buildings, there is a risk for infrastructure damage from downed power lines due to falling limbs and trees. Large scale power failures are common during straight-line wind events.

Severe winds spawned by thunderstorms and other weather events can have devastating effects in terms of loss of life, injuries, and property damage. According to data compiled by the National Weather Service Michigan has experienced over 9,000 severe wind events (not including tornadoes) that resulted in 122 deaths and millions of dollars in damage since 1970. Severe wind events are characterized by wind velocities of 58 mph or greater, with gusts sometimes exceeding 74 mph (hurricane velocity), but do not include tornadoes.

Wind Events in Gladwin County

Fifty severe wind events were reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 01/01/1950 and 12/31/2015. While many of these events occurred during thunderstorms, they were not limited to thunderstorm activity. Reported damages were less than \$500,000, but not all damages were reported. No deaths or injuries were reported during this time frame.

On 7/13/1995 thunderstorm winds did widespread tree damage across all but extreme southeast Gladwin County, with well over 100 trees down. Most of the trees brought down were the largest and healthiest, as they had the highest tops and heaviest foliage. Widespread damage to residences, cottages, garages, and vehicles was caused by falling trees, while the winds damaged and destroyed docks and boats on the lee shores of county lakes. Consumers Power Company estimated over 100 miles of phone and power lines were downed in the County and electrical service remained out to thousands of homes and cottages for periods ranging from a few days to over a week. Average wind gusts in most areas were estimated to be in the 65-80 mph range.

On 6/08/2008 a line of strong to severe thunderstorms produced pockets of wind damage resulting in the loss of trees and downed power lines near the city of Gladwin. Storm also caused damage to a barn and home.

Severe Winds Overview

While there have been nearly 60 events reported in the past 60+ years, or approximately one event per year; however nearly 80 percent of the reported storms have occurred in the past 30 years. With the changing weather patterns, this trend is anticipated to continue with more severe wind events occurring in the near future. Severe winds are considered to be a severe weather activity, which was given a high priority to address.

Figures from the National Weather Service indicate that severe winds occur more frequently in the southern half of the Lower Peninsula than any other area in the State. On an average, severe wind events can be expected 3-4 times per year in the northern Lower Peninsula. These figures refer to winds from thunderstorms and other forms of severe weather not tornadoes.

FOG

Condensed water vapor in cloudlike masses lying close to the ground and limiting visibility.

Hazard Description

Fog forms near the ground when water vapor condenses into tiny liquid water droplets that remain suspended in the air. Many different processes can lead to the formation of fog, but the main factor is saturated air. Two ways that air can become saturated are by cooling it to its dew point temperature or by evaporating moisture into it to increase its water vapor content. Although most fog, by itself, is not a hazard because it does not actually apply destructive forces, the interaction between humans and fog can be a dangerous situation, sometimes resulting in disastrous consequences.

Haze and Smog

Haze occurs when dust, smoke and other pollutant particles obscure the normal clarity of the sky. It occurs when dust and smoke particles accumulate in relatively dry air. When weather conditions block the dispersal of smoke and other pollutants, they concentrate and form a usually low-hanging shroud that impairs visibility and may become a respiratory health threat, as well as make safe driving more difficult. Dense haze caused by industrial pollution is also known as smog. This hazard may cause public health problems, so it is mentioned in this subsection but is not given particular emphasis since this plan has more of an emergency management focus. It is noted here as an area of potential overlap and future coordination with other agencies. The Michigan Department of Community Health and the Michigan Department of Natural Resources may do more with this issue in the future, if the effects become severe enough. Since it may be possible that climate change issues cause this to be a more frequent and ongoing concern in Michigan, it is mentioned here. In general, however, air quality has generally improved since the effects of the Clean Air Act, other legislation, regulatory measures, and shifts away from heavy industry in Michigan's economy.

Smoke-producing hazards may have an effect that seems visually comparable to fog. For example, wildfires, hazardous materials incidents, structural fires, major transportation accidents, or industrial accidents may produce clouds of smoke that can obscure visibility and increase the risk of transportation accidents.

Hazard Analysis

In considering severe and high-impact meteorological events, attention can easily become focused on the more dramatic storms. Tornadoes and hurricanes for example, are readily recognized by the general public and the meteorological community alike for their devastating consequences. Fog, on the other hand, does not lend itself as readily to this categorization. Yet, both in cost and casualties, fog has consistently impacted society, and in particular the transportation sector - sometimes with deadly consequences. Fog has played a contributing role in several multi-vehicle accidents over the past several years. While statistics suggest that highway accidents and fatalities, in general, have fallen, that trend is not evident with respect to accidents and fatalities caused by fog.

Fog can be very dangerous because it reduces visibility. Although some forms of transport can penetrate fog using radar, road vehicles have to travel slowly and use more lights. Localized fog is especially dangerous, as drivers can be caught by surprise. Fog is particularly hazardous at airports, where some attempts have been made to develop methods (such as using heating or spraying salt particles) to aid fog dispersal. These methods have seen some success at temperatures below freezing.

One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Fog has not

yet been identified as one of the most significant hazards in any of Michigan's local hazard mitigation plans.

Fog Overview

No major events have occurred in Gladwin County in recent years. One major fog event is estimated to occur in Michigan approximately every two years. Property damage can be significant for vehicles, although real property and structures are usually unaffected. Thus, while fog has not impacted the residents of Gladwin County in recent years, it is not unforeseeable that fogs could impact Gladwin County in the future. However, fog is not considered to be a severe weather event and was not given a high priority to address.

EXTREME TEMPERATURES (HEAT)

Prolonged periods of very high temperatures, often accompanied by exacerbating conditions such as high humidity and lack of rain.

Hazard Description

Extreme temperatures – whether it be extreme heat or extreme cold – share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense.

Gladwin County is susceptible to extreme heat. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon. These events occur regularly depending on the year.

Extreme Heat Events in Gladwin County

No extreme heat events were reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 1/01/1950 and 12/31/2015.

Hazard Description

Prolonged periods of extreme heat can pose severe and often life-threatening problems for Gladwin County's citizens. Extreme summer weather is characterized by a combination of very high temperatures and humid conditions. When persisting over a long period of time, this phenomenon is commonly called a heat wave. The major threats of extreme summer heat are **heatstroke** (a major medical emergency), and **heat exhaustion**. **Heatstroke** often results in high body temperatures, and the victim may be delirious, stuporous, or comatose. Rapid cooling is critical to preventing permanent neurological damage or death. Heat exhaustion is a less severe condition than heatstroke, although it can still cause problems involving dizziness, weakness and fatigue. **Heat exhaustion** is often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. Other, less serious risks associated with extreme heat are often exercise-related and include heat syncope (a loss of consciousness by persons not acclimated to hot weather), and heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors).

Extreme Heat Overview

While there have been no reported excessive heat conditions, high heat events occur annually in Gladwin County and are a risk to the resident and visitors. Air conditioning is probably the most effective measure for mitigating the effects of extreme summer heat on people. Unfortunately, many of those most vulnerable to this hazard (children, elderly, and homeless individuals, and the critically ill) do not have access to air-conditioned environments. Excessive heat is considered to be a severe weather event, which was given a high priority to address.

Natural Hazards-Severe Winter Weather

ICE/SLEET STORMS

A storm that generates sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage.

Hazard Description

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Ice and Sleet Storms in Gladwin County

A total of three ice/sleet storms were reported by the NCDIC for Gladwin County, Michigan between 01/01/1950 and 12/31/2015. Minimal damages were estimated as a result of these storms; however, the data from these events is incomplete as not all damages that may have occurred have been reported.

On 4/11/2013 a local storm brought snow and freezing rain/ice to lower Michigan. Ice amounts were substantial near Saginaw Bay, with $\frac{3}{4}$ of an inch throughout parts of Gladwin County. Trees and large limbs were downed and power outages were common as a result

Ice and Sleet Storms Overview

There have only been three reported ice/sleet storms in the past 60+ years. However, they have all occurred in past 15 years. This changing weather pattern may reflect a changing weather pattern, one that could result in more ice/sleet storms in the future. One of the biggest problems with ice and sleet storms is loss of power. The weight of the ice causes power lines to snap and break. Sometimes it can take days to restore power. If this happens temporary shelters may need to be set up. The local chapter of the American Red Cross would be called. Also with the power loss would come loss of heat, which could cause death from hypothermia especially with the elderly population. Another problem caused by ice and sleet storms would be debris cleanup. The weight of the ice could cause tree limbs to snap and break.

Approximately 87% of ice storms occur during the months of January, February, March and April, when conditions are most conducive for the development of ice and sleet. Ice/sleet storms are considered to be severe winter events, which were given a high priority to address.

SNOWSTORMS

A period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility.

Hazard Description

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation ranges from 30 to 170 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan.

Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds (35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous.

The western Upper Peninsula experiences the most snowstorms in Michigan each year. The western half of the Lower Peninsula also experiences a relatively large number of snowstorms. One reason for this is the “lake effect”, a process by which cold winter air moving across Lakes Michigan and Superior picks up moisture from the warmer lake waters, resulting in significant snowfall amounts in the western part of the state.

Snowstorms in Gladwin County

There have been a total of 37 events in the snowstorm category (blizzards, winter storms, winter weather, and heavy snows) reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 01/01/1950 and 12/31/2015. No damages or human-related injuries were reported as a result of these storms; however, the data from these events is incomplete as not all damages that may have occurred were reported. Following are examples of the different types of snowstorms in this category that have affected the County.

Blizzard-On 1/2/1999 to 1/3/1999 an intense winter storm which developed over the southern plains lifted northeastward across lower Michigan from the evening of the 2nd through the morning of the 3rd producing blizzard conditions across the region. Winds increased steadily during Saturday the 2nd...with heavy snow starting to lift across northern lower Michigan during the afternoon and early evening hours. The snow reached eastern upper Michigan overnight. System snows tapered off during the morning of the 3rd. Across northern lower Michigan...snowfall totals generally ranged from 10-to 18 inches...with localized totals around 20 inches. Wind gusts of around 35 mph were common during the peak of the storm...with some gusts of 40 to 50 mph reported along Lake Huron shoreline where winds were onshore. The strong winds caused extensive blowing and drifting of the snow and greatly limited visibilities. Drifts as high as 6 to 8 feet were reported across portions of the region.

Heavy snows-On 1/21/2008 a passing low pressure system brought a few inches of snow to parts of northern lower Michigan. However, the snow was heavy in parts of Gladwin County, with 6-8 inches of accumulation in and south of the city of Gladwin. Winter storms-on 2-27-97 a surface low tracking across the lower Great Lakes and an upper low crossing northern lower Michigan combined to bring heavy snows to the region. Snow occasionally fell at the rate of 1 to 2 inches per hour. Strong winds combined with snow to cause significant blowing and drifting...with near whiteout conditions at times. Total snowfall across the county ranged from 6 to 10 inches.

Winter storm-On 12/19/2008 a low pressure system moved from central Illinois to central Ohio, with heavy snow falling norther of the track of the low system. Gladwin and Sterling had around 8 inches

Snowstorms Overview

All of the 37 reported snowstorms have occurred in the past 20 years, or nearly two storms per year. With the changing weather patterns, this activity is anticipate to continue or possibly increase in the future. Severe snowstorms can affect every Michigan community. While these events have not resulted in any reported deaths or injuries, these events are considered to be severe winter weather events and have a high priority to address.

EXTREME TEMPERATURES (COLD)

Prolonged periods of very low temperatures, often accompanied by exacerbating conditions such as heavy snowfall and high winds.

Hazard Description

Prolonged periods of extreme cold can pose severe and often life-threatening problems for Gladwin County's citizens. Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die as a result of severe cold temperature-related causes. This is substantially higher than the average of 170 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of "freezing" conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. It could be convincingly argued that, were it not for the extreme cold temperatures, death in many cases would not have occurred at the time it did from the illness or disease alone.

Hypothermia (the unintentional lowering of core body temperature), and **frostbite** (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. As body temperature drops, the victim may slip in and out of consciousness, and appear confused or disoriented. Treatment normally involves re-warming the victim, although there is some controversy in the medical community as to exactly how that should be done. Frostbite rarely results in death, but in extreme cases it can result in amputation of the affected body tissue.

Hypothermia usually occurs in one of two sets of circumstances. One situation involves hypothermia associated with prolonged exposure to cold while participating in outdoor sports such as skiing, hiking, or camping. Most victims of this form of hypothermia tend to be young, generally healthy individuals who may lack experience in dealing with extreme cold temperature. The second situation involves a particularly vulnerable person who is subjected to only a moderate, indoor cold stress. A common

example would be that of an elderly person living in an inadequately heated home. In such circumstances, hypothermia may not occur until days or perhaps weeks after the cold stress begins.

The special vulnerability of elderly persons to hypothermia has become readily apparent. Over half of the approximately 700 persons who die each year due to cold exposure are 60 years of age or older, even though this age group only represents about 20% of the country's population. This remarkable statistic may be due, in part, to the fact that elderly persons appear to perceive cold less well than younger persons and may voluntarily set thermostats to relatively low temperatures. In addition, high energy costs and the relative poverty among some elderly people may discourage their setting thermostats high enough to maintain adequate warmth. Because many elderly people live alone and do not have regular visitors, the cold conditions may persist for several days or weeks, thus allowing hypothermia to set in.

Babies and very young children are also very vulnerable to hypothermia. In addition, statistics indicate that death due to cold is more frequent among males than females in virtually all age groups. Part of that may be explained by differences in risk factors, and part may be due to different rates of cold exposure between the sexes.

Gladwin County is susceptible to extreme cold. The temperate climate of southern Michigan, combined with the unsettling effect of Lake Huron, make for extreme deviations in temperature. 50-degree swings in the temperature in a 24-hour period are not uncommon. These events occur regularly depending on the year.

Extreme Cold Events in Gladwin County

Three extreme cold events were reported by the National Climatic Data Center (NCDC) for Gladwin County, Michigan between 1/01/1950 and 12/31/2015.

On 2/4/2007 to 2/5/2007 exceptionally cold air surged into Northern Michigan. High temperatures on the 4th were around zero, with low temperatures that night from five to ten below zero. Gusty northwest winds produced hazardous wind chills of 20 to 30 below zero, along with blowing and drifting snow. Many area schools closed on the 5th, due to the extreme cold and poor road conditions.

On 1/6/2014 to 1/7/2014 one of the most brutal cold air outbreaks in recent memory-the coldest since at least January 1994-plunged into the Great Lakes region. Near-to below-zero temperatures were accompanied by blustery northwest winds. Away from the warming influence of Lake Michigan, wind chills sunk to 30 below or colder. The coldest wind chills observed were 44 below near Cedarville, 39 below near Engadine, 36 below at Sault Ste Marie, and 33 below at West Branch and Houghton Lake (immediately north of Gladwin County). All of these were reached in the morning hours of the 7th. As a result, school closings were widespread across northern Michigan on the 7th.

On 2/14/2015 the coldest air of the winter surged in behind a cold front, along with gusty northwest winds and lake effect snow. Across the northern lower Michigan peninsula (including Gladwin County) wind chills reached 30-40 below.

Extreme Cold Overview

While there have been minimal conditions with excessive cold, cold events occur annually in Gladwin County and are a risk to the residents. Unfortunately, many of those most vulnerable to this hazard (children, elderly, and homeless individuals, and the critically ill) may not have access to sufficiently

heated environments. Excessive cold is considered to be a severe weather event, which was given a high priority to address.

Hydrological Hazards

DAM FAILURES

The collapse or failure of an impoundment (water held back by a dam) resulting in downstream flooding.

Hazard Description

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of misoperation, lack of maintenance and repair, or vandalism. A common form of dam failure occurs when tree roots disrupt the integrity of an earthen dam. Water can pass through the dam where the soil has been broken apart by the roots. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation.

In Michigan, all dams over 6 feet high that create an impoundment with a surface area of more than 5 acres are regulated by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. This statute requires the Michigan Department of Environmental Quality (DEQ) to rate each dam as either a low, significant, or high hazard potential this rating system is based solely on the potential downstream impact if the dam were to fail, and is not according to the physical condition of the dam.

The National Inventory of Dams lists 23 dams within Gladwin County with seven (7) of these dams identified as High Hazard Potential Dams and one (1) identified as a Significant Hazard Potential Dam. The definitions for these ratings by Michigan Law (Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act) are as follows:

“High hazard potential dam” means a dam located in an area where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class I carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for loss of life.

“Significant hazard potential dam” means a dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, where environmental degradation may be significant, or where danger to individuals exists.

Dam Failures in Gladwin County

On 4/15/2014, the Wraco Lodge Dam in Roscommon County, immediately north of Gladwin County, collapsed causing water to flow into an already flooded Muskegon River. The dam was considered to be a low risk dam as this additional water caused the wash out of several roads, but did not cause any damage to property or harm to human life.

Dam Failure Flooding Overview

The Federal Emergency Response Commission (FERC) has emergency planning oversight of the dams. Dam owners are required to maintain an emergency action plan (EAP) for significant and high hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dam failures have been given a medium priority to address.

Map of the Tittabawassee River watershed in Michigan, showing major roads, towns, and dams. The map includes labels for various roads such as W Sargent Rd, W M18, W M61, and W M30. It also identifies several dams: Chappel Dam, Second Dam, Smallwood Dam, Beaverton City Dam, and Edenville Dam. The Tittabawassee River is shown flowing through the landscape, with tributaries like Wiggins Lake and Wixom Lake. The map is credited to Wm Mason, Director Equalization/GIS.

RIVERINE FLOODING

The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snowmelt or ice.

Hazard Description

Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes.

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

Ice Jams

Cold winters like those we experience in Gladwin County can produce thick river ice and the potential for ice jams. An ice jam develops when pieces of snow and ice buildup along a river. As the ice buildup increases, water passes slowly, and flooding develops behind the dam of ice. Water levels can also rise rapidly when temperatures rise and result in snowmelt runoff or rain, thus adding more water to the river behind an ice jam.

In the spring, or when temperatures rise, the ice buildup will thaw and break up, and may unleash all of the damned up water in a short period of time. When this occurs, flooding can rapidly result downstream from the ice jam. The combination of ice, debris, and water released from the ice jam can cause tremendous physical damage to homes, docks, and other structures.

Monthly Mean Precipitation in Gladwin County, 1929-2015

TABLE 4.2

Month	Gladwin County	
	1929-2000	2001-2015
January	1.86	1.88
February	1.33	1.64
March	2.21	1.82
April	2.76	3.82
May	3.00	3.98
June	3.38	3.58
July	2.95	3.12
August	3.38	3.06
September	3.53	2.80
October	2.88	3.18
November	2.67	2.46
December	1.97	2.21
Annual Average	31.90	33.55

Source: National Weather Service

Figures are in liquid equivalent inches.

Citing the information above, there is a slight increase in precipitation from the last fifteen years over the previous 70 years. However, there is not enough data to warrant a concern in the change in precipitation. (The usual time period for determining averages is 30 years.)

Riverine Flooding in Gladwin County

Eight flood incidents were reported by the NCDC for Gladwin County, Michigan between 1/1/1950 and 12/31/2015. Two of the events were more impactful than were the other floods.

On 6/18/1996 heavy rains locally fell across Gladwin County. The rains cause flooding of several rivers including the Tittabawassee River and Sugar River. The flooding on Sugar River washed out a portion of M-18 west of Oberlin. Several families had to be evacuated from their homes by boat and livestock rescued and relocated to higher ground. This flood was the impetus for many households purchasing flood insurance.

On 4/15/2014 a tardy spring thaw was enhanced by 1-2" of rain that fell on the 13th and 14th. The Cedar River rose out of its banks and flooded several businesses in downtown Gladwin. Damages were estimated to be nearly \$100,000.

Riverine and Urban Flooding Overview

Though the records indicate that there were eight floods over 66 years, all the floods have occurred within the past 30 years. This would be reflective of changing weather patterns, and would be suggestive that the likelihood of floods will be greater in the future. Currently there are only 3 townships of Gladwin County that are able to purchase flood insurance from the National Flood Insurance Program (NFIP). They

are Hay, Butman and Secord Townships. As of April 30, 2016, Gladwin County has two properties identified as repetitive flood-loss properties, according to information obtained from FEMA. Both properties are located in Hay Township, and are of a single-family residential type. One property suffered four flood losses since 2004, while the other suffered three. The average damages were just over \$20,000 per event to the former property, and just over \$5,000 per event to the latter property. This includes damage both to the structures and to their contents. These properties are therefore considered to be of proportional priority ranking for flood mitigation actions within the township.

Floodplain maps are currently in the process maps of being updated and were not available to include at the time of this Plan, with the exception of the digital map for Hay Township. Currently there are three townships in Gladwin County that are participating in the National Flood Insurance Program (NFIP), with digital mapping only available for Hay Township. In order to maintain their participation in the NFIP ordinances have been adopted that prohibit new construction within floodplains and modifications to existing buildings within floodplains have to be approved by a certified floodplain manager within the County.

DROUGHT

“A water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time.”

Hazard Description

Drought is the consequence of a reduction in the amount of precipitation that was expected over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation.

A drought can cause many severe hardships for communities and regions. Probably one of the most common and severe impacts to a community like Gladwin County would be the threat of wildfires as sixty-three percent of the County is forests. Also there would be a drop in the quantity and quality of agricultural crops. Other negative impacts that can be attributed to a drought include water shortages for human consumption, industrial, business and agricultural uses, recreation and navigation, declines in water quality in lakes, streams and other natural bodies of water, malnourishment of wildlife and livestock, increases in fires and wildfire related losses to timber, homes, and other property, increases in wind erosion, and declines in tourism in areas dependent on water-related activities.

These direct impacts can further result in indirect impacts to a community, such as reduced revenue due to income losses in agriculture, retail, tourism and other economic sectors; declines in land values due to physical damage from the drought conditions and decreased functional use of the property, and possible loss of human life due to extreme heat, fire, and other heat-related problems.

Two common measurement tools of dry weather conditions are the Palmer Drought Indices (including the Palmer Drought Severity Index and the Palmer Hydrological Drought Index) and the Crop Moisture Index. The Palmer Drought Severity Index is a good long-term drought monitoring tool. It is a monthly index that indicates the severity of a wet or dry spell. This index is based on average temperature and rainfall information for a particular location in a formula to determine dryness. It uses a value of 0 for the normal amount of rainfall in a particular location, and drought is shown in terms of negative numbers, for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. Any

value above 0 demonstrates that there has been above normal amounts of precipitation. This index can be used for indicating lake levels and surface water supply abnormalities but is not all that good for monitoring climatic impacts on vegetation, especially crops.

The Crop Moisture Index (CMI) evaluates short-term moisture conditions across crop producing regions. The CMI measures how much moisture is in the plant root zone of the soil. This index is based on the mean temperature and total precipitation that occurs each week, as well as the CMI from the previous week. The CMI changes as quickly as the weather changes. A heavy rainstorm can dramatically change the CMI for a region. Since this index changes so quickly and in response to a single weather event, the CMI is not considered a good long-term drought measurement tool.

Droughts/Drought Related Events in Gladwin County

While drought occurs periodically, in Gladwin County, the Palmer Drought Index indicated drought conditions reached extreme severity only 2% of the time. There were no drought events reported in Gladwin County between 1/1/1950 and 8/31/ 2015.

Drought Overview

As 53 percent of Gladwin County consists of forested lands, the biggest problem drought presents is the increased threat of wildfire. A drought impacted landscape could quickly turn a small fire into a raging out of control blaze. Wildfires could destroy homes, businesses, and other property located in the County's rural residential areas. A drought could also impact the agricultural areas of the County, alter the quantity and quality of crops, livestock and other agricultural activities, resulting in severe economic and social hardships throughout the County. Due to the secondary effects of droughts they were given a medium priority to address.

Transportation Hazards

TRANSPORTATION ACCIDENTS: AIR, LAND, AND WATER

A crash or accident involving an air, land or water-based commercial passenger carrier resulting in death or serious injury.

Hazard Description

Air Transportation Accidents

There are four circumstances that can result in an air transportation accident:

1. An airliner colliding with another aircraft in the air.
2. An airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause.
3. An airliner crashing while in the takeoff or landing phases of a flight.
4. Two or more airliners colliding with one another on the ground during staging or taxi operations.

When responding to any of these types of air transportation accidents, emergency personnel may be confronted with a number of problems, including:

1. Suppressing fires.

2. Rescuing and providing emergency first aid for survivors.
3. Establishing mortuary facilities for victims.
4. Detecting the presence of explosive or radioactive materials.
5. Providing crash site security, crowd and traffic control, and protection of evidence.

Land Transportation Accidents

A land transportation accident in Michigan could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, the bus slipping off a roadway in inclement weather, or colliding with another vehicle causes bus accidents. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are usually kept to a minimum. Bus accidents, on the other hand, can be quite serious – especially if the bus has tipped over. Numerous injuries are a very real possibility in those types of situations.

Existing Prevention Programs

Air Transportation

The Michigan Aeronautics Commission of the Michigan Department of Transportation administers several programs aimed at improving aviation safety and promoting airport development. The Commission's safety programs include:

1. Registering aircraft dealers, aircraft, and engine manufacturers.
2. Licensing airports and flight schools.
3. Inspecting surfaces and markings on airport runways.
4. Assisting in removal of airspace hazards at airports.

The Commission's airport development program includes providing state funds for airport development and airport capital improvements – many of which contribute to overall air transportation safety.

The Federal Aviation Administration (FAA) contracts with the Michigan Department of Transportation for the inspection of the state's 238 public-use airports on an annual basis. The FAA has regulatory jurisdiction over operational safety and aircraft worthiness. The National Transportation Safety Board (NTSB) investigates all aircraft crashes that involve a fatality and publishes reports on its findings. (See the NTSB section below). A map identifying all the airports within the state is included in this section.

Land Transportation

School bus safety programs and initiatives generally fall into two categories:

1. Driver skill enhancement and competency training.
2. Physical inspections of bus mechanical and safety equipment.

The Motor Carrier Division, Michigan Department of State Police, inspects all school buses and other school transportation vehicles (21,000 units) on an annual basis. In addition, all school bus drivers in Michigan must take and pass a bus driver education and training program, and then take regular refresher courses to maintain their certification to operate a school bus. School bus drivers must also pass an annual medical examination.

Local transit and intercity bus safety falls under the purview of the Michigan Department of Transportation's Bureau of Urban and Public Transportation. Generally, the issue of intercity and transit bus safety is handled on a partnership basis with the service providers, with MDOT providing oversight of the initiatives undertaken by the providers to ensure mechanical and operational safety.

Transportation Related Events in Gladwin County

In September 2015, there was a private plane mishap that caused a plane to land in a private field. While no injuries occurred, there was some damage to the crops that occurred as a result of the emergency landing.

Transportation Overview

Gladwin County does not contain any railroad lines nor any federal highways. This reduces many of the transportation concerns faced by other county governments. However, as everyone does travel on the state and county roads throughout the County and on the local waterways, transportation was given a medium priority.

HORSE-DRAWN VEHICLES

A mechanized piece of equipment pulled by one horse or by a team of horses. These vehicles typically have two or four wheels and are used to carry passengers and/or goods. These vehicles were once common worldwide, but they have mostly been replaced by automobiles and other forms of self-propelled transport.

Hazard Description

Horse-drawn vehicles are the primary source of transportation for the Amish population in Gladwin County. There are three Amish settlements within the County. As there are not separate roads or even specified lanes for the horse-drawn vehicles to travel, they must utilize the same lanes as the motorized vehicles. Most of these vehicles do not have any lights, creating potential visibility problems during dusk and evening hours as well as during times of inclement weather.

Horse-drawn Vehicle Overview

The utilization of lights for these vehicles would be a benefit to not only the people using these vehicles, but would also benefit the general population using the roads within Gladwin County. Gladwin County is not only a destination for seasonal travelers, but is also the gateway to many of the northern counties within the state. Travelers not familiar with the area may not be aware of the horse-drawn non-motorized vehicles.

Some mitigation of these accidents may be achieved by educating the general public of the presence of the horse-drawn vehicles, which would bring a better awareness of them on the roads.

Hazardous Material Incidents

HAZARDOUS MATERIAL INCIDENTS - TRANSPORTATION

An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

Hazard Description

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people.

Michigan has had numerous hazardous material transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are fairly commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel.

Hazardous Material Incidents: Transportation Overview

Although there have not been any significant hazardous materials transportation incidents, there have been many minor petroleum and hazardous materials spills throughout the years. Most major roads within the county are primarily two lanes. These routes are heavily congested in the summer months and often icy or impassible in the winter. It is certainly only a matter of time before a serious hazardous materials incident occurs on a county roadway, railway, or waterway.

OIL/GAS WELL INCIDENT

An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

Hazard Description

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Since 1925 over 44,000 oil and natural gas wells have been drilled in Michigan, of which roughly half have produced oil and gas. To date, Michigan wells have produced approximately 1.4 billion barrels of crude oil and 4 trillion cubic feet of gas.

The petroleum and natural gas industry is highly regulated and has a fine safety record, but the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H₂S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions. Over 1,300 wells in Michigan have been identified as having H₂S levels exceeding 300 parts per million (ppm).

As the table below indicates, at concentrations of 700 ppm, as little as one breath of hydrogen sulfide can kill. Although hydrogen sulfide can be detected by a "rotten egg" odor in concentrations from .03 ppm to 150ppm, larger concentrations paralyze a person's olfactory nerves so that odor is no longer an indicator of the hazard. Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above, and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. This requires that all company and government responders be familiar not only with emergency procedures for the well site, but also with the kinds of materials that are safe for use in sour gas well response.

Physiological Response to H₂S

TABLE 4.3

10ppm	Beginning eye irritation
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1 hour exposure
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to 1 hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

Oil and Gas Well Accidents Overview

There are 443 oil and natural gas wells in Gladwin County along with 35.2 miles of gas pipeline. This is a relatively small quantity when compared with state leader, Otsego County, with over 5700 wells. Of almost as great a concern is the fact that a combination of multiple organizations and individuals own the wells. As a general rule, most gas companies prefer to respond to incidents involving their wells themselves – and in the vast majority of cases that is what happens. Because gas companies often have controlled burns, and deal with wells on a daily basis, it is impossible to ascertain how many incidents have actually occurred in the county. However, there is still the possibility that an emergency response agency could find themselves in the situation of responding to an incident at a gas well. Responders must understand the dangers associated with H₂S and must have a working knowledge of these wells that are in their areas of responsibility.

PETROLEUM AND NATURAL GAS PIPELINE ACCIDENTS

An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

Hazard Description

Though often overlooked, petroleum and natural gas pipelines pose a real threat in many Michigan communities. Petroleum and natural gas pipelines can leak or fracture and cause property damage, environmental, contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur in Michigan are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. The remaining 75% is imported by five interstate pipeline companies that have access to the major natural gas producing regions in North America. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 11th in the nation in production of natural gas, and ranks 6th in consumption at 937.2 billion cubic feet. Michigan's petroleum product consumption in 1997 was 189 million barrels, ranking it 10th nationally. These figures underscore

the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries – from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems.

While it is true that the petroleum and natural gas industries have historically had a fine safety record, and that pipelines are by far the safest form of transportation for these products, the threat of fires, explosions, ruptures, and spills nevertheless exists. In addition to these hazards, there is the danger of hydrogen sulfide (H₂S) release. These dangers (fully explained in the Oil and Natural Gas Well Accidents section) can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has a high sulfur content. Hydrogen sulfide is not only an extremely poisonous gas, but is also explosive when mixed with air at temperatures of 500 degrees Fahrenheit or above.

Petroleum and Natural Gas Pipeline Accidents in Gladwin County

No recent accidents are on record as occurring in Gladwin County.

Petroleum and Natural Gas Pipeline Accidents Overview

There are several petroleum and natural gas pipelines running throughout the County. Gladwin County has several compressor stations and storage fields in the area. In the Emergency Service Office are plans and emergency contact numbers for these locations. One point that is stressed in most of these plans is for local emergency crews not to do anything on scene until a representative from the company arrives.

Because petroleum and natural gas pipeline accidents are an inevitable occurrence, affected local communities must be prepared to respond to the accident, institute necessary protective actions, and coordinate with federal and state officials and the pipeline company emergency crews to effectively manage and recover from the accident. That can best be accomplished through collaborative planning, training, and exercising of emergency procedures with all potentially involved parties.

HAZARDOUS MATERIAL INCIDENTS - FIXED SITE AND PROPANE STORAGE SITES

Hazardous Material Incident-An uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property, and the environment.

Industrial Accidents-A fire, explosion, or other severe accident (especially if it involves hazardous materials) at an industrial facility that results in serious property damage, injury, or loss of life.

Hazard Description (Hazardous Material Incidents)

Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use and disposal of these materials, accidental releases are bound to occur. Areas at most risk are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but release can still cause severe harm to people, property, and the environment if proper mitigative action is not taken in a timely manner.

Hazard Description-Industrial Accidents

Industrial accidents differ from hazardous material incidents in the scope and magnitude of offsite impacts. Whereas hazardous material incidents typically involve an uncontrolled release of material into the surrounding community and environment that may require evacuations or in-place sheltering of the affected population, the impacts from industrial accidents are often confined to the site or facility itself, with minimal physical outside impacts. Nonetheless, industrial accidents, such as fires, explosions, and excessive exposure to hazardous materials, may cause injury or loss of life to workers at the facility, and significant property damage. In addition, industrial accidents can cause severe economic disruption to the facility and surrounding community, as well as significant long-term impacts on the families of the workers injured or killed.

Hazardous Material Incidents/Industrial Accidents in Gladwin County

On 8/31/2013 a natural gas leak occurred in Gladwin resulting in the evacuation of the residents/visitors in the area. Residents, visitors, business operators/employees were told of the leak and were advised to leave the area. A safe zone was established in City Park. People were allowed to return after several hours. No injuries or deaths occurred as a result of the leak.

Hazardous Material Incidents/Industrial Accidents Overview

Like all heavily industrialized states, Michigan will always be concerned with the risk of accidental hazardous material releases. However, the threat of accidental hazardous material releases that can affect life, health, property or the environment can be greatly reduced by: 1) developing and maintaining adequate community hazardous material response plans and procedures; 2) adequately training hazardous material workers and off-site emergency responders; 3) educating the public about hazardous materials safety; 4) enforcing basic hazardous material safety regulations; and 5) mitigating, wherever possible, the threat of accidental hazardous material releases. Fortunately, many Michigan communities are making great strides in these important areas.

NOTE: Nuclear research facilities can produce/use radioactive materials, as well as other hazardous substances, and therefore need to be dealt with by specially trained personnel. Caution should be exercised at these facilities, and proper radiological survey equipment should be used during a response.

Superfund Amendments and Reauthorization Act (SARA), Title II

There are currently 5 Sites in Gladwin County designated SARA Title III, Section "302 Sites". These sites are required to have an emergency plan on file with the Local Emergency Planning Commission, Fire Department, and their facility. All 5 "302 Sites" in Gladwin County have an emergency plan on file with the Local Emergency Planning Committee and their individual Fire Departments.

The meetings that were held in the county, attendees and the emergency manager expressed some concern for the safety and security of propane storage sites. The county would like to improve security

and inventory the sites for the future safety of the residents. 302 Sites maps are located at the end of this section. (Buffer Zones for 302 Sites are half-mile radius.)

NUCLEAR POWER PLANT ACCIDENTS

An actual or potential release of radioactive material at a commercial nuclear power plant or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population.

Hazard Description

Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant, and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the Federal government.

Nuclear Power Plant Failures Overview

Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10 mile Emergency Planning Zone (EPZ) around the plant, and a 50 mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has 3 active and 1 in-active commercial nuclear power plants, in addition to 4 small nuclear testing/research facilities located at 3 state universities and within the City of Midland. Gladwin County does not have a nuclear power plant.

Gladwin County does not have a nuclear power plant located within 50 miles and is not within the Secondary EPZ or ingestion pathway zone. Thus, they are not required to have a plans in place for that zone. The closest active Nuclear Power Plant is located within the US is 142 miles, which is the Point Beach Nuclear Plant in Wisconsin, and the closest nuclear plant in Michigan is 169 miles, which is the Palisades Nuclear Generating Station.

Technological Failures

INFRASTRUCTURE FAILURES

A failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services.

Hazard Description

Michigan's citizens are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other cause – even for a short period of time – it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes if immediate mitigative action is not taken. When the water or waste treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur.

These are just some examples of the types of infrastructure failures that can occur, and all of these situations can lead to disastrous public health and safety consequences if immediate mitigative actions are not taken. Typically, it is the most vulnerable members of society (i.e., the elderly, children, impoverished individuals, and people in poor health) that are the most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and possibly even regions can be severely impacted.

Communication Loss

Communication loss can be catastrophic in emergency situations in the county. Power outages or direct damage to communication equipment could mean life or death in certain situations. The population is dependent on emergency services getting to the incident site in a timely manner, and if there is damage to the equipment, the services may not reach their destination at all. The elderly population in the county is especially vulnerable to power outages and times of extreme weather, and these times are the most important to get services to them. In that case, there needs to be an alternative way of communication for the emergency services to reach their destination.

The county has come up with a few ideas to help solve this problem. They suggested that Mutual aid assistance for failures in utility and communications systems (including 9-1-1) could help alleviate the problem. Alternative 9-1-1 access could be done through radio operators whose homes are identified through special markings. Also, they could use generators for backup power at critical facilities. Finally, the replacement or renovation of aging structures and equipment (to make as hazard-resistant as economically possible).

Infrastructure Failures Overview

Most of Gladwin County's infrastructure failures are secondary hazards caused by other major events such as floods, windstorms, snow and ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. However, if the power were out for a longer period of time, the local chapter of the American Red Cross would be called to set up temporary shelters. Infrastructure failures are identified as a high priority due to the dangers that could result in loss of utilities.

Fire Hazards

WILDFIRES

An uncontrolled fire in grass or brushlands, or forested areas.

Hazard Description

Contrary to popular belief, lightning strikes are not a leading cause of wildfires in Michigan. Today, lightning causes only 2 percent of all wildfires, and the rest are caused by human activity. Outdoor burning is the leading cause of wildfires in Michigan. Debris burning was responsible for 32 percent of the wildfires in Michigan in 1999. Incendiary, or intentional, fires accounted for another 12 percent of the total wildfires.

Upon examination of the causes of fire, it becomes apparent that most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from

uncontrolled wildfires is the destruction of timber, structures, other property, wildlife, and injury or loss of life to people who live in the affected area or who are using recreational facilities in the area.

Wildfires in Gladwin County

Although there have been no significant wildfires in Gladwin County in recent years, each year there are numerous small fires. (Please refer to the Wildfires Overview section for more information on the annual number of wildfires in Clare County.) Given the appropriate weather, fuels (dry and dead grasses, tree debris, etc.) and topography, any fire can develop into a significant wildfire.

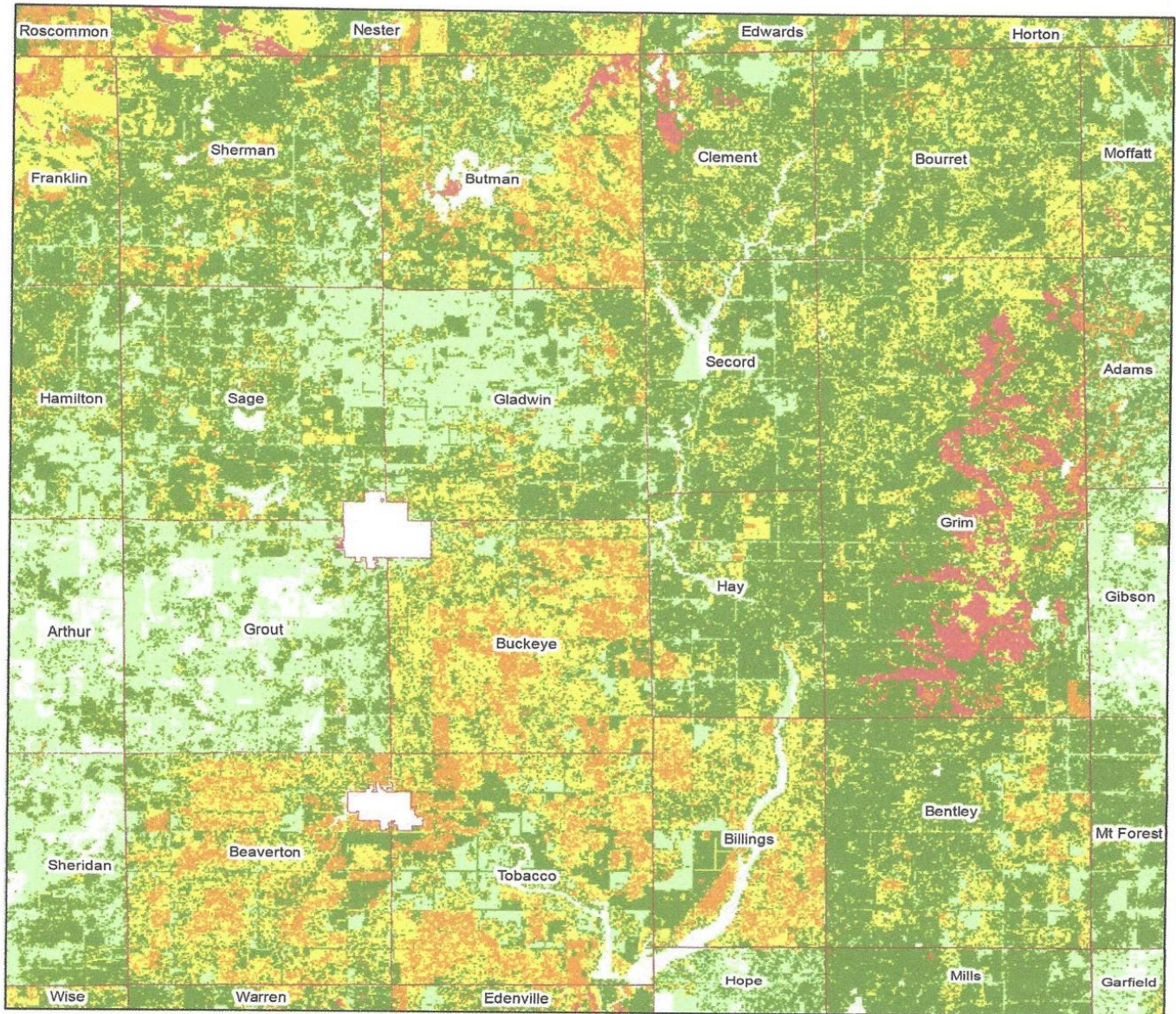
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Wildfire Overview

Since 2007, there have been 106 wildfires reported to the Michigan Department of Natural Resources. The damages resulting from these wildfires was 338.3 acres, with no major wildfire being reported to MDNR. Using the information from the MDNR, over the past 10 years there have been an average 10 fires per year, and 38 acres being lost due to the fires. These numbers do not include the fires put out by the township fire departments not requiring MDNR assistance, as these numbers were not available from the local fire departments. It must be noted that the fire departments within the County are trained to fight wildfires and a mutual aid agreement provides additional support should it be required. While the number of wildfires and acreage lost does not appear to be high, because of the County being highly forested, any wildfire given the right conditions in the future could result in lost property and or the loss of human lives, which is why this hazard has been given a high priority to address.

Gladwin County Wildfire Risk MAP

MAP 4.2



Legend

— Civil Township Boundaries
 — Counties

Fire Risk w/ Dry Soils

Value

No Risk (0-5)
 Low Risk (6-24)
 Moderate Risk (25-36)
 High Risk (37-48)
 Very High Risk (49-96)
 Extreme Risk (97-273)



0 1 2 4 6 8 Miles

STRUCTURAL FIRES

A fire, of any origin that ignites one or more structures, causing loss of life and/or property.

Hazard Description

In terms of average annual loss of life and property, structural fires – often referred to as the “universal hazard” because they occur in virtually every community – are by far the biggest hazard facing most communities in Michigan and across the country. Each year in the United States, fires result in approximately 5,000 deaths and 25,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Direct property losses due to fire exceed \$9 billion per year – and much of that figure is the result of structural fire.

According to the Federal Emergency Management Agency’s National Fire Data Center, residential fires represent 74% of all structural fires and cause 80% of all fire fatalities. Approximately 85% of those fatalities occur in single- family homes and duplexes. Perhaps the most tragic statistic of all is that over 40% of residential fires and 60% of residential fatalities occur in homes with no smoke alarms.

Structural Fires in Gladwin County

On 4/13/2016 a structural fire in Gladwin destroyed a 20-unit apartment building, displacing 17 families. Two residents were hospitalized as a result of the fire, due to smoke inhalation and chest pains, but no other injuries occurred. Five fire departments from Gladwin and Clare Counties were called to put the fire out. (At the time of this document the cause for the fire had not been determined, nor had the estimated damages.)

Structural Fires Overview

Major impacts occur every year, beyond the ordinary single-home fires that happen in every community. Since historic areas are less well-fireproofed and tend to have greater densities, the risk of major fire impacts seems to be higher there and the downtowns in the two cities are both older, if not historic buildings. Structural fires were given a high priority to address due to its potential devastation.

SCRAP TIRE FIRES

A large fire that burns scrap tires being stored for recycling/re-use.

Hazard Description

Michigan generates some 7.5 to 9 million scrap tires each year. Although responsible means of disposal have become more common, tire dumps of the last forty years present environmental and safety hazards that will last into the foreseeable future. By 2001, the State of Michigan had identified a total in excess of 24 million scrap tires in disposal sites scattered around the state.

The Scrap Tire Regulatory Program is implemented by the Waste Management Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program per the following initiatives: 1) a compliance and enforcement program was

implemented; 2) a scrap tire policy recycling hierarchy was established; 3) special uses of scrap tires were approved; and 4) a grant program was established to address abandoned tires.

In 1997, Part 169 was amended to require that a statewide emergency response plan be put into place to address response to fires at collection sites.

Scrap Tire Fires in Gladwin County

Gladwin County has not had a significant tire fire in recent memory, and the scrap tires that were identified in the County have since been removed.

Scrap Tire Overview

With the elimination of scrap tire sites within the County, this hazard has been greatly reduced. However, as there are used/scrap tires located at car dealerships this hazard has not been completely eliminated.

Seasonal Population Increase

SEASONAL POPULATION INCREASE

A population, in the county, beyond the normal level of people to which resources are allocated.

Hazard Description

As more and more people vacation to the northern portions of Michigan, local communities in northern Michigan are going to find it harder to maintain levels of safety and resources to keep the population in the jurisdictions comfortable and safe. The trend of people buying summer homes or cottages is growing, and with the advent of Baby-Boomers reaching retirement age, the seasonal and permanent populations of the northern counties will continue to slowly grow.

Gladwin County is no exception to seasonal population spikes in the summer, deer season, and to a lesser extent, the winter months. From 2000 to 2012 there was an estimated decrease in population of 287 people. However, Gladwin County has approximately 10,000 housing units that are used as secondary or seasonal homes. During the summer months and especially on the three major summer holidays many of these homes become occupied, which can double or triple the local population.

Many stresses are put on local governmental agencies such as fire departments, police departments, as well as hospitals, the road commission, and ambulance services to maintain the status quo of service for their county. With more people relocating to the northern counties for extended periods of time, the level of staff and resources may not suffice to the needs of the population.

Seasonal Population Increases in Gladwin County

With the power outages across the country in the summer of 2003, Gladwin County experienced a high influx of people from the Detroit area going to their seasonal homes. The emergency management office reported that there were low supplies of food and stresses on emergency services in Gladwin County.

Seasonal Population Increase Overview

Seasonal population increase will continue to be a problem in Gladwin County unless there are preventative measures taken to solve it. The population of Gladwin County is projected to increase and

with budget cuts, Gladwin County is finding it hard to maintain the status quo for emergency services. The seasonal population influx will only make the situation harder to manage. Also, infrastructure problems in southern Michigan can be a factor that directly affects Gladwin County. As this hazard is not considered to be a life-safety hazard it was given a moderate priority to address.

Civil Disturbances

CIVIL DISTURBANCES

Collective behavior that results in a significant level of law-breaking, perceived threat to public order, or disruption of essential functions and quality of life.

Hazard Description

Civil disturbances can be classified within the following four types: (1) acts or demonstrations of protest, (2) hooliganism, (3) riots, or (4) insurrection. Since most of these types of disturbance share similarities with each other, and the classifications presented here are not absolute and mutually exclusive, it is recommended that this entire section be studied as a whole. The descriptions that follow, while roughly organized by type of disturbance, provide information of interest in evaluating and understanding all types of civil disturbance, and therefore should not be treated as independent subsections or read in isolation from each other.

The first type, demonstrations of protest, usually contains some level of formal organization or shared discontent that allows goal oriented activities to be collectively pursued. This first category includes political protests and labor disputes. Many protest actions and demonstrations are orderly, lawful, and peaceful, but some may become threatening, disruptive, and even deliberately malicious (on the part of at least some of those involved either in the protest itself or in reaction to the protest). It is only the latter type of event that should properly be classified as a civil disturbance. The destruction of property, interruption of services, interference with lawful behaviors of ordinary citizens and/or emergency responders, the use of intimidation or civil rights violations, and threats or actual acts of physical violence may all occur during civil disturbance events. Actual Michigan events have included the willful destruction of property and impeded property access during labor strikes, and heated conflicts between opposing participants at political rallies or issue-driven demonstrations. Different risks and forms of disturbance are connected with the nature and perceived importance of the cause, the degree of organization among those who are active in the protest, and the amount of group cohesion among those who are involved.

The second category of civil disturbance, hooliganism, is relatively unorganized and involves individual or collective acts of deviance inspired by the presence of crowds, in which the means (and responsibility) for ordinary levels of social control are perceived to have slackened or broken down. Certain types of events, such as sporting events, "block parties," or concerts, become widely publicized and, in addition to normal citizens who merely seek entertainment, tend to also attract certain types of persons who seek situations in which anonymity, confusion, and a degree of social disorder may allow them to behave in unlawful, victimizing, or unusually expressive ways that would normally be considered unacceptable by most ordinary people. An Example includes the disorder that has followed various championship sporting events. Although the majority of persons present are ordinary citizens (although many may have some level of intoxication), a minority of persons begin making itself known through unlawful or extreme acts of deviance, and it is from this part of the crowd that the hazard primarily stems.

Common problems include the widespread destruction of property, numerous types of assault and disorderly conduct, and criminal victimization. It should also be noted that many persons who are normally law-abiding may temporarily behave in unusually aggressive ways during these events, often prompted by an understandably defensive anxiety about the disorder and behavior exhibited by the deviant minority, but also possibly exacerbated by a level of alcoholic intoxication as well as the temptation by some to engage in appealing deviant behaviors that under normal circumstances of social control would not be selected. Many citizens remain law-abiding, but may remain in the area of a civil disturbance either because they live in the area, have activities (including social and recreational ones) that they wish to continue engaging in, have legitimate business to conduct, or because they are curious or concerned and wish to observe or witness the situation as it occurs. The majority of such law-abiding citizens will leave the area in an orderly way when given clear instructions by a legally-recognized authority to do so. There are cases in which hooliganism may become combined with protest, and thus complicate the situation for law enforcement personnel. In some circumstances, elements of protest are added only by a small minority of participants after the disturbances have already begun, but in other circumstances, protest activity may arise out of concerns regarding the extent and nature of pre-emptive law enforcement activities that were intended to prevent a civil disturbance.

The third type, riots, may stem from motivations of protest, but lacks the organization that formal protests include. Although legitimate and peaceful protests may spontaneously form when people gather publicly with the perception that they already share certain values and beliefs, riots tend to involve violent gatherings of persons whose level of shared values and goals is not sufficiently similar to allow their collective concerns or efforts to coalesce in a relatively organized manner. Instead, there tends to be a diffuse sense of shared discontent, but relatively few norms to shape these strivings into clearly coherent action. For example, widespread discontent within a community that is sufficiently cohesive may quickly take on a set of shared leaders and clear organization, such as a march or chant that is clearly in the form of a protest or demonstration, but in an area that doesn't have the same cohesiveness and shared norms and values, a relatively chaotic form of expression may take place instead, involving assaults, intimidation, and unlawfully destructive expressions of discontent, possibly including the victimization of innocent citizens or businesses who have been selected by part of the crowd to function as scapegoats during their expression of discontent. In addition to the sentiments of discontent that may have sparked the initial activities, however, elements of hooliganism may emerge and even come to predominate, as certain persons may attempt to exploit the social disorder for their own individual ends. In other cases, elements of legitimate protest may also form within this type of civil disturbance, and pockets of organized protest may help to channel and contain the negative elements of hooliganism, looting, etc. that might otherwise threaten all area residents. The complexity of these events for law enforcement can be very great, demanding carefully calculated efforts to analyze the nature of the disturbance, and difficult decisions about how to approach and possibly involve the numerous types of persons, gatherings, groups, and behaviors that may have the potential to either mitigate or exacerbate the situation.

The fourth type of civil disturbance, insurrection, involves a deliberate collective effort to disrupt or replace the established authority of a government or its representatives, by persons within a society or under its authority. Some prison uprisings may fall into this category, although others may more properly be classified as riots or protests, depending upon the presence and extent of specific goals and organization, and the type of action used in achieving such goals. An insurrection has the deliberate goal of either replacing established authorities with a new distribution of power, or with the destruction of established power structures in favor of (usually temporary) anarchy or a smaller-scale set of recognized criminal (gang), ethnic, or other group networks and power structures. The latter circumstances tend to involve disturbances that exist on a relatively small scale, such as in a single local area or involving a prison

network or “cult compound” (or any other similarly self-aware group or subculture with identified collective interests and a network that allows rapid communication). However, larger-scale insurrections are also possible, involving issues of class conflict or other widespread social inequalities, highly divisive political issues, or other important large-scale events that disrupt the social equilibrium because they illuminate areas in which cultural values are not sufficiently shared throughout the society or region that is experiencing the conflict, disruption, or strain. In many cases, this kind of large-scale social strain has developed gradually over time, and involves an entire series of compromises, concessions, and migrations that may temporarily relieve the disruptive social and value conflicts, only to reemerge after another period of changes and population growth has caused a breakdown in previous arrangements. This description of the causes of social discontent applies to many protests and riots, as well as insurrection. In cases involving the formation or emergence of significant subcultures or counterculture, such as during the Vietnam era, or when dominant values break down or fail to be established on important key issues or mores, there is the potential for insurrection on a larger scale. The Civil War of 1861-1865 was one such instance, in which the authority of the federal government was either accepted or rejected by various states which then aligned themselves in opposition to each other. Between these two extremes (of a purely localized civil disturbance and a national civil war) are numerous other possibilities for regional, political, class, or ethnic conflicts that may involve one or more categories of citizen in conflict with others. Examples could include prisoners versus law enforcement personnel, a countercultural group versus the establishment, or a violent political activist group in conflict with selected representatives of a contrary viewpoint. (Some such actions may overlap with those of terrorism, q.v.)

Civil Disturbances in Gladwin County

On 9/17/2015 in rural Gladwin County, the Michigan State Police were involved in a three-hour standoff with a local resident. The MSP were called out with complaints that guns were being fired and upon showing up at the scene were shot at by the citizen using a high-powered rifle. The incident ended with the shooting/killing of the suspect.

Civil Disturbances Overview

Civil disturbances occur rarely in Gladwin County. However, with the ever increasing threats throughout society, this is a growing problem that cannot be resolved at the local level. Should a major event occur, the Michigan State Police, and possibly other law enforcement details will have to be called in to assist the local public safety personnel. Civil disturbances were given a moderate priority to address.

NUCLEAR ATTACK

A hostile action taken against the United States which involves nuclear weapons and results in destruction of property and/or loss of life.

Hazard Description

Any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries place these areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the “Cold War” and the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there still exists in the world a large number of nuclear weapons capable of destroying multiple locations

simultaneously. In addition, the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

At this point, attack-planning guidance prepared by the Federal government in the late 1980s still provides the best basis for a population protection strategy for Michigan. That guidance has identified 25 potential target areas in Michigan, and 4 in Ohio and Indiana that would impact Michigan communities, classified as follows: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets. For each of these target areas, detailed plans have been developed for evacuating and sheltering the impacted population, protecting critical resources, and resuming vital governmental functions in the post-attack environment.

Nuclear weapons are explosive devices that manipulate atoms to release enormous amounts of energy. Compared to normal chemical explosives such as TNT or gunpowder, nuclear weapons are far more powerful and create harmful effects not seen with conventional bombs. A single nuclear weapon is able to devastate an area several miles across and inflict thousands of casualties. Although nuclear attack is an unlikely threat, the severe damage that would be caused by even one weapon requires the danger to be taken seriously.

The threat of nuclear attack has primarily been associated with the Cold War between the United States and the Soviet Union in the last half of the 20th Century. Although the Cold War is over, there remains a threat of nuclear attack. More nations have developed nuclear weapons and there is also the possibility that terrorists could use a nuclear weapon against the United States.

Hazard Analysis

Understanding Nuclear Weapons

The following information about nuclear weapons is important for understanding the threat of nuclear attack: (1) types of nuclear weapons, (2) measures of weapon power, (3) forms of attack, and (4) types of delivery systems.

Nuclear weapons have been built in a wide variety of types for several different purposes. The first weapons relied on nuclear fission, or the splitting of heavy atoms to release energy and create an explosion. Later, new weapons were invented that used a combination of fission and fusion, which involves the creation of heavier atoms from lighter ones. Fusion bombs are also referred to as hydrogen bombs or H-bombs. For emergency planning purposes, the important differences are that (1) fusion bombs are more difficult to build and (2) that they can be much more powerful. Otherwise, all types of nuclear weapons create the same types of effects.

The power of nuclear weapons is measured by comparing the energy released by the weapon to the energy released by large amounts of conventional high explosive. The strengths of smaller weapons are measured in kilotons (or thousands of tons) of TNT explosive. A twenty-kiloton bomb produces as much energy as twenty thousand tons of TNT exploded all at once. The strength of larger weapons is measured in megatons, or millions of tons of TNT. A two-megaton bomb produces as much energy as two million tons of high explosive.

Smaller nuclear weapons are generally designed to be used against military targets on the battlefield. These are called tactical nuclear weapons. Larger devices designed to attack cities, infrastructure, and military bases are called strategic nuclear weapons.

Bombs can be set off at varying heights above the target. If the bomb is set off high in the air, its effects are spread out over a wider area and generally more damage is done. This is called an air burst. A bomb that is set off at or near the Earth's surface level wastes much of its energy against the ground. This is called a ground burst. Ground bursts have some specific military uses and terrorists may use ground bursts because they are unable to lift their weapons high enough to create an air burst.

Like any weapon, a nuclear device must be carried to its target by a delivery system. The first nuclear weapons were bombs dropped out of aircraft. Later, tactical weapons were made small enough to fire out of cannons or carry in large backpacks. Intercontinental ballistic missiles (ICBMs) are rockets that can carry one or more nuclear weapons across thousands of miles in less than an hour. Terrorists may lack sophisticated missiles, but they could create effective delivery systems by transporting a nuclear weapon in the back of a truck, aboard a cargo plane, or within a shipping container.

Effects of Nuclear Weapons

The effects of nuclear weapons are more complicated than those of conventional explosives. Nuclear devices cause damage through six major effects: (1) thermal pulse, (2) blast, (3) prompt radiation, (4) electromagnetic effects, (5) mass fire, and (6) residual radiation.

THERMAL PULSE is an intense flash of light and heat released within the first few seconds of a nuclear explosion. The damage from thermal pulse is almost instantaneous and covers a wide area. People and animals exposed to the pulse can be badly burned. Flammable objects such as buildings, vehicles, and trees may be set on fire. The flash is strongest close to the bomb and becomes weaker with distance. Even people located far away from the explosion may still be blinded by the intense light of the pulse.

BLAST is a powerful wave of force that moves out from the center of the explosion through the air and the ground. The farther the blast travels, the weaker it becomes. Very close to the bomb, the blast will destroy even the most strongly built buildings and will kill everyone not hidden deep underground. Farther away, buildings may survive, but with severe damage, and people will be injured by being picked up and smashed against objects. At still greater ranges, buildings will be less damaged and injuries will largely result from shattered glass and thrown debris. At all distances, a powerful wind follows the initial blast wave and adds to the destruction. The blast from a ground burst will dig a large crater into the ground, but this cratering will not occur with an air burst.

PROMPT RADIATION is the harmful blast of high energy radiation given off at the same time as the thermal pulse. Prompt radiation includes gamma rays and neutron radiation. This radiation is capable of killing or injuring living beings by damaging tissues and organs. Prompt radiation is quickly absorbed by the atmosphere and does not impact as wide an area as other nuclear weapons effects. In most instances, a person close enough to receive a harmful dose of prompt radiation is also close enough to be immediately killed by the explosion's thermal pulse or blast. However in unusual cases, some people who survive the immediate effects of the bomb may sicken or die days later, from radiation poisoning.

ELECTROMAGNETIC EFFECTS occur immediately after a nuclear explosion and may damage communications equipment, computers, and electronics. Radios, cell phones, and power lines are especially vulnerable. In most cases, the effects are limited to an area near to the explosion. Some

equipment may recover after a period of time, while other devices will need to be replaced. One special type of nuclear attack might cause more widespread electromagnetic effects: a very large nuclear weapon carried high into the atmosphere by a missile is capable of damaging communications and electronics over a very large area.

MASS FIRE results from the ignition of thousands of individual fires by a bomb's thermal pulse, combined with widespread destruction from its blast. Over a period of hours, small fires merge and feed on damaged buildings and debris. Controlling these fires would be very difficult, due to damaged water mains, destroyed fire-fighting equipment, and blocked roads. The result is an extremely intense fire that can spread quickly and reach very high temperatures. Mass fire may significantly expand the area devastated by a bomb, destroying areas that might otherwise be only lightly damaged by other types of effects.

RESIDUAL RADIATION is unlike prompt radiation in that it lasts well after the nuclear explosion has ended. The ground immediately underneath the center of the explosion will be dangerously radioactive for several days due to "induced radiation." There will also be some radioactive dust and debris that will drift downwind of the explosion. This radioactive dust is called "fallout." Fallout will be a minor problem in the case of an air burst explosion, but will be very intense in the case of a ground burst attack. Regardless of the type of attack, the danger from fallout will tend to be greatest close to the site of the attack. The cloud of fallout will weaken the longer it lasts and the farther it travels.

Note that the effects of a nuclear attack will depend on the size of the weapon. A larger bomb will cause damage over a wider area. The importance of different types of damage will also vary with the weapon. Large strategic nuclear weapons will create most of their damage through thermal pulse and mass fires, while with small tactical bombs the blast effect and prompt radiation will be relatively more important.

Nuclear Attack Overview

Nuclear attack is an unlikely hazard, but even a single weapon could cause death and destruction on a massive scale. Nuclear weapons inflict damage over a wide area and through a variety of effects, including thermal pulse, blast, fire, and radiation. Despite the end of the Cold War, nuclear attack by foreign nations remains a real possibility, and this danger has been joined by the threat of terrorist nuclear attack. It makes sense to continue to prepare for the nuclear attack hazard as part of an overall emergency management strategy.

Hazard Mitigation Alternatives for Nuclear Attack

- Designated fallout shelters and public warning systems.
- Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
- Using laminated glass, metal shutters, structural bracing, and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
- Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).

(Note: Should a nuclear attack occur, the emergency management will be taken over by the Department of Homeland Security.)

SABOTAGE (TERRORISM)

An intentional, unlawful use of force or violence 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.

Hazard Description

Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are so widely varied, so too are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target. In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities.

One of the first acts of domestic sabotage/terrorism ever carried out occurred in Michigan on May 18, 1927, in Bath. A disgruntled taxpayer and farmer detonated 1,000 pounds of explosives under the newly constructed Bath Consolidated School killing 38 students and 3 teachers and injuring 58 others. The perpetrator then blew himself up, along with the school superintendent. As tragic as that event was, it could have been worse were it not for the fact that half of the explosives failed to detonate as planned, which certainly would have killed many more students and teachers. Concentrated activities to prevent terrorist activities have become even more vital with the passage of time and in the wake of the 9/11 events of destruction in New York City and Washington D.C. Many more resources may anticipate to be mobilized to prevent terrorist activities in the near future.

Although at first it might appear Gladwin County is an unlikely target for terrorism, it cannot be totally discounted. Potential targets include the dams, the water treatment plant, the runways at the airports, and all industrial sites in the area. Furthermore, any government building, school, or individual can become a target of domestic terrorism.

Sabotage and Terrorism include a broad range of potential hazards that affect a community from a variety of perspectives. This hazard is defined as an intentional, unlawful use of force or violence 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. Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings; 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical, radiological, and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrowing the U.S. Government; 8) eco-extremism, designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations.

Sabotage Overview

Even though there have not been any recently recorded sabotage/terrorism events occurring recently in Gladwin County, the Emergency Management staff has regularly scheduled training events to address

these circumstances. With the ever-growing threat of local acts, the County is working to prepare their personnel should an event occur.

Public Health Emergencies

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.

Hazard Description

Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological, or biological agents; 5) large scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events another disaster or emergency, such as flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

Perhaps the greatest emerging public health threat would be the intentional release of a radiological, chemical, or biological agent with the potential to adversely impact a large number of people. Such a release would most likely be an act of sabotage aimed at the government or at a specific organization or segment of the population. Fortunately, Michigan has not yet experienced such a release aimed at mass destruction.

Public Health Emergencies in Gladwin County

The most common type of public health emergency involves influenza that spreads through educational institutions, the workplace and other entities that experience a large volume of public traffic. Influenza typically kills between 200 and 500 individuals in Michigan alone and has the potential to change its structure and rapidly affect large populations.

Occurrences of influenza and disease are common to residents, students and visitors to Gladwin County and typically impact only a small portion of the population. Although most of public health related events occur in schools and are quickly managed, the potential does exist for these events to rapidly spread to adjacent populations.

Most public health emergencies in Gladwin County impact only a small number of individuals and occur more than once annually. The potential for these events to continue is high and can be effectively managed. However, increased public awareness to potential outbreaks of influenza or other disease has also raised the real possibility that a large scale event could occur. For this reason, development and testing of surveillance systems and integrated planning between local, state and federal sources continues to receive much needed attention.

Public Health Emergency Overview

Michigan has had several large-scale public health emergencies in recent history, but fortunately nothing that caused widespread severe injury or death. One of Michigan's most serious emergencies to hit Michigan occurred in 1973 when a local farmer fed polybrominated biphenyls (PBB) laced feed to his dairy herd. Michigan Chemical Corporation had accidentally supplied the Michigan Farm Bureau Services with sacks of fire-proofing chemical PBB, which is known to cause cancer, genetic mutation, and birth defects, and the PBB was inadvertently substituted for magnesium oxide (commonly used in antacid tablets used for human consumption) in a custom dairy feed # 402. During the crucial eight-month period between the farmer's first observations and the discovery of the accident, serious contamination had already occurred. By 1975 the state had quarantined more than 500 farms. Condemned for slaughter were more than 17,000 cattle; 3,415 hogs; 1.5 million chickens and 4.8 million eggs. The 1973 PBB contamination incident is unprecedented in U.S. history, but the long-term implications of contamination may be less than was feared.

In the 1980s, the state health department confirmed that 95 percent of Michigan's population had PBB in their bodies from eating beef, drinking milk or consuming other products from contaminated farms. A cancer epidemic was feared. Although one has not occurred, so far anyway, studies do show the most exposed families have increased breast and digestive cancer, and lymphoma. Among the effects observed in the exposed populations the daughters of the most highly exposed women began menstruation, on average, before they reached their twelfth birthdays.

Similarly, the northern Michigan water and sewer infrastructure disaster of 1994 is also unprecedented in scope, magnitude, and public health and safety implications for the affected communities. These events, though unusual, have heightened awareness of the broad nature of threats that can result in a public health emergency. Such emergencies no longer simply involve the spread of disease, but rather can arise out of a variety of situations and circumstances.

In 2001, Michigan health officials were introduced to the emerging health threats posed by foot-and-mouth disease and the West Nile encephalitis virus. Although foot-and-mouth disease is a highly contagious disease that only affects animals, a widespread outbreak such as that which occurred in parts of the United Kingdom in the spring of 2001 could have significant public health implications for humans as well, due to the potentially large numbers of dead animal carcasses that would have to be disposed of to prevent disease outbreaks. The Michigan Department of Agriculture and Rural Development, in conjunction with numerous other federal, state and local agencies and the agriculture industry, continues to monitor the foot-and-mouth disease situation and take the necessary steps to prevent the introduction and spread of the disease in the United States.

Geological Hazards

EARTHQUAKES

A shaking or trembling of the crust of the earth caused by the breaking and shifting of rock beneath the surface.

Hazard Description

Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes, or come as a series of tremors over a period of several days. The energy of an

earthquake is released in seismic waves. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued. However, scientists cannot yet predict exactly when or where an earthquake will occur. Earthquakes tend to strike repeatedly along fault lines, which are formed where large plates of the earth's crust below the surface constantly push and move against one another. Risk maps have been produced which show areas where an earthquake is more likely to occur. Earthquake monitoring is conducted by the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, and universities throughout the country.

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Most casualties result from falling objects and debris. Disruption of communications systems, electric power lines, gas, sewer and water mains can be expected. Water supplies can become contaminated by seepage around water mains. Damage to roadways and other transportation systems may create food and other resource shortages if transportation is interrupted. In addition, earthquakes may trigger other emergencies such as fires and hazardous material spills, thereby compounding the situation.

Earthquake Overview

No severely destructive earthquake has ever been documented in Michigan. However, several mildly damaging earthquakes have been felt since the early 1800s. The exact number is difficult to determine, as scientific opinion on the matter varies. With most of these earthquakes, damage (if any) was limited to cracked plaster, broken dishes, damaged chimneys, and broken windows. (Biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage)

The greatest impact on Gladwin County would probably come from damage to natural gas and petroleum pipelines. Damage would probably be negligible in well-designed and constructed buildings. However, poorly designed and constructed buildings could suffer considerable damage under the right circumstances.

In January 1990, Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, was signed into law. This EO requires that appropriate seismic design and construction standards and practices be adopted for any new construction or replacement of a federal building or federally building during or after an earthquake.

Gladwin County is not in an area designated as high risk to ground movement; yet by encouraging awareness of the hazards of poor construction practices and/or routine evaluations of existing structures for deficiencies, vulnerabilities can be identified and repaired before loss is sustained.

There is some chance of a moderate earthquake over the next few decades, which might be strong enough to damage some property and underground infrastructure.

SUBSIDENCE

The lowering or collapse of the land surface caused by natural or human-induced activities that erode or remove subsurface support.

Hazard Description

Subsidence is the lowering or collapse of the land surface due to loss of subsurface support. It can be caused by a variety of natural or human-induced activities. Natural subsidence occurs when the ground collapses into underground cavities produced by the solution of limestone or other soluble materials by groundwater. Human-induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining. In the United States, these activities have caused nearly 17,000 square miles of surface subsidence, with groundwater withdrawal (10,000 square miles of subsidence) being the primary culprit. In addition, approximately 18% of the United States land surface is underlain by cavernous limestone, gypsum, salt, or marble, making the surface of these areas susceptible to collapse into sinkholes.

Generally, subsidence poses a greater risk to property than to life. Nationally, the average annual damage from all types of subsidence is conservatively estimated to be at least \$125 million.

Mine Subsidence

In Michigan, the primary cause of subsidence is underground mining. Although mine subsidence is not as significant a hazard in Michigan as in other parts of the country, many areas in Michigan are potentially vulnerable to mine subsidence hazards. Mine subsidence is a geologic hazard that can strike with little or no warning and can result in very costly damage. Mine subsidence occurs when the ground surface collapses into underground mined areas. In addition, the collapse of improperly stabilized mine openings is also a form of subsidence. About the only good thing about mine subsidence is that it generally affects very few people, unlike other natural hazards that may impact a large number of people. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life. In extreme cases, mine subsidence can literally swallow whole buildings or sections of ground into sinkholes, endangering anyone that may be present at that site. Mine subsidence may take years to manifest. Examples of collapses occurring decades after mines were abandoned have been documented in several areas of the country.

Michigan's Mining Experience

Michigan's rich mining heritage has played a significant role in the State's development into a world economic power. Due to its diverse geology, Michigan has a wide variety of mineral resources, most notable of which are copper ore, iron ore, coal, sand, gravel, gypsum, salt, oil and gas. It is not surprising then that underground mining has occurred on a significant scale throughout Michigan's history. The principal types of underground mining that occurs, or has occurred in Michigan, include coal mining, metallic mineral mining, salt mining, gypsum mining, and solution mining.

Copper Mining

Copper mining, in particular, put Michigan on the map as a major mining area. Although native copper ore occurs in other parts of the world, at one time the quantity of Michigan's native ore was unsurpassed. From the mid to late 1800s, Michigan's Keweenaw Peninsula mines produced more native copper ore than any other mining area in North America. As those resources became depleted, copper mining began near White Pine in Ontonagon County. The target strata in the White Pine mining operations were on an anticline that was mined both at depths as shallow as 100 feet and as deep as 2900 feet. Over-mining of pillars in shallow parts of the mine caused collapse and subsidence at the surface, on mine property, during the 1980s. The "Copper County" area generally crosses Ontonagon, Houghton, and Keweenaw Counties.

Iron Ore Mining

Michigan's Lake Superior region has been home to significant iron ore mining operations since the mid-1800s. The iron producing areas are referred to as ranges, since the iron deposits generally occur on the slopes or at the base of remnants of ancient mountain ranges. Michigan has three ranges: 1) Gogebic Range, which extends from Gogebic County into Wisconsin; 2) Marquette Range, in Marquette County; and 3) Menominee Range, in Dickinson and Iron Counties. Most near-surface iron deposits in these three ranges have been exhausted, so underground mining has become the primary extraction technique. Nearly two billion tons of iron ore have been extracted from these areas.

Salt/Solution Mining

Michigan also has one of the world's largest underground salt accumulations. The thickest salt beds lie under most of the Lower Peninsula. These formations are, in some places, over 3,000 feet thick and composed of layers of salt and other minerals. Michigan ranked first or second in national salt production from 1880 to the late 1920s. The bulk of the salt production was from natural brines pumped from six salt formations. Salt was also produced from artificial brines that were derived by injecting freshwater into salt formations and retrieving the resulting brines (called solution mining). The old Detroit salt mine produced rock salt using the "room and pillar" method until 1983. (The room and pillar method involves creating large underground expanses [rooms] in which to mine, supported by pillars [natural or artificial structural members] that held in place the roofs of these rooms.) The Detroit salt mine was approximately 1,100 feet below ground, and encompassed approximately 1,100 acres of subsurface land. The room and pillar method is being used only in the single salt mine that is still operating in Michigan, by the Detroit Salt Company, which has an excellent safety record. Salt is also being produced from brines extracted at various locations within the state.

Gypsum Mining

Gypsum has been mined in Michigan since 1841. In the Grand Rapids area, gypsum is mined by the "room and pillar" method. Open pit mining is used in the Alabaster region (Gladwin County). In both of these areas, gypsum beds directly underlie thin layers of glacial drift. Closed topographic lows observed in both areas are believed to be due to groundwater solution of the gypsum and subsequent collapse of the overlying material.

Coal Mining

Michigan also once supported a thriving coal mining industry. Records indicate that over 165 different coal mines operated in Michigan's coal-bearing region, which includes 31 counties in the south-central portion of the lower Peninsula. Over 100 of the 165 known coal mines in the state were located in the Saginaw Bay area. Coal was first discovered in Michigan in 1835 in Jackson County. From that discovery, several small underground and surface coal mines were opened in that area of the state. In 1861, coal was discovered near Bay City, and in 1897 commercial coal mining began in Bay County. That led to the establishment of numerous additional mines in Saginaw, Tuscola and Genesee counties, which tended to be larger, deeper and more extensive mines. That was the start of Michigan's coal mining industry.

The state's underground coal mines were an average of 110 feet deep, and were worked by the "room and pillar" method. Michigan had continuous coal mining from 1897 to 1952, when the last underground coal mine near St. Charles, Saginaw County, closed. From 1860 (the year mine records were first kept) until 1975 (the year the last surface coal mine closed), the 165 commercial coal mines produced a total output of over 46 million tons of coal. The maximum coal output was achieved in 1907, when Michigan's 37 operating coal mines produced two million tons per year - enough to supply 16% of Michigan's total demand for coal.

Mine Subsidence Problem in Michigan

The legacy of underground mining can be felt in numerous locations across the state. Many of the underground mining areas, whether active or abandoned, are vulnerable to subsidence in some form. Unfortunately, records of abandoned mines are often sketchy and sometimes non-existent. Therefore, it is often difficult to determine exactly where the mines were located. Many areas of Michigan may have developed over abandoned mines and may not even be aware of it. Oftentimes, the only way a community or home / business owner becomes aware of a potential hazard is when subsidence actually occurs and damage or destruction results.

Subsidence Overview

Gladwin County has not experienced any cases of subsidence on record. However, with the number of mines that exist and have been abandoned, it could be possible for a future occurrence(s) of subsidence to occur in the County. This was identified as a moderate priority.

CHAPTER 5: ANALYSIS OF ALTERNATIVE ACTIONS

Prior to the development of the mitigation strategies, goals and objectives were developed. Upon the development of the goals and objectives, mitigation actions were then determined, based on the six categories of mitigation actions. Below are the goals and objectives, and the mitigation action categories as determined for the 2007 Hazard Mitigation Plan. Revised goals and objectives for the 2015 Plan, as determined by the Gladwin County Hazard Mitigation Advisory Committee, will appear in Chapter 5: Action Plan.

Goals are general guidelines that explain what a community wants to accomplish. Goals are often long term and represent broad visions. **Objectives** define strategies or implementation steps to attain the identified goals. They are specific, measurable and may have completion dates.

GOALS AND OBJECTIVES

GOAL 1: Protect Public Health and Safety

OBJECTIVES

- Provide community wide hazard warning systems (natural, health and terrorism)
- Provide information and resources to increase hazard awareness and education
- Maintain existing resources and provide necessary training
- Identify and obtain necessary resources and equipment to prevent or minimize hazard effects
- One warning siren at each fire department (7 total) that can be activated from Central Dispatch, also include Public Address system

GOAL 2: Minimize damage to public and private property

OBJECTIVES

- Adopt policies to make property less vulnerable
- Apply proactive mitigation measures to prevent hazard damage
- Obtain necessary equipment, (i.e. contractors with cranes to help with dams) resources and training to protect property if hazard occurs
- Conduct training sessions and exercises to prepare for possible hazards
- Protect drinking water sources (well and municipal)

GOAL 3: Maintain essential services

OBJECTIVES

- Identify, inspect and maintain all critical infrastructure and facilities
- Security for the County Courthouse
- Repair or replace critical infrastructure and facilities that are damaged or degraded
- Protect critical infrastructure and facilities from hazard damage
- Obtain necessary resources and equipment to insure essential services are maintained in the event of a hazard
- Shelters in case of a hazard event-Designate township halls, K of C halls, etc. as shelters. Build new shelters; acquire generators for shelters

- Maintain communication infrastructure-fire, police, EMS; install second communications tower in the southern end of the county
- Identify resources in the County Courthouse
- Move critical documents to secondary location

GOAL 4: Manage growth/development

OBJECTIVES

- Develop hazard resistant growth policies
- Discourage development in high hazard areas
- Integrate hazard mitigation planning into land use planning
- Encourage sustainable development
- Protect and conserve natural resources
- Set up program to help famers with their livestock during times of hazard events

The next steps in the 2007 hazard mitigation planning process were to identify mitigation actions suitable to the community, evaluate the effect the action will have on the specified mitigation objective and prioritize actions to decide what sequence or order these actions should be pursued. This step will also be utilized in the 2015 Plan and will be located in Chapter 5: Action Plan.

2007 Mitigation Strategies

1. **Prevention**-government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
2. **Property Protection**-actions that involve the modification of existing buildings or structures to protect them from a hazard or removal from a hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
3. **Public Education and Awareness**-actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, Fire-Wise Program, real estate disclosure, hazard information centers, and school-age and adult education programs.
4. **Natural Resource Protection**-actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
5. **Emergency Services**-actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
6. **Structural Projects**-actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.
- 7.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
A. Multi-Hazard Actions			
Continue to develop Emergency Response Team program to help prepare for all hazard events in the county.	High	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities
Enhance and expand a public education program for all natural hazards that threaten the community.	High	In Progress	Program was initiated in 2014 with the hiring of the current emergency management director. Calendar created to inform public of the many programs in the County.
Organize outreach program to vulnerable populations during and after hazard events, including wildfires, extreme winter and summer weather events, periods of extreme temperatures, public health emergencies, and other hazards that can impact the community.	High	Ongoing	FD, Red Cross, Gladwin County Emergency Response Team (CERT)
Work with power companies to inventory condition of power line right-of-ways, and identify priority sections to clear branches and trees from power lines. The end goal is to create and maintain a disaster resistant landscape in public rights-of-way.	High	Ongoing	Consumer's Energy is the local utility company and they have contracts to address this issue on an annual basis.
Where feasible and cost effective (more densely populated areas) bury and protect power and utility lines.	High	Ongoing	The burying of cable is very limited. Power lines not buried due to costs, but fiber optic cable has been buried.
Communities will acquire and maintain an adequate level of emergency power generators to supply emergency water needs, wastewater processing, emergency communications, emergency health care, and shelters.	Med.	In Progress	County and the townships have acquired generators for emergency purposes. Additional generators are still required.
Individual communities should prepare future land use plans and capital improvement programs to plan for their future needs.	Med.	Ongoing	Master plans address this issue. State law requires that Master Plans be reviewed at a minimum, every five (5) years. The County and several townships have Master Plans. The entire County is covered through these Plans.
Produce and distribute family emergency preparedness information relating to all natural hazards affecting the County.	Med.	Ongoing	Red Cross, Fire Departments/County all have information regarding natural hazards that is available to the public.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Build the capabilities of the county GIS program to function as a tool to address multiple hazards. This effort would require the creation/updating of datasets such as parcels/ownership, location of all structures, driveways with ingress/egress conditions, roads, forest types, ownership types, floodplains, utilities (power lines, gas lines and water lines), wetlands, water features, bridges and culverts, (SARA III sites).	Med.	In Progress	The County's Equalization Department has the GIS technology and software. They are in the process of learning its capabilities.
Ensure that the County and individual communities have adequate equipment, staff, and training to respond to transportation-related accidents specific to their needs.	Med.	In Progress	There are limited funds, which has curtailed the formation and training of staff to address these matters. The County does not have a hazmat team, but utilizes the team from Roscommon County.
Communities will work with the Federal Emergency Management Agency (FEMA) to identify floodplains.	Med.	In Progress	County and township officials have been working with FEMA since 2010 to complete the updated floodplain maps in the County.
Ensure key gasoline stations have the capacity to pump gasoline during power outages.	Med.	In Progress	Started in May 2015.
Develop plans to identify and inform persons of "Safe Areas" during festivals/events. (include signs and directions to shelters)	Med.	In Progress	The County Fair does require a safe area during the event, but that is the only event that requires safe areas at this time.
Enhance and expand an all hazards education and awareness program in schools, which includes classroom presentations and incorporating wildfire and weather hazard preparedness into school curriculums.	Low	Ongoing	FD, Red Cross
Conduct workshops at community gatherings to encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	FD, CERT Team
Enforce a balanced system of ordinances that protect the community as-a-whole while respecting the rights of individuals.	Low	Ongoing	Building and zoning codes are two of the more influential codes that are enforced throughout the County to protect the rights of the citizens.
Increase usage of NOAA Weather Radio by subsidizing purchase and distribution of radios to county residents, organizations and businesses. Use NOAA radios as a community emergency alert system to information on hazard events.	Low	Ongoing	This was initiated, but only included the distribution of radios to schools and businesses. Residents have not received these radios.
Acquire portable/changeable message signs to direct crowds and provide information.	Low	Not Started	Funding has not been secured to obtain a message sign.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
B. Dam Failure			
Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).	High	Ongoing	Plans in 2014 being revised.
Public awareness and warning systems.	High	In Progress	Several sirens have been erected, but additional sirens are still needed. Phone applications (in place beginning in 2015) also provide for additional warning systems.
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	Ongoing	Schools in Gladwin and Beaverton have plans. Fire Departments work with representatives of the buildings to develop plans. Fire Departments work with the businesses as part of the "Firefighter Right to Know" regulations.
Greater local support for assistance with dam inspections and enforcement of the Dam Safety Program (Part 315 of the Natural Resources and Environmental Protection Act) requirements and goals.	High	Ongoing	Drain Commissioner does inspections of dams and is responsible for enforcement of regulations as well.
Pump and flood gate installation/automation.	Med.	Not Started	Most dams are privately owned. Nothing done to date on the dams.
Regulate development in the dam's hydraulic shadow (where flooding would occur if there was a severe dam failure).	Med.	Ongoing	Boyce Hydro Power LLC is responsible for regulating development within their hydraulic shadow. The County also regulates development through planning and zoning.
Trained, equipped, and prepared search and rescue teams.	Med.	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities.
Real estate disclosure laws that identify a home's location within a dam's hydraulic shadow.	Med	Ongoing	Realtors to comply.
Constructing emergency access roads to dams.	Low	Complete	All dams have emergency access roads.
Encourage residents to develop a Family Disaster Plan, which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	FD, CERT Team

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Increased coverage and use of NOAA Weather Radio.	Low	Ongoing	This was initiated, but only included the distribution of radios to schools and businesses. Residents have not received these radios.
Obtaining insurance.	Low	Ongoing	Both homeowners and flood insurance are options that are available to homeowners.
C. HazMat Transportation			
Enforcement of weight and travel restrictions for truck traffic.	High	Ongoing	The Gladwin County Sheriff's office is responsible for enforcement of the weight restrictions on roads.
Trained, equipped, and prepared local hazardous materials emergency response teams.	High	In Progress	The emergency response team is in the process of being formed. There is limited funding, which has delayed much of the training opportunities and the formation of the team.
Proper planning, design, maintenance of, and enhancements to designated truck routes.	High	Ongoing	The Road Commission is responsible for this activity.
Training, planning, and preparedness for hazardous materials incidents along roadways and railways (in addition to fixed-site emergencies).	High	Ongoing	The FD and Road Commission are responsible.
Improvement to driver education, traffic law enforcement, and transportation planning that balance the needs of the hazardous material transporters with the safety of the general public.	Med.	Ongoing	Michigan State Police Motor Carrier and Sheriff's office are responsible for enforcement, and the trucking industry is responsible for driver education and planning of truck routes. They are also responsible for notifying the appropriate agencies when transporting hazardous materials.
Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.	Med.	Not Started	No major route carrying significant number of vehicles carrying hazardous materials.
Road closures and traffic control in accident areas.	Med.	Ongoing	Law enforcement and hazmat teams are responsible for road closures and traffic control.
Trained, equipped, and prepared search and rescue teams.	Med.	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities.
Improved design, routing, and traffic control at problem roadway areas.	Med.	Ongoing	MDOT
Evacuation plans and community awareness of them.	Low	Ongoing	MDOT and Michigan State Police

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including large scale hazardous material incidents.	Low	Ongoing	This was initiated, but only included the distribution of radios to schools and businesses. Residents have not received these radios.
Encourage residents to develop a Family Disaster Plan, which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	FD, CERT Team
Public warning systems and networks.	Low	In Progress	Several sirens have been erected, but additional sirens are still needed. Phone applications (in place beginning in 2015) also provide for additional warning systems.
Long-term planning that provides more connector roads for reduced congestion of arterial roads.	Low	Not Started	Not applicable.
C. HazMat Fixed Sites			
Trained, equipped, and prepared local hazardous materials emergency response teams.	High	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities
Training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use and disposal of hazardous materials.	High	Ongoing	Medical personnel are continuously being trained on this matter. The County does not have its own hazmat team and uses Roscommon County's team. Training for the hazmat team is the responsibility of Roscommon County.
Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations.	High	Ongoing	Superfund Amendments and Reauthorization Act (SARA) III sites are monitored by the Emergency Management Director to follow EPA regulations and are in compliance.
Maintaining an active and viable Local Emergency Planning Committee (LEPC).	High	Ongoing	The LEPC meets monthly under the guidance of the Emergency Management Director and Michigan State Police.
Proper storage and use of flammables, including the use of flammable substances (such as when fueling machinery). Store gasoline, oily rags and other flammable materials in approved safety cans. Stack firewood at least 100 feet away and uphill from homes.	High	Ongoing	Proper storage of materials (with the exception of firewood) is included in the information provided by the Emergency Management Director and local fire departments.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Policies stressing the importance of safety above other considerations.	Med.	Ongoing	Hospitals and public safety departments have policies on safety matters, as do many private businesses.
Location of industrial areas from schools, nursing homes, etc.	Med.	Ongoing	This is addressed through local zoning ordinances.
Evacuation plans and community awareness of them.	Med.	In Progress	Plan is completed, working on public awareness.
Hazardous material public awareness and worker education programs.	Med.	Ongoing	OSHA, MIOSHA, and hospitals all have programs to address these matters.
Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations.	Med.	Ongoing	OSHA, MIOSHA, and hospitals all have programs to address these matters.
Developing and exercising site emergency plans and community response plans as required under SARA Title III	Med.	Ongoing	The Emergency Management Director is responsible for developing plans for these sites.
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	Med.	Ongoing	The Emergency Management Director works with the businesses/agencies on the development of these plans.
Enhanced security and anti-terrorist/sabotage/civil disturbance measures.	Med.	Ongoing	This is addressed in the County's Emergency Operations Plan as well as by the law enforcement agencies in the County, including the Sheriff's Department and Michigan State Police.
Facility and community training and exercise programs.	Low	In Progress	The County Plan addresses these programs.
Proper separation and buffering between industrial areas and other land uses.	Low	Ongoing	Zoning provides buffering and separation for land uses.
Public warning systems and networks for hazardous material releases.	Low	In Progress	Several sirens have been erected, but additional sirens are still needed. Phone applications (in place beginning in 2015) also provide for additional warning systems.
Trained, equipped, and prepared search and rescue teams.	Low	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities. Fire Departments also are trained for search and rescue matters.
Road closures and traffic control in accident areas.	Low	In Progress	Purchase of phone application in 2015 to notify public, also use of local press/media.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA) standards.	Low	Ongoing	The Environmental Protection Agency (EPA) has been given authority to enforce the RCRA standards.
Insurance coverage.	Low	Ongoing	Both homeowners and flood insurance are options that are available to property owners.
Increased coverage and use of NOAA Weather Radio, which can provide notification to the community during any period of emergency, including large scale hazardous material incidents.	Low	Ongoing	This was initiated, but only included the distribution of radios to schools and businesses. Residents have not received these radios.
D. Structural Fires			
Code existence and enforcement with new construction.	High	Ongoing	Local and state building codes are in place and enforced by local governments.
Landlords and families can install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each level of homes (to be tested monthly, with the batteries changed twice each year). Family members and residents should know how to use a fire extinguisher.	High	Ongoing	Public awareness of fire safety through Fire Prevention Week has made the importance of installing smoke detectors known. Local fire departments also have smoke detectors to distribute annually.
Improved and continuing training for emergency responders, and provision of equipment for them.	High	In Progress	The emergency response team is in the process of being formed. There is limited funding, which has delayed much of the training opportunities and the formation of the team.
Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures and special facilities).	High	Ongoing	Building and fire suppression codes are in place to regulate these items.
Public education and school programs (especially about the use of stoves, heaters, fireworks, matches/lighters, etc.).	High	Ongoing	Fire Departments and the Red Cross have programs that address these matters.
Proper installation and maintenance of heating systems (especially those requiring regular cleaning, those using hand-loaded fuels, such as wood, or using concentrated fuels such as liquid propane).	High	Ongoing	Building codes, the issuance of building permits, and building inspections address this item.
Pre-planned escape routes and fire alert responses.	Med.	Ongoing	The local fire departments have programs to assist businesses and residents for escape routes and to respond to fires.
Safe and responsible use of electric and "space" heaters (placed at least 3 feet from objects, with space near hot elements free of combustibles).	Med.	Ongoing	Continuous education through local fire departments.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Safe installation, maintenance, and use of electrical outlets and wiring.	Med.	Ongoing	Local building codes and inspections.
Encourage residents to develop a Family Disaster Plan, which includes the preparation of a Disaster Supplies Kit.	Med.	Ongoing	FD., CERT Team
Transportation planning that provides roads, overpasses, etc. to maximize access and improve emergency response times, and evacuation potential, for all inhabited or developed areas of a community (not just designing for the minimum amount of road capacity to handle normal traffic volumes in the community). This includes transportation access <u>within</u> developed sites (shopping malls, stadiums, office & commercial parking lots, etc.).	Med.	Ongoing	MDOT, and MSP work with local agencies to provide this planning.
Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and proper storage of flammable items). Residents should inspect chimneys at least twice a year and clean them at least once a year.	Med.	Ongoing	Fire departments have this included as part of the training offered through Fire Prevention Week.
Proper workplace procedures, training and exercising, and handling of explosive and flammable materials and substances.	Med.	Ongoing	Fire Departments and the Emergency Management Director have put together information on these matters.
Proper maintenance of power lines, and efficient response to fallen power lines.	Low	Ongoing	Consumers Energy is responsible for maintenance of power lines. They work with local fire departments to maintain safety in response to fallen power lines.
Enforced fireworks regulations.	Low	Ongoing	State legislation is regulated by local law enforcement personnel.
Measures to reduce urban blight and associated arson (including CPTED).	Low	Ongoing	Local codes, such as building codes, property maintenance codes, and zoning, address these matters.
Condominium-type associations for maintaining safety in attached housing/building units or multi-unit structures.	Low	Ongoing	Local building codes and fire codes, which includes the inclusion of hard-wired smoke alarms. In existence prior to 2007.
Obtaining insurance.	Low	Ongoing	Both homeowners and flood insurance are options that are available to property owners.
Defensible space around structures in fire-prone wildland areas.	Low	Ongoing	Local fire departments and DNR staff.
Control of civil disturbances and criminal activities that could lead to arson.	Low	Ongoing	Law enforcement does this.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
E. Standoff/Civil Disturbance			
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	Ongoing	The Emergency Management Director works with the businesses/agencies on the development of these plans.
Local law enforcement mutual aid, and support from the Michigan State Police and National Guard.	High	Ongoing	There is a mutual aid agreement in place, and the Emergency Management Director is responsible for the National Guard deployment.
Law enforcement training, staffing, and resource provision.	Med.	Ongoing	The County Emergency Operations Plan covers these items.
Design requirements for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas etc that take into consideration emergency and security needs.	Med.	Ongoing	The Emergency Management Director works with the businesses/agencies on the development of these plans.
Incident anticipation and planning, and video documentation of events for later study and use.	Med.	Ongoing	Exercises are completed with local public safety personnel. In addition, the cities have cameras for incidents.
It is possible that design, management, integration, and lowered density of poor or blighted areas may reduce vandalism, crime, and some types of riot events. Crime prevention through Environmental Design (CPTED) is a field of planning that deals with this.	Low	Ongoing	Local municipalities have property maintenance codes and zoning ordinances to address density and blight issues. Also several municipalities have blight officers to cite offenders.
Insure structures and property in risky areas.	Low	Ongoing	Both homeowners and flood insurance are options that are available to property owners.
F. Oil/Gas Pipeline/Well Accident			
Community and operator compliance with industry safety regulations and standards.	High	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters.
Using 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 the level of risk.	High	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters.
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	High	Ongoing	The Emergency Management Director works with the businesses/agencies on the development of these plans.
Proper pipeline design, construction, maintenance, and inspection.	High	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
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.	Med.	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters. The County EOP also addresses these matters.
Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.	Med.	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters.
Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800) 482-7171).	Med.	Ongoing	Public program to increase awareness of "Miss Dig" as well as pipeline companies use of "Miss Dig".
Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.	Low	Ongoing	Department of Natural Resources (DNR) regulates and enforces these matters.
Encourage residents to develop a Family Disaster Plan, which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	FD, CERT Team
G. Drug Labs			
Elimination of clandestine Methamphetamine laboratories through law enforcement and public education.	High	Ongoing	Public law enforcement and local fire departments deal with this issue, both on enforcement and educational levels.
H. Transportation Accidents			
Improvements in driver education, traffic law enforcement, and transportation planning that balance the needs of hazardous material transporters with the safety of the general public.	High	Ongoing	Michigan State Police Motor Carrier and Sheriff's office are responsible for enforcement, and the trucking industry is responsible for driver education and planning of truck routes. They are also responsible for notifying the appropriate agencies when transporting hazardous materials.
Marine safety and general boater awareness programs.	High	Ongoing	DNR and Sheriff's Department.
Enforcement of weight and travel restrictions.	High	Ongoing	Michigan State Police department enforces the weight and travel restrictions.
Trained, equipped, and prepared search and rescue teams.	Med.	In Progress	The Gladwin County Emergency Response Team (CERT) has been formed. There is limited funding, which has delayed some training opportunities
Training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.	Med.	Ongoing	This is done through the EOP and MSP.
Commercial operator training and skill enhancement programs.	Med.	Ongoing	This is done through the private sector.

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015			
Mitigation	Priority	Status	Outcomes
Use of designated truck routes.	Med.	Ongoing	The local police departments, Sheriff's Department, and MSP regulate truck routes.
Airport maintenance, security, and safety programs.	Low	Ongoing	FAA regulated
Use of ITS (intelligent transportation systems) technology.	Low	Not Started	Funds have not been available to take advantage of this opportunity.
I. Ice Storms			
Maintaining adequate road and debris clearing capabilities.	High	Ongoing	The road commission maintains the roads and the local fire departments assist with the clearing of the debris.
Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)	High	Ongoing	Consumer's Energy is the local utility company and they have contracts to address this issue on an annual basis.
Establishing heating centers/shelters for vulnerable populations.	High	Ongoing	The EOP includes a shelter plan. Red Cross and local fire departments assist.
Organizing outreach to isolated, vulnerable, or special-needs populations.	Med.	Ongoing	Red Cross and Emergency Operations Center (EOC)
Producing and distributing family emergency preparedness information relating to severe winter weather hazards.	Med.	Ongoing	The Red Cross and local FD have information available upon request or is distributed at various times. (Fire Prevention Week)
Pre-planning for debris management staging and storage areas. (Debris is usually the sleet and ice itself being cleared from roads and roofs, or vegetation such as tree branches that have fallen under the impact of winds or the weight of ice. Broken power or phone lines that had frozen or been weighted down by ice or fallen branches could be part of the problem. In some cases, roofs may collapse under the weight of ice and snow. Some storage areas will definitely be needed for snow removal during blizzards.)	Med.	Ongoing	The road commission and local FD address the staging and storage areas for debris.
Farmer preparedness to address livestock needs/problems.	Med.	Ongoing	Michigan State University (MSU) Extension and the US Department of Agriculture offer assistance to farmers.
Pre-arranging for shelters for stranded motorists/travelers, and others.	Med.	Ongoing	The EOP and Red Cross.
Encourage residents to develop a Family Disaster Plan, which includes the preparation of a Disaster Supplies Kit.	Low	Ongoing	FD, CERT Team

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Increased coverage and use of NOAA Weather Radio.	Low	Ongoing	This was initiated, but only included the distribution of radios to schools and businesses. Residents have not received these radios. Phone applications (in place beginning in 2015) also provide for additional warning coverage.
Home and public building maintenance to prevent roof and wall damage from "ice dams."	Low	Not Started	Home inspections have not been completed due to lack of funding and lack of manpower.
J. Flood (Riverine and Urban)			
Accurate identification and mapping of flood-prone areas.	High	Ongoing	FEMA, Drain Commissioner, and Boyce Hydraulic Power are working with local municipalities to make sure the information is correct.
Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.)	High	Ongoing	The local building inspectors work with the Soil Conservation District to reduce/eliminate soil erosion.
Enforcement of basic building code requirements related to flood mitigation.	High	Ongoing	Local building inspectors/fire inspectors.
Training for local officials on flood fighting, floodplain management, floodproofing etc.	High	Ongoing	Training is available through the DNR and local FD.
Floodplain management-planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvement planning) and involving drain commissioners hydraulic studies, etc, in these analyses and decisions.	High	Ongoing	This is a joint effort with FEMA, local building officials, the drain commission, local planning commissions to reduce properties damaged by flooding.
Public awareness of the need for permits (MDEQ Part 31) for building in floodplain areas.	High	Ongoing	This is a joint effort with FEMA, local building officials, the drain commission, local planning commissions to reduce properties damaged by flooding.
Dredging and clearance of sediment and debris from drainage channels.	High	Ongoing	The Department of Environmental Quality (DEQ) and the drain commission work together on this matter.
Detection and prevention/discouragement of illegal discharges into stormwater sewer systems, from home footing drains, downspouts, and sump pumps.	High	Ongoing	Public Health Department, the drain commission, and local building officials work on this matter.
Road closures and traffic control in flooded areas.	High	Ongoing	This is accomplished by the local public safety personnel (FD/PD),

GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2007-2015

Mitigation	Priority	Status	Outcomes
Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.	Med.	Ongoing	Schools in Gladwin and Beaverton have plans. Fire Departments work with representatives of the buildings to develop plans. Fire Departments work with the businesses as part of the "Firefighter Right to Know" regulations.
Improved/updated floodplain mapping.	Med.	Ongoing	FEMA works with the local governmental agencies and other parties as appropriate to update the floodplain mapping.
K. Infrastructure Failure			
Use of generators for backup power at critical facilities.	High	In Progress	County and the townships have acquired generators for emergency purposes. Additional generators are still required.
Regular maintenance and equipment checks.	High	Ongoing	Done by the private sector and the public works staff as appropriate.
Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.	High	Ongoing	Red Cross, Council on Aging, Emergency Management Plan, CERT Team (when activated).
Burying electrical and phone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards.	High	Ongoing	The burying of cable is very limited. Power lines not buried due to costs, but fiber optic cable has been buried.
Mutual aid assistance for failures in utility and communication systems (including 9-1-1).	Med	Ongoing	Mutual aid assistance is with Isabella and Clare Counties for 911.
Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).	Med	Ongoing	Local municipalities rely on their local public works departments and or local engineering firms to design the infrastructure.
Protecting electrical and communications systems from lightning strikes.	Med	Ongoing	This is addressed by the local utility (Consumers Energy).
Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).	Med	Ongoing	Public program to increase awareness of "Miss Dig" as well as pipeline companies use of "Miss Dig".
Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).	Med	Ongoing	Capital Improvement Plans (CIPs) are approved by local governments to prioritize the renovation and replacement of public infrastructure.
Tree-trimming programs to protect utility wires from falling branches. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)	Med	Ongoing	Consumer's Energy is the local utility company and they have contracts to address this issue on an annual basis.

CHAPTER 6: ACTION PLAN

Through a systematic process, that included the review of all action items identified in the Gladwin County 2007 Hazard Mitigation Plan (2007 Plan) and the possible mitigation strategies as identified in the 2007 Local Hazard Mitigation Planning Workbook (Workbook), the Gladwin County Advisory Committee (GCAC) was able to identify the following actions to be the most effective strategies for hazard mitigation for the 2016 Hazard Mitigation Plan for Gladwin County. The actions include mitigation actions identified in the 2007 Plan that have not been completed and are still considered to be relevant, as well as new strategies that have been identified by the GCAC.

The GCAC initiated the selection process with a review of the goals and objectives as identified in the 2007 Plan and modified them to fit the needs of Gladwin County in 2016 and beyond. These goals and objectives are identified below.

GOAL 1: Protect Public Health and Safety

OBJECTIVES

- Provide community wide hazard warning systems (natural, health and terrorism)
- Provide information and resources to increase hazard awareness and education
- Maintain existing resources and provide necessary training
- Identify and obtain necessary resources and equipment to prevent or minimize hazard effects

GOAL 2: Minimize damage to public and private property

OBJECTIVES

- Adopt policies to make property less vulnerable
- Apply proactive mitigation measures to prevent hazard damage
- Obtain necessary equipment, (i.e. contractors with cranes to help with dams) resources and training to protect property if hazard occurs
- Conduct public education sessions, training sessions, and exercises to prepare for possible hazards
- Protect drinking water sources (well and municipal)

GOAL 3: Maintain essential services

OBJECTIVES

- Identify, inspect and maintain all critical infrastructure and facilities
- Security for the County Courthouse
- Repair or replace critical infrastructure and facilities that are damaged or degraded
- Protect critical infrastructure and facilities from hazard damage
- Obtain necessary resources and equipment to insure essential services are maintained in the event of a hazard
- Shelters in case of a hazard event-Designate township halls, K of C halls, etc. as shelters. Build new shelters; acquire generators for shelters
- Maintain communication infrastructure-fire, police, EMS; install second communications tower in the southern end of the county
- Identify resources in the County Courthouse
- Move critical documents to secondary location

GOAL 4: Manage growth/development

OBJECTIVES

- Develop hazard resistant growth policies
- Discourage development in high hazard areas
- Integrate hazard mitigation planning into land use planning
- Encourage sustainable development
- Protect and conserve natural resources
- Set up program to help famers with their livestock during times of hazard events

The action plan items from the 2007 Plan were then evaluated and those items that were deemed complete or no longer applicable were eliminated from this plan (see review of all 2007 items in Chapter 5). The GCAC then began review of the possible mitigation strategies as identified in the Workbook. After reviewing and identifying nearly 200 possible mitigation strategies (many of them duplicate strategies of multiple hazards) the GCAC was able to eliminate duplicate strategies to reduce the number of possible strategies to 57. The final list of strategies is found in Appendix C. The original list of possible strategies is found in Appendix D.

The GCAC was then asked to identify hazard mitigation projects/processes that address the items on the list. Projects that have a greater impact to reduce the loss of human lives or injuries were given a high priority. Projects that impact human losses to a lesser degree were given a medium priority. Projects that have been deemed high and medium priority projects are identified below and make up the Action List for the Plan. Projects that minimally reduce human loss or injury were given a moderate priority and are not identified as an action item. All projects that were identified as possible projects are included in Appendix E.

The list of action items (projects) identified in the 2007 were based on the identification of mitigation strategies for each hazard and prioritizing them accordingly. This resulted in approximately 145 action plan items. With our goal of 12-20 action plan items, the action list items were not divided by hazard. Instead action list items were prioritized based on their potential to save lives. It should also be noted that projects that were deemed economically unfeasible were not included in the list of action items. There is not specifically a high priority project for each hazard type, as was done in the 2007 Plan.

Multiple actions identified in the 2016 Plan have been purposely re-worded to be less specific than in the 2007 plan, which allows those items to address multi-hazard actions rather than the hazard-by-hazard approach in the previous plan. New items not identified in the 2007 Plan have been labeled as “NEW” in their descriptions. The projects are identified in order based on their potential impact to saving human lives and preventing injuries.

HIGH PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1

Update existing sirens to meet current standards, and add warning sirens where needed to fill gaps in Gladwin County’s current warning system.

Action: Update existing sirens and purchase 10 warning sirens to warn residents/visitors of Gladwin County of hazardous situations. Educate the public of the warning system and how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Hazards Addressed: All hazards
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA), United States Department of Agriculture (USDA), and local governmental agencies
- Project Cost: TBD
- Participating Agencies: Clement Township, Gladwin County, Grout Township, Hay Township, Sage Township, Secord Township, and other local municipalities (subject to funding availability)
- Schedule: 2016
- Priority: High
- Benefit(s): Saving of lives/reducing injuries with a better warning system and a more informed public that will accompany the installation of the system.

Action Item 2

Purchase back-up generators for all municipal buildings and other critical facilities.

Action: Survey is currently underway to determine the number of generators desired for the County. Purchase generators for all local municipal building and other critical facilities that can be used as back-up power during power outages. The buildings can be utilized as shelters or warming/cooling centers or utilized by emergency management.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Butman Township, Gladwin County, Gladwin Township, Grout Township, Tobacco Township, and other local municipalities (subject to funding availability)
- Schedule: 2016
- Priority: High
- Benefit(s): The back-up generators will be able to allow local municipal buildings to utilize as emergency shelters for residents/visitors/special needs populations in need of power/heat/air conditioning.

Action Item 3 (NEW)

Purchase battery back-up packs for generators to ensure uninterrupted power at critical facilities throughout the County.

Action: Purchase battery back-up packs for generators to ensure uninterrupted power at critical facilities throughout the County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure

- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Butman Township, Gladwin County, Gladwin Township, Grout Township, Tobacco Township, and other local municipalities (subject to funding availability)
- Schedule: 2016
- Priority: High
- Benefit(s): Power can be maintained at critical facilities.

Action Item 4

Purchase weather radios for critical facilities, thereby providing additional preparation time during times of emergency.

Action: Conduct a survey of critical care facilities/shelters/medical buildings/schools to determine who currently has weather radios and who needs radios/additional radios. After survey is complete develop a priority list for receiving radios, and purchase/distribute radios according to the priority list.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): Homeland Security, FEMA, Enbridge Inc.
- Project Cost: \$7,000
- Participating Agencies: Gladwin County
- Schedule: 2016
- Priority: High
- Benefit(s): Facilities will be able to receive weather warnings in a timely manner and will be able to address the situation in a more timely fashion.

Action Item 5

Complete a Community Wildfire Protection Plan for Gladwin County.

Action: Secure funding to complete a Community Wildfire Protection Plan for the residents/businesses of Gladwin County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Department of Natural Resources (DNR), FEMA
- Project Cost: \$35,000
- Participating Agencies: Gladwin County, Michigan DNR, Secord Township Fire Department, Beaverton Area Fire Department, Billings Township Fire Department, Clement Township Fire Department, Bourret Township Fire Department, and Sherman Township Fire Department
- Schedule: TBD
- Priority: High
- Benefit(s): The Community Wildfire Protection Plan (CWPP) will address those areas most at risk for wildfires and will also develop mitigation measures to help reduce damages resulting from wildfires.

Action Item 6 (NEW)**Prepare municipal facilities for the installation of generators.**

Action: Upon receipt of the generator(s) for facilities within the County, each building must be inspected and modified to allow the installation of a generator. Included in the inspection is the determination of the type of generator (liquid and/or gas fueled) that is to be installed.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, Gladwin County, local governmental agencies
- Project Cost: \$2,000 per/unit
- Participating Agencies: Gladwin County, Gladwin Township, Tobacco Township, and other local municipalities (subject to funding availability)
- Schedule: 2016
- Priority: High
- Benefit(s): The modifications to the buildings to allow a liquid and/or gas fueled generators would ensure that the generators could be installed without delay.

Action Item 7 (NEW)**Improve security measures for the County Courthouse.**

Action: Purchase scanner for monitoring visitors to the court rooms. Add bailiffs for court and courthouse security.

- Location: County Courthouse, Gladwin
- Lead Agency: OEM
- Hazards Addressed: Sabotage/Terrorism, Civil Disturbance
- Potential Funding Source(s): FEMA, USDA, Gladwin County, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Gladwin County
- Schedule: 2016
- Priority: High
- Benefit(s): The employees and visitors to the County Courthouse will have improved security to the building to conduct business.

Action Item 8 (NEW)**Encourage the inclusion of hazard mitigation into other planning documents**

Action: Encourage municipal agencies to include hazard mitigation into master plans/comprehensive land use plans and other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Gladwin County, Beaverton Township, Bourret Township, Secord Township, and all other townships (as funding becomes available)
- Hazards Addressed: all hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: 2016

- Priority: High
- Benefit(s): Hazard Mitigation is identified in the local municipal planning documents, thereby increasing community awareness of hazard mitigation and increasing the opportunity for community resiliency.

The following activities have been identified as having an impact on saving human lives and preventing injuries and have been given a medium priority. New items not identified in the 2007 Plan have been labeled as “NEW” in their descriptions. The projects are identified in order based on their potential impact to saving human lives and preventing injuries.

MEDIUM PRIORITY HAZARD MITIGATION ACTIONS

Action Item 1 (NEW)

Purchase portable emergency back-up generators that can be used for shelters and special needs populations.

Action: Complete a survey of facilities that have generators/are targeted to obtain generators and develop a list of facilities that would benefit from the use of portable generators. The list would also prioritize the facilities in order of need/benefit.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD (\$8,000/per unit)
- Participating Agencies: Gladwin County, City of Gladwin, Gladwin Township, and other local municipalities (subject to funding availability)
- Schedule: 2017
- Priority: Medium
- Benefit(s): Facilities that are unable to secure a permanent generator would be eligible to secure the use of a temporary generator, thereby keeping the facility open.

Action Item 2

Purchase additional firefighting equipment for the firefighters.

Action: Complete an analysis of local firefighting equipment and seek funds to bring the necessary equipment to all departments.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural and scrap tire fires
- Potential Funding Source(s): FEMA, DNR, DEQ, USDA, Enbridge Inc., Private grants/donations
- Project Cost: TBD
- Participating Agencies: Gladwin County, Gladwin Township, Billings Township, and other local municipalities (subject to funding availability)
- Schedule: 2017

- Priority: Medium
- Benefit(s): Fire fighters would benefit as they would have equipment adequate for today's standards. Property owners/residents of the County would benefit with the improved equipment to fight fires.

Action Item 3

Purchase smoke detectors for installing in every residence, business, and critical facility within the County.

Action: Conduct a survey to determine how many smoke detectors are needed for the entire County.

Purchase the smoke detectors and distribute to all residences and businesses within the County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Structural fires
- Potential Funding Source(s): Red Cross
- Project Cost: TBD
- Participating Agencies: Gladwin County, Red Cross
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Smoke detectors, when installed/maintained properly can save lives and structures by alerting the occupants of the buildings of smoke/fire.

Action Item 4 (NEW)

Educate the public on the benefits of NIXLE and have them sign up for the service.

Action: Conduct a publicity campaign on the benefits of NIXLE and the importance for residents to sign up for the service.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Participating Agencies: Gladwin County, local newspapers, Billings Township, Secord Township, and other local municipalities (subject to funding availability)
- Schedule: 2016
- Priority: Medium
- Benefit(s): Users of the service will be provided with early warnings of storms and other disasters. In addition, other notification such as amber alerts will also be included in the service.

Action Item 5 (NEW)

Develop a program to educate the public on proper responses to all hazards, including meth labs and horse-drawn vehicles.

Action: Educate the public through Public Service Announcements (PSAs), Red Cross packets, and school programs on how to properly respond to warnings for hazards.

- Location: County-wide

- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): Emergency Management/Homeland Security grants
- Project Cost: TBD
- Participating Agencies: Gladwin County, Red Cross
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): By educating the public on proper responses to hazard/weather warnings, the citizens will become more knowledgeable on hazards and less likely to panic in adverse situations.

Action Item 6 (NEW)

Upgrade a one-mile section of Wagarville Road in Sage Township to meet current road standards.

Action: Reconstruct Wagarville Road to meet MDOT road standards, which would allow emergency equipment to utilize the road.

- Location: Sage Township
- Lead Agency: Gladwin County Road Commission
- Hazards Addressed: Infrastructure failure, transportation accidents
- Potential Funding Source(s): Gladwin County Road Commission, MDOT, Sage Township
- Project Cost: \$2.3 million
- Participating Agencies: MDOT, Sage Township
- Schedule: TBD
- Priority: Medium
- Benefit(s): Bringing the road to current standards would allow emergency equipment to use the road, which would save time in emergency situations. The time saved could result in a life saved or property saved.

Action Item 7 (NEW)

Construct additional firefighting facilities to help reduce response times for fires within the County.

Action: Construct an additional 3-4 fire houses in Gladwin County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural and scrap tire fires
- Potential Funding Source(s): DEQ, FEMA, DNR, and USDA
- Project Cost: \$4 million
- Participating Agencies: Gladwin County, MDNR, Sherman Township, Sage Township, and other local municipalities (subject to funding availability)
- Schedule: TBD
- Priority: Medium
- Benefit(s): Constructing additional fire houses would help reduce travel times to fight local fires where houses currently do not exist. When properly staffed, the result could be a house saved, lives saved.

Action Item 8

Work with the utilities to develop standards for the pruning of trees in the utilities' rights-of-way.

Action: Consumers Energy and Tri Count Electric have ongoing tree trimming initiatives along the power line right-of-way.

- Location: County-wide
- Lead Agency: Consumers Energy
- Participating Agencies: NA
- Hazards Addressed: all hazards
- Potential Funding Source(s): Annual Budget
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Trimming trees along power lines, roads and streets mitigates damages that occur from summer and winter storm events. Fallen trees and limbs can obstruct passage on streets and roads impeding the passage of emergency vehicles. Fallen trees and limbs that damage power lines can leave vulnerable populations, particularly the elderly and disabled, without heat, air conditioning and electrical power for home medical devices, and leaves residents with residential wells without a source of water. Critical facilities such as urgent care clinics, pharmacies and gas stations can be shut down from a loss of electrical power.

Action Item 9 (NEW)

Retrofit at-risk structures with ignition-resistant materials.

Action: Complete a two-phase study to determine which buildings are at-risk, and to determine steps to mitigate fire damage. Secure funds to complete improvements to buildings.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural fires
- Potential Funding Source(s): FEMA, USDA, local governments
- Project Cost: TBD
- Participating Agencies: Secord Township, Sage Township, other governmental units, as funding becomes available.
- Schedule: 2018
- Priority: Medium
- Benefit(s): Completing improvements will reduce the damages that could result from wildfires and structural fires.

Action Item 10 (NEW)

Protect critical buildings and infrastructure from the impacts of severe winter weather conditions

Action: Complete an inspection of critical buildings and infrastructure to determine what buildings/structures are in need of additional weather-proofing/protection from severe winter weather events. Seek funds to complete the improvements.

- Location: County-wide
- Lead Agency: OEM

- Hazards Addressed: Severe weather events
- Potential Funding Source(s): USDA, local communities
- Project Cost: TBD
- Participating Agencies: Gladwin County, Gladwin Township, other local municipalities, should funding become available.
- Schedule: 2018
- Priority: Medium
- Benefit(s): Weatherproofing and additional improvements to the critical buildings and infrastructure throughout Gladwin County will not only provide safer environments for the workers/visitors of the buildings, but also could enable these buildings to be utilized as shelters during extreme weather conditions.

Action Item 11 (NEW)

Protect Critical Facilities/Structures from Lightning Damage and other hazards

Action: Protect critical facilities/structures from lightning strike damage and other hazards with the installation of lightning rods and proper grounding and install/maintain surge protection on critical electronic equipment.

- Location: County-wide
- Lead Agency: Gladwin County OEM
- Participating Agencies: NA
- Hazards Addressed: all hazards
- Potential Funding Source(s): OEM Budget, grants
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Facilities and critical equipment will be protected from effects of lightning strikes, thereby keeping the facilities operational during hazard events.

CHAPTER 7: FOLLOW-UP

The follow-up for Gladwin County is an important part of the planning process. Follow-up is the process in which the plan will be monitored, evaluated, and updated within a five-year cycle. When updated, the plan will be reviewed, revised, and resubmitted to the Michigan State Police, Emergency Management and Homeland Security Division for approval by the Federal Emergency Management Agency (FEMA). As appropriate, the plan will also be evaluated after a disaster, or after unexpected changes in land use or demographics in or near hazard areas. The Gladwin County Advisory Committee (GCAC) will also be kept apprised of a change in federal regulations, programs and policies, such as a change in the allocation of FEMA's funding for mitigation grant programs. These evaluations will be addressed in the plan and may affect the action items for mitigation goals and activities. The hazard mitigation plan should be considered by community planners within Gladwin County, when future updates of their comprehensive plans are taking place.

The GCAC will continue to monitor the status and track the progress of the plan elements on an annual basis. The GCAC will oversee the progress made on the implementation of the identified action items and update the plan as needed to reflect changing conditions. Representatives will also meet annually to evaluate plan progress and recommend updates. The Gladwin County Emergency Management Director will facilitate the meetings.

Evaluation of the plan will not only include checking the implementation status of mitigation action items, but also assessing their degree of effectiveness and assessing whether other natural hazards need to be addressed and added to the plan. This will be accomplished by reviewing the benefits (or avoided losses) of the mitigation activities that were in place within each jurisdiction and the County. These will be compared to the goals the Plan has set to achieve. The GCAC will also evaluate whether mitigation action items need to be discontinued or modified in light of new developments or changes within the County.

As required, this plan will be updated within five (5) years of the date of FEMA's approval of the plan. The plan may be updated earlier, at the discretion of the GCAC and its jurisdictions. The GCAC's ability to update the mitigation process by adding new data and incorporating it into the mitigation plan will allow for the efficient use of available resources, staff, and programs. They will meet to discuss the plan and document data collected including hazard events, completed mitigation activities, new mitigation activities, and FEMA grant application efforts. The information will be used for the five (5) year update. The Gladwin County Emergency Management Director will coordinate the annual meeting and keep records of the participants and information received.

In order to have continued public support of the mitigation process, it is important that the public be involved not only in the preparation of the initial plan, but also in any modifications or updates to the plan. The public is invited to the quarterly meetings, in compliance with the Public Meetings Act.

To ensure that public support is maintained, the following actions may be taken by GCAC:



- Updates to the plan.
- The Gladwin County plan has been web posted along with contact information that allows any citizen to read it and provide feedback.

- Develop informational mailings to be distributed to the public about mitigation efforts in the county and updates made to the plan.
- Develop mitigation flyers or mailings that contain mitigation activities and action items that promote reducing damages and risks of natural hazards.

**APPENDIX A –
GLADWIN COUNTY ADVISORY COMMITTEE SIGN-IN SHEETS**

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 4-13-16

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
J Mike Brosier		Navy Imp	30
W E Mace		106000	30
1:41	THX help	106000	34
1:41	Walt Host	Shawna	24
Don Stengale	Don Savarone	Butna	18
Madelyn Hinkle	Madelyn Stokole	Peaverton	30
Patricia Wilton	Peaverton	Peaverton	30
Barb Bruck	Barbara Bruck	Peaverton	30
Shirley George	Shirley George	Peaverton	22
Termy George	Termy George	Peaverton	22
Mike Stamp	Mike Stamp	Peaverton	14
Larry McElroy	Larry McElroy	Peaverton	32
Chad Alcott	Chad Alcott	Peaverton	32
13007 WADLERS	13007 WADLERS	Peaverton	10
Maridene Hill	Maridene Hill	Peaverton	10
Bill Ernst	Bill Ernst	Peaverton	10

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date March 9, 2016

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
Bill Ernst		EMCOG	—
Mike Rosier		May 1 up	30
Bob Walker		BROOKFIELD	54
George		St. Clair	22
Terrance Walters		St. Clair	10
White Stephens		St. Clair / County	14
Don Biecker		County Commission	14
Marianne Hie Prunneur		Glennville Co. DEP	—
MARY NELSON		Bellefonte Township	32
CHARL MAZOTT		Bellefonte Township	32
Walt Heid		Sharon Twp.	24
JOHN M. MELLA		GLADWIN TWP.	18
John W. Linton		Sharon	30
Bills Weaver		Sharon	10
William Elmer		Traverse	30
Dave R. Hesch		GLRC	—
Tom W. Hesch		City of Gladwin	—
Bob Evans		GLRC	30
Terry George		St. Clair	22

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 01/13/2016

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
LARRY ALERSON	<i>[Signature]</i>	Boelling Twp P.	32
CARL MALOTT	<i>[Signature]</i>	" "	32
WM CLARK	<i>[Signature]</i>	Robas Twp	30
J.M. Kresler	<i>[Signature]</i>	New Twp	30
BOB EVANS	<i>[Signature]</i>	G.C.C.	30
Walt Host	<i>[Signature]</i>	Shuman	42
Dee Dunham	<i>[Signature]</i>	City of Gladwin	1
Kathy Wilton	<i>[Signature]</i>	Seabird	30
Shirley George	<i>[Signature]</i>	Greent	22
Jerry George	<i>[Signature]</i>	Greent	22
Barbara Hild	<i>[Signature]</i>	Bairston Twp	17
Thom Almark	<i>[Signature]</i>	City of Gladwin	1
James Wynemko	<i>[Signature]</i>	Gladwin County Road Comm	—
W. He Stumpert	<i>[Signature]</i>	Boag Twp	14
Ruth Meers	<i>[Signature]</i>	Shuman Twp	14
BOB WEAVER	<i>[Signature]</i>	Gladwin Twp	3
John M. Mella	<i>[Signature]</i>	Gladwin Twp	6
Madelyn Hubble	<i>[Signature]</i>	Bairston Twp	30
Leung WATERS	<i>[Signature]</i>	Gladwin Co	10
Red 744402	<i>[Signature]</i>	Novell	34
Bill Ewert	<i>[Signature]</i>	EMCOG	—
Marianne Hill	<i>[Signature]</i>	Gladwin Co. Cem	—

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date November 10, 2017

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
Bill Ewert	Bill Ewert	EMCOG	—
J. Mike Bessie	J. Mike Bessie	Boy Trip	30
Carl A. Gnaase	Carl A. Gnaase	Indus	16
Walter Gerg	Walter Gerg	Geot Turs	23
Sam Gerg	Sam Gerg	Geot Turs	22
Bob Everts	Bob Everts	Code	30
Walt Heid	Walt Heid	Shuman	24
John Wilton	John Wilton	Geod	30
Mike Stump	Mike Stump	Sage Trip	14
LARRY Nelson	LARRY Nelson	Bellows	32
CARL ALON	Carl Alon	Bellows	32
DAVID HOFMAN	DAVID HOFMAN	Clement Trip	40
DAVID HOFMAN	DAVID HOFMAN	Code RR	54
Rollin BEEBE	Rollin BEEBE	Albion	16
Marianne Hill	Marianne Hill	Gladwin DEM	—
Don B. Rife	Don B. Rife	Comm	—
Macdonald	Macdonald	Beaver Trip	30
Carl Gnaase	Carl Gnaase	Beaver Trip	30

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 10-14-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
J. Surovic	[Signature]	Burmah Township	25
M. K. Boger	[Signature]	Hwy Trip	30
Dan Lee	[Signature]	Gladwin Township	16
Rollin Greer	[Signature]	Gladwin Twp	16
James Dwin	[Signature]	Amelia Rid CMS	92
James Milton	[Signature]	Speed	30
LARRY K. LSON	[Signature]	Billing	32
CARL ALLOT	[Signature]	Billing	32
Mike Stump	[Signature]	Sage Twp	14
DAK TAYLOR	[Signature]	Sherman Twp	24
WALTER HART	[Signature]	Sherman Twp	30
WM CLARK	[Signature]	Gcke	30
BOB EVANS	[Signature]	Shant	30
Bill Shearer	[Signature]	Barton Twp	30
Walter Hubble	[Signature]	Barton Twp	30
Paul Doud	[Signature]	Barton Twp	30
Shirley George	[Signature]	Port Townsend	22
Shirley George	[Signature]	Port Townsend	22
Don Williams	[Signature]	City of Gladwin	1
BOB MUFFIT	[Signature]	City of Gladwin	1
Bill Ernst	[Signature]	City of Gladwin	1
Marlene Clark	[Signature]	Gladwin Dem	5
James Clark	[Signature]	Gladwin Dem	5

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date July 15, 2015

[illegible]

Sign Area

6-23-15

<u>Name</u>	<u>Trip</u>	<u>Miles</u>
Larry Nelson	Billings	32 76.0
Carl Matott	Belevy	32 76.0
J. Mike Brosier	Hay	30
Walt Hart	Sherman	24 miles
Wm Clark	Tobacco	30 mi
Dale Taylor	BROUT Bourret	54
Wm. J. [unclear]	Sage	14
Shirley Gerge	Grout	21
STEVE SIKOWIEC DEPUTY SUPERVISOR	BOTMAN	25
Rollie B Green	CLADWIN	16
ONALEE Green	CLADWIN	16
Kay Hiltner	Secord	30
Karon Hoffman	Clement	40
Tony L. [unclear]	CLADWIN CO	5
Bill ERNST	EMCOG	—
Madalyn Hubble	Beaverton Troop	30

GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

Date 5-13-15

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
BOB EVANS	Bob Evans	ECDC	35
CARI MAZLOH	Carl Males	Billing Twp	32
JERRY WELSON	Jerry Maleson	Billing Twp	32
J. Mike Braser	J. M. Braser	May Twp	30
Dale Taylor	Dale Taylor	BRADING	
Walt Hart	Walt Hart	Shelburne Twp.	24
Myrlay George	Myrlay M. George	OROUT	22
Rollin Greer	Rollin Greer	gladwin	16
CONAL Lee Greer	Conal Lee Greer	gladwin	14
CONNIE BRINE	Connie Brine	Agar	26
IRBY BRUCE	Irby Bruce	ALGON	26
Dan Pittsford	Dan Pittsford	CCRC	0
Wm. C. Hall	Wm. C. Hall	Tobacco	30
Kathy LeDuff	Kathy LeDuff	Seed	30
Cheryl Hall	Cheryl Hall	Soag	14
Bill Ernst	Bill Ernst	Jim. Road Crew	
Marianne Hal	Marianne Hal	EMCOG	—
		Gladwin Co. OEM	—

Date: 3-24-15

MITIGATION PLAN UPDATE SIGN-IN SHEET

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
Mike Brosier	[Signature]	May Trip	30
Rollin Greer	[Signature]	Chadwick Trip	16
Onalee Greer	[Signature]	Chadwick Trip	16
Bob Evans	[Signature]	Chadwick	35
Patricia Wilton	[Signature]	Deed	30
Wm & Jack	[Signature]	Job Tree	30
Mike Stump	[Signature]	Booe	14
Don, Harold & [Signature]	[Signature]	SAKE	7
ARON HOEFMAN	[Signature]	CLEMENT	40
Walter Hart	[Signature]	Sherman	24
PAUL TAYLOR	[Signature]	BOURRET	34
Shirley George	[Signature]	OROUT	24
Carl M. [Signature]	[Signature]	Bulwiga	30
LARRY NELSON	[Signature]	Booe	30
Bill Evans	[Signature]	EMBOC	—
TEANYC. WATERS	[Signature]	CO-204	—
Bill [Signature]	[Signature]	Booe	10
Marianna Hill	[Signature]	Glenn Co OPM	—

SIGN-IN SHEET

2-11-15

	NAME	TOWNSHIP
1	<i>Debra Taylor</i>	BROODUE
2	J. Mike Brosier	HAY
3	Rollin B Green	GLADWIN
4	<i>Sharon R. Green</i>	GLADWIN
5	Kathy Wilton	Second
6	Donald Zakett	Tabacco
7	Shirley George	GROUT
8	Shirley Kyle	Sutma
9	<i>John Simpson</i>	Sage
10	<i>Wm Clark</i>	TOBACCO
11	Walt Hart	Shuman
12	<i>Jimmy Brown</i>	GROUT
13	<i>Bill Ernat</i>	GLADWIN
14	BILL ERNAT	EMCOG
15	<i>Gayle Reid</i>	Secretary
16	<i>Lang Whit</i>	Co. R.M.
17	Marianna Hill	Co. EM
18	BOB EVANS	G.C.D.C.
19		
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Miles ed trip

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30 MILES







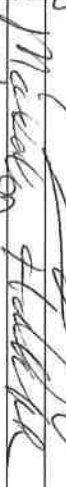
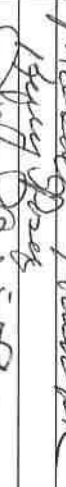

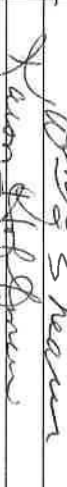








1-14-15

SIGN-IN Sheet

NAME	ORGANIZATION	Miles Round Trip
Bill Ernst	EMCOG	—
J. Mike Brosier	HAY	30 mi
Shirley George	GROU	20 mi
Walt Hart	Sherman	24 mi
Donna Drew	Adrian Twp	16 mi
Gallen Drew	Adrian Twp	16 mi
Kary Hilton	Secord Twp	30 mi
Mike	Tobacco	30 mi
Mike	Sage	12 mi
BOB EVANS	GROU	30 mi
Jerry Geer	GROU	20 m
Joe Beauchamp	ARC	50 mi
Marianne Hill	OEM	—

Gladwin
GLADWIN COUNTY
MITIGATION PLAN UPDATE SIGN-IN SHEET

November 12, 2014

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Round Trip)
Diana G. Green		Gladwin Township Clerk	16 miles
Rollin B. Greer		Gladwin Twp	16 miles
Shirley George		Gladwin Township	16 miles
J. M. Keiser		Hwy Twp	30 mi
Joan Wilton		deade Twp	30
Jim Lecker		deade Twp	30
Allye Stampf		Sage Green Ship	12
Shirley Kelle		deade Twp	12
Madalyn Hilda		deade Twp	30
Heidi Posey		City of Beavertown	16
Andy Penning		Commissioner's Secretary	4
Bill Shearer		Plant Twp	8
Karen Hoffman		CLEMENS TWP	18
Don BIRGER		Court Commission - Court	14
Melissa DeRoche		CNDHD	14
Terry George		deade Twp	14
Bill Greer		ENCOS	14
Marianne Hie		Gladwin Co. Dem	14

GLADWIN COUNTY

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
J. M. Ke Brosier	<i>J. M. Ke Brosier</i>	Hay Trip	40
Kevin W. Tim	<i>Kevin W. Tim</i>	Buckeye	8
John W. Hester	<i>John W. Hester</i>	Deerid	50
Shirley George	<i>Shirley George</i>	CRout	15
Lincoln	<i>Lincoln</i>	SHILMAN	24
Wm Elmore	<i>Wm Elmore</i>	TOLSON	15
Bob Evans	<i>Bob Evans</i>	GCDE	35
Shaneen, Wm	<i>Shaneen, Wm</i>	Shaneen	10
Bill Evans	<i>Bill Evans</i>	EMCOG	—
Tony Marshall	<i>Tony Marshall</i>	BovECT	24
Andy Remington	<i>Andy Remington</i>	Commissioner Office City of Gladwin	5
Dan Binger	<i>Dan Binger</i>	Commissioner / Crout Township	14
Margaret Hill	<i>Margaret Hill</i>	Gladwin DEM/HHS	0

9/2/14

PRINTED NAME	SIGNATURE	ORGANIZATION	MILES DRIVEN (Roundtrip)
BOB EVANS	<i>Bob Evans</i>	Gladwin Co. Detroit Com	
Tom W. NASH	<i>Tom W. Nash</i>	City of Gladwin	
John W. HEN	<i>John W. HEN</i>	Second Trip	30
J. Mike BOSTER	<i>J. Mike Boster</i>	Hay Trip	20
CHARLES W. NELSON	<i>Charles Nelson</i>	Baldy Trip	14
CHARLIE ALLEN	<i>Charlie Allen</i>	Baldy Trip	14
W. CLARK	<i>W. Clark</i>	Baldy Trip	8
KARL HOFFMAN	<i>Karl Hoffman</i>	Clemens Trip	15
JOE BEAUCHAMP	<i>Joe Beauchamp</i>	CLEMENT TRIP	30
COLLIER BAKER	<i>Collier Baker</i>	American Red Cross	100
BILL CRANT	<i>Bill Crant</i>	Gladwin Red Cross	14
CHRISTY KATZ	<i>Christy Katz</i>	Gladwin County Treasurer	
JOHN B. BOSTER	<i>John B. Boster</i>	Commissioner's Secretary	
JOE PETERSON	<i>Joe Peterson</i>	GCC	
Karin LaTina	<i>Karin LaTina</i>	Backlog Trip Supervisor	\$12
Marianne Hill	<i>Marianne Hill</i>	Gladwin Co. Cem	

EMCOG Hazard Mitigation 2013-14 Sign-in Sheet

	Meeting Date		(Round Trip)
	Meeting Location		
	Name	Agency Represented	E-mail address/phone #
1	James McHenry	Bellingham Dept	James.McHenry@bellinco.com
2	Paul MacLellan	Bellingham Dept	Paul.MacLellan@bellinco.com
3	Shirley Kyle	Bellingham Dept	Shirley.Kyle@bellinco.com
4	Frank Shaver	SECond fire Dept	Frank.Shaver@seconfire.com
5	Bruce Salasman	EM/Staff Com	Bruce.Salasman@emstaff.com
6	Corin Combs	SECond fire Dept	Corin.Combs@seconfire.com
7	Leo Gray	Emergency Management	Leo.Gray@gladwinco.com
8	Justin Schneider	Bellingham Dept	Justin.Schneider@bellinco.com
9	Mike Shea	Gladwin Co. Sheriff	Mike.Shea@gladwinco.com
10	Robert Moffitt	Gladwin City Administrator	Robert.Moffitt@gladwin.org
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Total Miles Driven

APPENDIX B – GLADWIN COUNTY LOCAL COMMUNITY SUBSECTIONS

All local communities were encouraged to participate in the update of the Hazard Mitigation Plan (“Plan”) update. Their input was requested on two different levels, participation in the Plan itself, and the submittal of a survey that addressed the issues of that particular community.

Participation in the Plan update included attending any of a number of meetings of the Gladwin County Advisory Committee (GCAC), which was used in advisory capacity for the Gladwin County data. The GCAC met on a monthly basis in order to complete the Plan in a timely manner. The second means to participate was the completion of a community survey. The results of the survey are found below and provide feedback on the issues facing each community. As a follow-up to the survey, the Emergency Management Director (EMD) and the East Michigan Council of Governments (EMCOG) staff met with the survey participants to secure supplemental information not included in the survey.

Below is a list of the participating communities and their local representatives who participated in either completing the survey or attending the GCC meetings.

City of Gladwin: Robert Moffit, City Manager

City of Beaverton:

Beaverton Township: Madalyn Hubble, Township Clerk

Bentley Township:

Billings Township: Carl Malott, Township Trustee

Bourret Township: Anthony Marshall, Township Supervisor

Buckeye Township:

Butman Township: Shirley Kyle, Township Supervisor

Clement Township: Karon Hoffman, Township Supervisor

Gladwin Township: Robert Weaver, Township Supervisor

Grim Township: Robert Allaben, Township Trustee

Grout Township: Shirley George, Township Representative

Hay Township: Justin Eastman, Township Supervisor/J. Mike Brosier GCAC Member

Sage Township: Mike Stumpfing, Zoning Administrator

Secord Township: Kathy Wilton, Township Clerk

Sherman Township: Walter Hart, Township Supervisor

Tobacco Township: William Clarek

It should be noted that the language within this Appendix was shaped by the EMD and EMCOG staff, in order to better reflect FEMA planning requirements, and thus was not a verbatim response provided by these local representatives. Inquiries about this may be directed to the Gladwin EMD as well as local community representatives.

1. City of Gladwin

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Rare	
Dam Failures	Never	
Drought	Rare	
Earthquakes	Rare	
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Seldom	
Horse-drawn Vehicles	Frequent	
Infrastructure Failure	Frequent	
Major Population Change	Frequent	
Nuclear Attack	Never	
Nuclear Power Plant Failure	Never	
Public Health Emergencies	Occasional	
Riverine Flooding	Frequent	
Scrap Tire and Structural Fires	Frequent	
Severe Winter Weather	Frequent	
Severe Summer Weather	Frequent	
Subsidence	Never	
Terrorism/Sabotage	Seldom	
Transportation/HazMat Accidents	Occasional	
Wildfires	Occasional	
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

The City of Gladwin did not participate in the follow-up interview.

2. City of Beaverton

The City of Beaverton did not participate in the questionnaire or interview process.

3. Beaverton Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances		
Dam Failures		
Drought		
Earthquakes		
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents		
Horse-drawn Vehicles		
Infrastructure Failure		
Major Population Change		
Nuclear Attack		
Nuclear Power Plant Failure		
Public Health Emergencies		
Riverine Flooding		
Scrap Tire and Structural Fires		
Severe Winter Weather		
Severe Summer Weather		
Subsidence		
Terrorism/Sabotage		
Transportation/HazMat Accidents		
Wildfires		
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

Beaverton Township did not participate with the follow-up interview.

4. Bentley Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	Moderate
Dam Failures	Never	Moderate
Drought	Rare	Moderate
Earthquakes	Rare	Moderate
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Moderate
Horse-drawn Vehicles	Rare	Moderate
Infrastructure Failure	Seldom	Moderate
Major Population Change	Rare	Moderate
Nuclear Attack	Never	Moderate
Nuclear Power Plant Failure	Never	Moderate
Public Health Emergencies	Never	Moderate
Riverine Flooding	Never	Moderate
Scrap Tire and Structural Fires	Occasional	Moderate
Severe Winter Weather	Occasional	Moderate
Severe Summer Weather	Occasional	Moderate
Subsidence	Never	Moderate
Terrorism/Sabotage	Never	Moderate
Transportation/HazMat Accidents	Rare	Moderate
Wildfires	Rare	Moderate
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazard for Bentley Township is wildfires.

To address this concern, a more elaborate warning system to notify the residents is necessary. With the area being heavily wooded, there is a great threat of wildfires. In order to properly notify the residents, the warning of the residents should be done in several ways to make sure all the residents are aware of the danger.

2. Second tier of significant hazards is structural fires.

The installation of smoke alarms in every residence would be very beneficial. As the population is scattered throughout the township, having a smoke alarm system would alert the owners and should provide them the opportunity to leave the building unharmed.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

5. Billings Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Occasional	Moderate
Dam Failures	Rare	Extreme
Drought	Never	Moderate
Earthquakes	Rare	Moderate
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Seldom	Moderate
Horse-drawn Vehicles	Seldom	Moderate
Infrastructure Failure	Seldom	Moderate
Major Population Change	Rare	Moderate
Nuclear Attack	Never	Moderate
Nuclear Power Plant Failure	Never	Moderate
Public Health Emergencies	Rare	Moderate
Riverine Flooding/Pond Flooding	Never	Moderate
Scrap Tire and Structural Fires	Frequent	Moderate
Severe Winter Weather	Frequent	Extreme
Severe Summer Weather	Frequent	Extreme
Subsidence	Rare	Strong
Terrorism/Sabotage	Never	Moderate
Transportation/HazMat Accidents	Never	Strong
Wildfires	Seldom	Extreme
Other (please specify): Over the Road Vehicles (ORV)	Occasional	Strong

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Billings Township are severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures) and dam failure.

To address the summer weather conditions, the provision of a better warning system and shelters is desired. To address the dam failures, providing maintenance information to the dam owners is necessary. Storms throughout the year cause the loss of power, which puts the elderly and medically disabled at risk. Improving the warning system would allow all residents the opportunity to seek shelter. The provision of shelters is necessary for those residents who lose power during these storms.

2. Second tier of significant hazards are severe winter weather (snowstorms, ice/sleet, and extreme temperatures) and horse-drawn vehicles.

To address the winter weather conditions, the provision of a better warning system is desired. Storms throughout the year cause the loss of power, which puts the elderly and medically disabled at risk. Improving the warning system would allow all residents the opportunity to seek shelter. There are traffic concerns with horse-drawn vehicles and the lack of proper lighting of the vehicle. This has resulted in many accidents, often fatal. There is a need to work with the Amish to improve their visibility to the motorized vehicle drivers.

3. Third tier of significant hazards is public health emergencies.

More local facilities are desired to handle medical emergencies.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

6. Bourret Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	Moderate
Dam Failures	Never	Moderate
Drought	Seldom	Moderate
Earthquakes	Rare	Moderate
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Seldom	Moderate
Horse-drawn Vehicles	Seldom	Moderate
Infrastructure Failure	Seldom	Moderate
Major Population Change	Seldom	Moderate
Nuclear Attack	Never	Moderate
Nuclear Power Plant Failure	Never	Moderate
Public Health Emergencies	Seldom	Moderate
Riverine Flooding	Seldom	Moderate
Scrap Tire and Structural Fires	Never	Moderate
Severe Winter Weather	Seldom	Moderate
Severe Summer Weather	Seldom	Moderate
Subsidence	Seldom	Moderate
Terrorism/Sabotage	Never	Moderate
Transportation/HazMat Accidents	Seldom	Moderate
Wildfires	Occasional	Moderate
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

Bourret Township did not participate with the follow-up interview.

7. Buckeye Township

Buckeye Township did not participate in the questionnaire or interview process.

8. Butman Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	Moderate-People
Dam Failures	Rare	Moderate-People/Property
Drought	Rare	Moderate-Property
Earthquakes	Rare	Moderate-People/Property
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Moderate-People/Property
Horse-drawn Vehicles	Frequent	Moderate-People
Infrastructure Failure	Seldom	Moderate-Property
Major Population Change	Frequent	Moderate-People
Nuclear Attack	Never	Moderate-People
Nuclear Power Plant Failure	Never	Moderate-People
Public Health Emergencies	Never	Moderate-People
Riverine Flooding	Seldom	Moderate-People/Property
Scrap Tire and Structural Fires	Seldom	Moderate-People
Severe Winter Weather	Occasional	Strong-People
Severe Summer Weather	Occasional	Strong-People
Subsidence	Never	Strong-People
Terrorism/Sabotage	Never	Moderate-People
Transportation/HazMat Accidents	Rare	Strong-People
Wildfires	Rare	Strong-People/Property
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Butman Township are severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures) and severe winter weather (snowstorms, ice/sleet, and extreme temperatures).

To address both the summer and winter weather conditions, the purchase of generator(s) would provide back-up power at the local shelter/township hall. Storms throughout the year cause the loss of power, which puts the elderly and medically disabled at risk. The purchase of generator(s) would provide a haven for those families in times of crises.

2. Second tier of significant hazards are horse-drawn vehicles and infrastructure failures. There are traffic concerns with horse-drawn vehicles and the lack of proper lighting of the vehicle. This has resulted in many accidents, often fatal.

To address the matter, creating a general awareness of the horse-drawn vehicles to the general public and educating the Amish of the dangers of travelling without proper lights would be beneficial. Providing designated routes could also prove beneficial, provided they are utilized and properly identified for the general public. Many of the infrastructure concerns are the result of severe weather conditions. Providing a source of power during these times would address this matter.

3. Third tier of significant hazards is flooding. Flooding Butman Township is often a result of lake flooding.

To resolve this matter, trenching/retrenching the drains at Lake Lancer would mitigate many of these problems.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

4. Clement Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	Moderate-People
Dam Failures	Never	Moderate-Both
Drought	Never	Moderate-Property
Earthquakes	Never	Moderate-Both
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Never	Moderate-Both
Horse-drawn Vehicles	Rare	Moderate-People
Infrastructure Failure	Rare	Moderate-Property
Major Population Change	Rare	Moderate-People
Nuclear Attack	Never	Moderate-People
Nuclear Power Plant Failure	Never	Moderate-People
Public Health Emergencies	Never	Moderate-People
Riverine Flooding	Rare	Moderate-Both
Scrap Tire and Structural Fires	Rare	Moderate-People
Severe Winter Weather	Occasional	Moderate-both
Severe Summer Weather	Occasional	Moderate-both
Subsidence	Never	Strong-People
Terrorism/Sabotage	Never	Moderate-People
Transportation/HazMat Accidents	Never	Moderate-People
Wildfires	Rare	Strong-Both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Clement Township are severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures) and severe winter weather (snowstorms, ice/sleet, and extreme temperatures).

To address both the summer and winter weather conditions, the provision of an improved warning system is desired. An improved warning system should alert the township residents of oncoming storm events. This could include multiple methods to contact the residents (sirens and CodeRED are two examples).

2. Second tier of significant hazards are wildfires.

To address the matter, completing a wildfire plan would be most beneficial. The plan would not only educate the residents on the causes of wildfires, but would also provide measures that could be used to mitigate the damages that result from wildfires.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

5. Gladwin Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Rare	Moderate-Both
Dam Failures	NA	NA
Drought	Occasional	Moderate-Both
Earthquakes	Rare	Moderate-Property
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Moderate-Property
Horse-drawn Vehicles	Frequent	Moderate-Personal
Infrastructure Failure	Occasional	Moderate-Both
Major Population Change	Frequent	Moderate-Personal
Nuclear Attack	Never	Moderate
Nuclear Power Plant Failure	Never	Moderate
Public Health Emergencies	Rare	Moderate-Personal
Riverine Flooding	Rare	Moderate-Property
Scrap Tire and Structural Fires	Occasional	Strong-Both
Severe Winter Weather	Frequent	Strong-Both
Severe Summer Weather	Frequent	Strong-both
Subsidence	Rare	Moderate-Property
Terrorism/Sabotage	Rare	Moderate-Both
Transportation/HazMat Accidents	Rare	Moderate-Personal
Wildfires	Seldom	Moderate-Both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Gladwin Township are severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures) and severe winter weather (snowstorms, ice/sleet, and extreme temperatures).

The purchase of generators and the installation of warning sirens have been identified to mitigate the losses resulting from these hazards. The purchase of generator(s) would provide back-up power at the local shelter/township hall. Storms throughout the year cause the loss of power, which puts the elderly and medically disabled at risk. The purchase of generator(s) would provide a haven for those families in times of crises. The second item, installation of warning sirens would benefit the entire community. There are insufficient warning sirens currently in the Township. Adding additional sirens to warn the public of extreme weather conditions (and other emergencies as well) would provide a more complete warning system in the township.

2. Second tier of most significant hazards consists of horse-drawn vehicles and infrastructure failure. There are traffic concerns with horse-drawn vehicles and the lack of proper lighting of the vehicle. This has resulted in many accidents, often fatal.

To address the matter, creating a general awareness of the horse-drawn vehicles to the general public and educating the Amish of the dangers of travelling without proper lights would be beneficial. Many of the infrastructure concerns are the result of severe weather conditions. Providing a source of power during these times would address this matter.

3. Third tier of most significant hazards are structural fires. The township does not have a full-time fire staff.

Educating the public on ways to prevent structural fires would prove to be most beneficial.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

6. Grim Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Seldom	
Dam Failures	Seldom	
Drought	Occasional	
Earthquakes	Never	
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Seldom	
Horse-drawn Vehicles	Frequent	
Infrastructure Failure	Frequent	
Major Population Change	Frequent	
Nuclear Attack	Never	
Nuclear Power Plant Failure	Never	
Public Health Emergencies	Seldom	
Riverine Flooding	Occasional	
Scrap Tire and Structural Fires	Occasional	
Severe Winter Weather	Frequent	
Severe Summer Weather	Frequent	
Subsidence	Never	
Terrorism/Sabotage	Rare	
Transportation/HazMat Accidents	Frequent	
Wildfires	Occasional	
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

Grim Township did not participate with the follow-up interview.

12. Grout Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Rare	Moderate-Both
Dam Failures	Never	Moderate-Property
Drought	Rare	Moderate-Property
Earthquakes	Rare	Moderate-Both
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Seldom	Strong-Both
Horse-drawn Vehicles	Frequent	
Infrastructure Failure	Occasional	Strong-Both
Major Population Change	Frequent	Strong-Both
Nuclear Attack	Never	Extreme-Both
Nuclear Power Plant Failure	Never	Extreme-Both
Public Health Emergencies	Frequent	Strong-Both
Riverine Flooding	Frequent	Strong-Property
Scrap Tire and Structural Fires	Frequent	Extreme-Both
Severe Winter Weather	Frequent	Extreme-Both
Severe Summer Weather	Frequent	Extreme-Both
Subsidence	Rare	Moderate-Both
Terrorism/Sabotage	Rare	Moderate-Both
Transportation/HazMat Accidents	Seldom	Strong-Both
Wildfires	Seldom	Strong-Both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Grout Township are horse-drawn vehicles and infrastructure failure.

To address the horse-drawn vehicles, widening of the roads to accommodate both modes of traffic. While this may be unreasonable in certain areas, the widening of the roads in the most critical areas may be appropriate. Road improvements also are needed to address the concerns with failing infrastructure.

2. Second tier of most significant hazards include severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures) and severe winter weather (snowstorms, ice/sleet, and extreme temperatures).

To address both the summer and winter weather conditions, the purchase of generator(s) would provide back-up power at the local shelter/township hall. Storms throughout the year cause the loss of power, which puts the elderly and medically disabled at risk. The purchase of generator(s) would provide a haven for those families in times of crises. The installation of warning sirens would also benefit the entire community. There are insufficient warning sirens currently in the Township. Adding additional sirens to warn the public of extreme weather conditions (and other emergencies as well) would provide a more complete warning system in the township.

3. Third tier of most significant hazards are public health emergencies.

Again the installation of warning sirens would be beneficial to notify the public of the issues at hand. However, education is also a must, as the residents would need to know what they could/should do with the different public health emergencies.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

13. Hay Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Rare	Moderate-Property
Dam Failures	Rare	Moderate-Both
Drought	Seldom	Strong-Both
Earthquakes	Never	Moderate-Property
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Moderate-Property
Horse-drawn Vehicles	Rare	Moderate-Personal
Infrastructure Failure	Frequent	Strong-Both
Major Population Change	Frequent	Strong-Personal
Nuclear Attack	Never	Moderate-Both
Nuclear Power Plant Failure	Never	Moderate-Both
Public Health Emergencies	Rare	Moderate-Personal
Riverine Flooding	Frequent	Strong-Both
Scrap Tire and Structural Fires	Frequent	Strong-Both
Severe Winter Weather	Frequent	Strong-Both
Severe Summer Weather	Occasional	Strong-Both
Subsidence	Rare	Moderate-Property
Terrorism/Sabotage	Never	Moderate-Both
Transportation/HazMat Accidents	Seldom	Moderate-Both
Wildfires	Occasional	Moderate-Both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Hay Township are flooding/dam failure and severe winter weather (snowstorms, ice/sleet storms, and extreme temperatures).

Dam inspections and the maintenance required on the dams would mitigate most concerns with flooding. Warning systems are needed to better inform the public on the dangers of winter storms (and other hazards as well). The township is in need of additional sirens to accomplish this matter.

2. Second tier of most significant hazards structural fires and severe summer weather (tornadoes, high winds, thunderstorms, and extreme temperatures).

Additional fire equipment is needed and existing equipment needs to be upgraded. Shelters are needed for housing of the residents during the severe summer conditions.

3. Third tier of most significant hazards is wildfires. Due to the proximity of forested areas in Hay Township, wildfires are a big concern.

To mitigate losses as a result of wildfires educating the public on mitigating measures and the use of fuel breaks would be the most beneficial.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township. .

14.Sage Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Seldom	Strong-personal
Dam Failures	Rare	Extreme-both
Drought		Strong-property
Earthquakes	Rare	Extreme-both
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Strong-both
Horse-drawn Vehicles	Frequent	Extreme-personal
Infrastructure Failure	Frequent	Moderate-both
Major Population Change	Occasional	Moderate-personal
Nuclear Attack	Never	Moderate-both
Nuclear Power Plant Failure	Never	Moderate-both
Public Health Emergencies	Occasional	Strong-personal
Riverine Flooding	Frequent	Strong-both
Scrap Tire and Structural Fires	Frequent	Strong-both
Severe Winter Weather	Frequent	Strong-both
Severe Summer Weather	Frequent	Strong-both
Subsidence	Never	Strong-both
Terrorism/Sabotage	Rare	Extreme-both
Transportation/HazMat Accidents	Frequent	Extreme-both
Wildfires	Frequent	Extreme-both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the GCAC resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Sage Township are infrastructure failure and severe winter/summer weather conditions (snowstorms, ice/sleet storms, tornadoes, high winds, thunderstorms, and extreme high and low temperatures).

There is a major concern that Wagarville Road cannot support fire and/or emergency equipment, and as a result there would be delays in receiving assistance. The road must be improved to meet state standards to support local traffic. In addition, due to the number of large (and perhaps overweight) trucks, many of the roads in the Township are in a severe state of disrepair. Road improvements and enforcement of weight restrictions on trucks would mitigate these damages. The public does not currently have proper warning for severe winter/summer weather events and a warning system (sirens) to address these and other conditions is warranted. In addition, the township hall does not have a generator for back-up power during power outages. The hall is relatively new and could be used as a shelter during these times, if a generator were to be available. There is not a shelter currently in the Township.

2. Second tier of most significant hazards are dam failure and horse-drawn vehicles.

There is a concern that dams are not properly maintained and with the issues regarding Wagarville Road, any dam failure in the Township could result in heavy losses, both personal and property. With respect to the horse-drawn vehicle hazard, consideration to widen specific county roads, or the identification of a horse-drawn vehicle lane, could mitigate most of the problems with this matter. There are several trouble spots in the Township, and these areas should be addressed first.

3. Third tier of most significant hazards includes flooding.

The township's culvert system is in a state of disrepair and as a result flooding has resulted. Culverts need to be repaired/replaced to meet the standards of the State of Michigan. This in turn would result in improved roads throughout the township.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township. .

15. Secord Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Seldom	Moderate-personal
Dam Failures	Rare	Strong-property
Drought	Rare	Strong-property
Earthquakes	Rare	Moderate-property
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Strong-property
Horse-drawn Vehicles	Rare	Moderate-personal
Infrastructure Failure	Frequent	Moderate-both
Major Population Change	Frequent	Moderate-both
Nuclear Attack	Never	Extreme-both
Nuclear Power Plant Failure	Never	Moderate-both
Public Health Emergencies	Frequent	Moderate-personal
Riverine Flooding	Seldom	Strong-property
Scrap Tire and Structural Fires	Frequent	Extreme-both
Severe Winter Weather	Frequent	Strong-both
Severe Summer Weather	Frequent	Strong-both
Subsidence	Rare	Strong-property
Terrorism/Sabotage	Rare	Extreme-both
Transportation/HazMat Accidents	Rare	Extreme-both
Wildfires	Frequent	Extreme-both
Other (please specify) Plane Crash	Seldom	Extreme-both

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the EMCOG planning staff resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Secord Township include structural fires, and major population changes.

The matter of mitigating structural damages due to fires can be addressed, in part, with better/additional firefighting equipment as well as training for the firefighting personnel. The major population changes occur during the summer months. This increase in population is directly correlated to an increase in boating/water vehicle accidents. Many of the water accidents are due to vacationers/part-time residents of the Township. With the population of the Township nearly doubling during the summer months, additional public safety personnel (specifically marine patrol) is needed on the lakes, a major draw to the area. Additional educational materials would also be beneficial.

2. The second tier of most significant hazards include dam failures and wildfires.

Many of the summer residents/visitors utilize the amenities that are provided by the local bodies of water. Therefore, it is imperative that the dams are properly maintained, not only for the tourism aspect, but for the safety of the residents that live downstream of the dams. Regarding the wildfires, a large portion of the township is heavily forested and as a result each and every year there is a danger of wildfires. Due to the dangers that wildfires pose to the Township, it is imperative that the firefighters and the proper equipment and training to handle these fires.

3. The third tier of most significant hazards include severe winter/summer weather conditions (snowstorms, ice/sleet storms, tornadoes, high winds, thunderstorms, and extreme high and low temperatures), and infrastructure failure.

This Township is not heavily populated and is spread out over the Township. There are not sufficient warning sirens for the Township, additional sirens would provide a means to alert the public of severe weather and other dangerous situations. In addition, pack-up generators for the sirens would also be needed for times when the power is out. A second measure to address the severe weather conditions is for families to have a Family Disaster Kit and the training on how to store/utilize them. The Township is primarily rural and without its own emergency services, therefore, the disaster kit would be very beneficial.

Implementation of hazard mitigation actions would generally involve authorized Township officials, the Township's relevant departments, coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

16. Sherman Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	Moderate-personal
Dam Failures	Never	Strong-both
Drought	Seldom	Moderate-both
Earthquakes	Never	Moderate-both
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Never	Strong-both
Horse-drawn Vehicles	Occasional	Moderate-both
Infrastructure Failure	Occasional	Moderate-both
Major Population Change	Never	NA
Nuclear Attack	Never	NA
Nuclear Power Plant Failure	Never	NA
Public Health Emergencies	Rare	Moderate-both
Riverine Flooding	Rare	Moderate-both
Scrap Tire and Structural Fires	Occasional	Moderate-both
Severe Winter Weather	Occasional	Moderate-both
Severe Summer Weather	Occasional	Moderate-both
Subsidence	Never	Moderate-both
Terrorism/Sabotage	Never	NA
Transportation/HazMat Accidents	Seldom	Moderate-both
Wildfires	Seldom	Strong-both
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

After the initial questionnaire was filled out, follow-up between the Township and the EMCOG planning staff resulting in a general prioritization of hazards, as follows:

1. Most significant hazards for Sherman Township are dam failures, and severe winter/ summer weather (snowstorms, ice/sleet storms, tornadoes, thunderstorms, high winds, and extreme high and low temperatures).

To address the concerns with dam failures, dam maintenance would be the most beneficial. Hazardous weather conditions can occur in an instant, therefore, notification to the public is a must. The Township does not currently have sufficient warning sirens to be heard by all the residents. Additional warning sirens would address this matter.

2. The second tier of significant hazards are wildfires and structural fires.

The Township is in need of additional funds to purchase firefighting equipment, and the construction and staffing of an additional fire substation. While the construction and staffing of an additional fire substation, may not be imminent, the need to purchase additional firefighting equipment is.

Implementation of hazard mitigation actions would generally involve authorized Village officials, the Village's relevant departments, some coordination with Gladwin County OEM, and federal hazard mitigation funds where possible.

While other listed hazards do occur, they do not have the impact as those identified above and have been given a lower priority to be addressed by the Township.

13. Tobacco Township

Initial community feedback from hazard questionnaire:

Hazard	Likelihood of occurring annually *	Severity of hazard impacts **
Civil Disturbances	Never	
Dam Failures	Rare	Extreme-Both
Drought	Rare	Moderate-Property
Earthquakes	Rare	Moderate-Property
Fixed Site HazMat/Pipeline/Oil & Gas Well Incidents	Rare	Moderate-Property
Horse-drawn Vehicles	Occasional	Moderate
Infrastructure Failure	Frequent	Moderate-Both
Major Population Change	Never	
Nuclear Attack	Never	
Nuclear Power Plant Failure	Never	
Public Health Emergencies	Never	
Riverine Flooding	Occasional	Moderate-Property
Scrap Tire and Structural Fires	Frequent	Strong-Both
Severe Winter Weather	Frequent	Moderate-Both
Severe Summer Weather	Frequent	Moderate-Both
Subsidence	Rare	Moderate-Property
Terrorism/Sabotage	Never	
Transportation/HazMat Accidents	Rare	Moderate-Property
Wildfires	Rare	Moderate-Property
Other (please specify)		

*the frequency of occurring annually should be based on the following scale:

Frequent-occurs annually

Occasional-occurs at least once every 5 years, but not annually

Seldom-occurs once every 5-15 years

Rare-occurs less than once every 15 years

Never-has not occurred in past 100 years

** The severity should be rated: extreme, strong, or moderate and should include whether or not the damage is: personal, to the property, or both.

Tobacco Township did not participate with the follow-up interview.

APPENDIX C - GLADWIN COUNTY FINAL MITIGATION STRATEGIES

1. Using surge protectors on critical electronic equipment.
2. Installing lightning protection devices on the community's critical infrastructure.
3. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
4. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
5. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.
6. Storage of water for use in drought events (especially for human needs during extreme temperatures).
7. Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.
8. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
9. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
10. Enclosing the foundations of homes and buildings rather than leaving them open and the underside exposed to blown embers or materials.
11. Constructing emergency access roads to dams.
12. Flood plain management – planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
13. Dry/wet floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
14. Elevation of flood-prone structures above the 100-year flood level.
15. Construction of elevated or 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.
16. Government acquisition, relocation, or condemnation of structures within floodplain or floodway areas.
17. Monitoring of water levels with stream gauges and trained monitors.
18. Increasing functioning and capacity of sewage lift stations and treatment plants (installation, expansion, and maintenance), including possible separation of combined storm/sanitary sewer systems, if appropriate.
19. Purchase or transfer of development rights – to discourage development in floodplain areas.
20. Brownfield cleanup activities.

21. Identification of radioactive soils and high-radon areas
22. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
23. Redundancies in utility and communications systems, especially "lifeline" systems.
24. Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
25. Separation of storm and sanitary sewer systems.
26. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
27. Consistent use of computer data back-up systems and anti-virus software.
28. Identification signs on horse drawn vehicles.
29. Paved lanes (where possible) designated for horse-drawn vehicles.
30. Standardized safety equipment on horse-drawn vehicles.
31. Incident anticipation and planning, and video documentation of events for later study and use.
32. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
33. Work with power companies to inventory condition of power line right-of-ways, and identify priority sections to clear branches and trees from power lines. The end goal is to create and maintain a disaster resistant landscape in public rights-of-way.
34. Communities will acquire and maintain an adequate level of emergency power generators to supply emergency water needs, wastewater processing, emergency communications, emergency health care, and shelters.
35. Individual communities should prepare future land use plans and capital improvement programs to plan for their future needs.
36. Build the capabilities of the county GIS program to function as a tool to address multiple hazards. This effort would require the creation/updating of datasets such as parcels/ownership, location of all structures, driveways with ingress/egress conditions, roads, forest types, ownership types, floodplains, utilities (power lines, gas lines and water lines), wetlands, water features, bridges and culverts, (SARA III sites)
37. Ensure that the County and individual communities have adequate equipment, staff, and training to respond to hazard related events.
38. Communities will work with the Federal Emergency Management Agency (FEMA) to identify floodplains.
39. Ensure key gasoline stations have the capacity to pump gasoline during power outages.
40. Develop plans to identify and inform persons of "Safe Areas" during festivals/events. (include signs and directions to shelters)
41. Increase usage of NOAA Weather Radio by subsidizing purchase and distribution of radios to county residents, organizations and businesses. Use NOAA radios as a community emergency alert system to information on hazard events.
42. Acquire portable/changeable message signs to direct crowds and provide information.
43. Public awareness and warning systems.
44. Pump and flood gate installation/automation.
45. Training, planning, and preparedness for hazardous materials incidents along roadways (in addition to fixed-site emergencies.)
46. Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations.
47. Location of industrial areas from schools, nursing homes, etc.
48. Enhanced security and anti-terrorist/ sabotage/civil disturbance measures.

49. Transportation planning that provides roads, overpasses, etc. to maximize access and improve emergency response times, and evacuation potential, for all inhabited or developed areas of a community (not just designing for the minimum amount of road capacity to handle normal traffic volumes in the community). This includes transportation access within developed sites (shopping malls, stadiums, office & commercial parking lots, etc.).
50. Defensible space around structures in fire-prone wildland areas.
51. Using 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 the level of risk.
52. Airport maintenance, security, and safety programs.
53. Use of ITS (intelligent transportation systems) technology.
54. Home and public building maintenance to prevent roof and wall damage from "ice dams."
55. Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
56. Detection and prevention/discouragement of illegal discharges into stormwater sewer systems, from home footing drains, downspouts, and sump pumps.
57. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).

APPENDIX D – GLADWIN COUNTY POSSIBLE MITIGATION STRATEGIES

Thunderstorm Hazards

1. Increased coverage and use of NOAA Weather Radio.
2. Producing and distributing family emergency preparedness information relating to thunderstorm hazards.
3. Public education and awareness of thunderstorm dangers.
4. Training and increased use of weather spotters.
5. Public early warning systems and networks.
6. Tree trimming and maintenance to prevent limb breakage and safeguard nearby utility lines. (Ideal: Establishment of a community forestry program with a main goal of creating and maintaining a disaster-resistant landscape in public rights-of-way.)
7. Buried/protected power and utility lines.
8. Inclusion of safety strategies for severe weather events in driver education classes and materials.
9. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
10. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, objects from destroyed/damaged structures, vegetation or other items knocked down or blown by winds.)
11. Using surge protectors on critical electronic equipment.
12. Installing lightning protection devices on the community's communications infrastructure.
13. Using appropriate wind engineering measures and construction techniques (e.g. structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced entry and garage doors, window shutters, waterproof adhesive sealing strips, and interlocking roof shingles) to strengthen public and private structures against severe wind damage.
14. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
15. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.

Drought

16. Storage of water for use in drought events (especially for human needs during extreme temperatures).
17. Measures or ordinances to prioritize or control water use (especially when needed to fight fires).
18. Encouragement of water-saving measures by consumers (especially during irrigation and farming).

Winter Weather Hazards

19. Home and public building maintenance to prevent roof and wall damage from "ice dams."
20. Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.
21. Farmer preparedness to address livestock needs/problems.
22. Pre-arranging for shelters for stranded motorists/travelers, and others.
23. Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.

Extreme Temperatures

24. Organizing outreach to vulnerable populations during periods of extreme temperatures, including establishing and building awareness of accessible heating and/or cooling centers in the community, and other public information campaigns about this hazard.
25. Housing/landlord codes enforcing heating requirements.
26. Special arrangements for payment of heating bills.

Wildfires

27. Proper maintenance of property in or near wildland areas (including short grass; thinned trees and removal of low hanging branches; selection of fire-resistant vegetation; use of fire resistant roofing and building materials; use of functional shutters on windows; keeping flammables such as curtains securely away from windows or using heavy fire-resistant drapes; creating and maintaining a buffer zone (defensible space) between structures and adjacent wild lands; use of the fire department's home safety inspections; sweeping/ cleaning dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards; keeping woodpiles and other combustibles away from structures; use of boxed or enclosed eaves on house; thorough cleaning-up of spilled flammable fluids; and keeping garage areas protected from blowing embers).
28. Safe disposal of yard and house waste rather than through open burning.
29. Keep handy household items that can be used as fire tools; a rake, axe, hand/chainsaw, bucket and shovel. Install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each floor of buildings and homes. Test monthly and change the batteries two times each year. Teach family members how to use the fire extinguisher.
30. Post fire emergency telephone numbers. **(Complete)**
31. Residents should plan several escape routes away from their homes - by car and by foot.
32. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
33. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and with any history of flammable substances stored, spilled, or dumped on them).
34. Public education on smoking hazards and recreational fires.
35. Efficient response to fallen power lines.
36. Training and exercises for response personnel.
37. GIS mapping of vegetative coverage, for use in planning decisions and analyses through comparison with topography, zoning, developments, infrastructure, etc.
38. Media broadcasts of fire weather and fire warnings.
39. Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning.
40. Mutual aid pacts with neighboring communities.
41. Prescribed burns and fuel management (thinning of flammable vegetation, possibly including selective logging to thin out some areas. Fuels cleared can be given away as firewood or chipped into wood chips for distribution.)
42. The creation of fuel breaks (areas where the spread of wildfires will be slowed or stopped due to removal of fuels, or the use of fire-retardant materials/vegetation) in high-risk forest or other areas.
43. Keeping roads and driveways accessible to vehicles and fire equipment—driveways should be relatively straight and flat, with at least some open spaces to turn, bridges that can support emergency vehicles, and clearance wide and high enough for two-way traffic and emergency vehicle access (spare keys to gates around property should be provided to the local fire department, and an address should be visible from the road so homes can be located quickly).
44. Enclosing the foundations of homes and buildings rather than leaving them open and the underside exposed to blown embers or materials.

45. Safe use and maintenance/cleaning of fireplaces and chimneys (with the use of spark arresters and emphasis on proper storage of flammable items). Residents should be encouraged to inspect chimneys at least twice a year and clean them at least once a year.
46. Proper maintenance and storage of motorized equipment that could catch on fire.
47. Proper storage and use of flammables, including the use of flammable substances (such as when fueling machinery). Store gasoline, oily rags and other flammable materials in approved safety cans. Stack firewood at least 100 feet away and uphill from homes.
48. Obtaining insurance.
49. Including wildfire safety information in materials provided by insurance companies to area residents.
50. Residents should be instructed on proper evacuation procedures, such as wearing protective clothing (sturdy shoes, cotton or woolen clothing, long pants, a long-sleeved shirt, gloves and a handkerchief to protect the face); taking a Disaster Supplies Kit; and choosing a route away from fire hazards.
51. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Dam Failures

52. Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).
53. Regulate development in the dam's hydraulic shadow (where flooding would occur if there was a severe dam failure).
54. Greater local support for/assistance with dam inspections and enforcement of the Dam Safety Program (Part 315 of the Natural Resources and Environmental Protection Act) requirements and goals.
55. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
56. Constructing emergency access roads to dams.

Riverine and Urban Flooding/Shoreline Flooding and Erosion

57. Accurate identification and mapping of flood-prone areas.
58. Flood plain management – planning acceptable uses for areas prone to flooding (through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
59. Acceptable land use densities, coverage and planning for particular soil types and topography (decreasing amount of impermeable ground coverage in upland and drainage areas, zoning and open space requirements suited to the capacity of soils and drainage systems to absorb rainwater runoff, appropriate land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
60. Dry/wet floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
61. Elevation of flood-prone structures above the 100-year flood level.
62. Construction of elevated or 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.
63. Government acquisition, relocation, or condemnation of structures within floodplain or floodway areas.
64. Public awareness of the need for permits (MDEQ Part 31) for building in floodplain areas.

65. Employing techniques of erosion control within the watershed area (proper bank stabilization, techniques such as planting of vegetation on slopes, creation of terraces on hillsides, use of riprap boulders and geotextile fabric, etc.).
66. Dredging and clearance of sediment and debris from drainage channels.
67. Protection (or restoration) of wetlands and natural water retention areas.
68. Enforcement of basic building code requirements related to flood mitigation.
69. Joining the National Flood Insurance Program.
70. Participating in the Community Rating System (CRS).
71. Structural projects to channel water away from people and property (dikes, levees, floodwalls) or to increase drainage or absorption capacities (spillways, water detention and retention basins, relief drains, drain widening/dredging or rerouting, debris detention basins, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, wetlands protection and restoration).
72. Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
73. Farmland and open space preservation.
74. Elevating mechanical and utility devices above expected flood levels.
75. Improved/updated floodplain mapping.
76. Real estate disclosure laws.
77. Public education and flood warning systems.
78. Monitoring of water levels with stream gauges and trained monitors.
79. Training for local officials on flood fighting, floodplain management, floodproofing, etc.
80. Road closures and traffic control in flooded areas.
81. Back-up generators for pumping and lift stations in sanitary sewer systems, and other measures (alarms, meters, remote controls, switchgear upgrades) to ensure that drainage infrastructure is not impeded.
82. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
83. Employing techniques of erosion control in the area (bank stabilization, planting of vegetation on slopes, creation of terraces on hillsides).
84. Increasing functioning and capacity of sewage lift stations and treatment plants (installation, expansion, and maintenance), including possible separation of combined storm/sanitary sewer systems, if appropriate.
85. Purchase or transfer of development rights – to discourage development in floodplain areas.
86. Stormwater management ordinances or amendments.
87. Wetlands protection regulations and policies.
88. Regional/watershed cooperation.
89. Use of check valves, sump pumps and backflow preventers in homes and buildings.

Fixed Site Hazardous Material Incidents (including explosions and industrial accidents)

90. Maintaining an active and viable Local Emergency Planning Committee (LEPC).
91. Developing and exercising site emergency plans and community response plans as required under SARA Title III.
92. Development of Risk Management Plans for sites that manufacture, store, or handle hazardous materials, to comply with EPA regulations. (For guidance, see the EPA's CEPPO web site at <http://www.epa.gov/swercepp/acc-pre.html>.)
93. Training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.
94. Policies stressing the importance of safety above other considerations.

95. Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA) standards.
96. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
97. Hazardous material public awareness and worker education programs.
98. Facility and community training and exercise programs.
99. Brownfield cleanup activities.
100. Identification of radioactive soils and high-radon areas
101. Proper separation and buffering between industrial areas and other land uses.
102. Evacuation plans and community awareness of them.
103. Road closures and traffic control in accident areas.
104. Compliance with all industrial, fire, and safety regulations.

Hazardous Material Transportation Incidents

105. Improvements in driver education, traffic law enforcement, and transportation planning that balance the needs of hazardous material transporters with the safety of the general public.
106. Improved design, routing, and traffic control at problem roadway areas.
107. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
108. Proper planning, design, maintenance of, and enhancements to designated truck routes.
109. Enforcement of weight and travel restrictions for truck traffic.
110. Use of ITS (intelligent transportation systems) technology.
111. Compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport.
112. Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.
113. Road closures and traffic control in accident areas.

Infrastructure Failures

114. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
115. Redundancies in utility and communications systems, especially "lifeline" systems.
116. Mutual aid assistance for failures in utility and communications systems (including 9-1-1).
117. Alternative 9-1-1 access through radio operators whose homes are identified through special markings.
118. Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.
119. Separation and/or expansion of sewer system to handle anticipated stormwater volumes.
120. Regular maintenance and equipment checks.
121. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).
122. Protecting electrical and communications systems from lightning strikes.
123. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).

Oil and Natural Gas Well Accidents

124. Community and operator compliance with industry safety regulations and standards.
125. Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.
126. Using 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 the level of risk.

127. 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.

Public Health Emergencies

128. Encouraging residents to receive immunizations against communicable diseases.
129. Improving ventilation techniques in areas/facilities prone to crowding, or that may involve exposure to contagion or noxious atmospheres.
130. Increasing public awareness of radon dangers and the prevention efforts that can be taken to reduce concentrations of radon in homes and buildings.
131. Maintaining community water and sewer infrastructure at acceptable operating standards.
132. Demolition and clearance of vacant condemned structures to prevent rodent infestations.
133. Maintaining a community public health system with sufficient disease monitoring and surveillance capabilities to adequately protect the population from large-scale outbreaks.
134. Increasing public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies.
135. Community support of free or reduced-expense clinics and school health services.
136. Preventing public contact with contaminated sites or waters (including floodwaters).
137. Pollution control, enforcement, and cleanup; proper disposal of chemicals and scrap materials.
138. Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
139. Separation of storm and sanitary sewer systems.

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)

140. Development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.
141. Alertness, awareness, and monitoring of organizations and activities that may threaten the community.
142. Implementing school safety and violence prevention programs.
143. Heightening security at public gatherings, special events, and critical community facilities and industries.
144. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
145. Greater awareness of, and provision for, mental health services in schools, workplaces, and institutional settings.
146. The development and testing of internal emergency plans and procedures by businesses and organizations.
147. Establishing avenues of reporting (and rewards) for information preventing terrorist incidents and sabotage.
148. Consistent use of computer data back-up systems and anti-virus software.

Population Increase (Seasonal/Event)

149. Provide personnel on a temporary basis to handle greater loads on public services.
150. Provide for emergency equipment to deal with higher call rates.
151. Develop plans for excessive traffic patterns.
152. Develop special event permit approval process.

Horse-drawn Vehicles

153. Public awareness of horse drawn vehicles.
154. Identification signs on horse drawn vehicles.
155. Paved lanes (where possible) designated for horse-drawn vehicles.
156. Standardized safety equipment on horse-drawn vehicles.

157. (PROPOSED) Reach out to the Amish Community and work with them on safety issues and joint cooperation.

Civil Disturbances (prison or institutional rebellions, disruptive political gatherings, violent labor disputes, urban protests or riots, or large-scale uncontrolled festivities)

158. Incident anticipation and planning, and video documentation of events for later study and use.
159. It is possible that design, management, integration, and lowered density of poor or blighted areas may reduce vandalism, crime, and some types of riot events. Crime Prevention through Environmental Design (CPTED) is a field of planning that deals with this.
160. Design requirements for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, etc. that take into consideration emergency and security needs.

Earthquakes (biggest Michigan threats would be to pipelines, buildings that are poorly designed and constructed, and shelving, furniture, mirrors, gas cylinders, etc. within structures that could fall and cause injury or personal property damage)

161. Adopt and enforce appropriate building codes.
162. Use of safe interior designs and furniture arrangements.

Scrap Tire Fires

163. Policies for regulated disposal and management of scrap tires, and enforcement of regulations related to them (separation of stored scrap tires from other materials; limits on the size of each pile; minimum distances between piles and property lines; covering, chemically treating, or shredding tires to limit mosquito breeding; providing for fire vehicle access to scrap tire piles; training employees in emergency response operations; installation of earthen berms around storage areas; prevention of pools of standing water in the area; control of nearby vegetation; an emergency plan posted on the property; storing only the permitted volume of tires authorized for that site).
164. Proper siting of tire storage and processing facilities (land use planning that recognizes scrap tire sites as a real hazard and environmental threat).
165. Local awareness of scrap tire risk, training and preparedness of responders.
166. Law enforcement to prevent illegal dumping of tires at the site.
167. Pest-control measures for mosquitoes and other nuisances around scrap tire yards.

Structural Fires

168. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
169. Public education and school programs (especially concerning the use of stoves, heaters, fireworks, matches/ lighters, etc.)
170. Landlords and families can install and maintain smoke detectors and fire extinguishers. Install a smoke alarm on each level of homes (to be tested monthly, with the batteries changed twice each year).
171. Family members and residents should know how to use a fire extinguisher.
172. Proper installation and maintenance of heating systems (especially those requiring regular cleaning, those using hand-loaded fuels such as wood, or using concentrated fuels such as liquid propane).
173. Safe and responsible use of electric and "space" heaters (placed at least 3 feet from objects, with space near hot elements free of combustibles).
174. Education and practice of safe cigarette handling and disposal (also candles, fireworks, campfires, holiday lights)

175. Proper workplace procedures, training and exercising, and handling of explosive and flammable materials and substances.
176. Pre-planned escape routes and fire alert responses.
177. Defensible space around structures in fire-prone wildland areas.
178. Proper maintenance of power lines, and efficient response to fallen power lines.
179. Transportation planning that provides roads, overpasses, etc. to maximize access and improve emergency response times, and evacuation potential, for all inhabited or developed areas of a community (not just designing for the minimum amount of road capacity to handle normal traffic volumes in the community.) This includes transportation access within developed sites (shopping malls, stadiums, office & commercial parking lots, etc.)
180. Enforced fireworks regulations.
181. Condominium-type associations for maintaining safety in attached housing/building units or multi-unit structures.

Pipeline Accidents (Petroleum and Natural Gas)

182. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
183. Increasing public awareness of pipeline locations and appropriate emergency procedures.
184. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800 482-7171).
185. Proper pipeline design, construction, maintenance and inspection.

Subsidence

186. Hydrological monitoring of groundwater levels in subsidence-prone areas.
187. Community awareness of subsidence risks and effects.

Transportation Accidents

188. Use of designated truck routes.
189. Marine safety and general boater awareness programs.
190. Commercial operator training and skill enhancement programs.
191. Airport safety.
192. Dam Safety.

APPENDIX E - PROPOSED GLADWIN COUNTY ACTION ITEMS

Item 1

Update existing sirens to meet current standards, and add warning sirens where needed to fill gaps in Gladwin County's current warning system.

Action: Update existing sirens and purchase 10 warning sirens to warn residents/visitors of Gladwin County of hazardous situations. Educate the public of the warning system and how to properly respond in case of emergencies.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Hazards Addressed: All hazards
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA), United States Department of Agriculture (USDA), and local governmental agencies
- Project Cost: TBD
- Participating Agencies: Gladwin County, Hay Township, Sage Township, Secord Township, and other local municipalities (subject to availability of funds)
- Schedule: 2016
- Priority: High
- Benefit(s): Saving of lives/reducing injuries with a better warning system and a more informed public that will accompany the installation of the system.

Item 2

Purchase back-up generators for all municipal buildings and other critical facilities.

Action: Survey is currently underway to determine the number of generators desired for the County. Purchase generators for all local municipal building and other critical facilities that can be used as back-up power during power outages. The buildings can be utilized as shelters or warming/cooling centers or utilized by emergency management.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Gladwin County, Gladwin Township, Tobacco Township, and other local municipalities (subject to availability of funds)
- Schedule: 2016
- Priority: High
- Benefit(s): The back-up generators will be able to allow local municipal buildings to utilize as emergency shelters for residents/visitors/special needs populations in need of power/heat/air conditioning.

Item 3 (NEW)

Purchase battery back-up packs for generators to ensure uninterrupted power at critical facilities throughout the County.

Action: Purchase battery back-up packs for generators to ensure uninterrupted power at critical facilities throughout the County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Gladwin County, Gladwin Township, Tobacco Township, and other local municipalities (subject to availability of funds)
- Schedule: 2016
- Priority: High
- Benefit(s): Power can be maintained at critical facilities.

Item 4

Purchase weather radios for critical facilities, thereby providing additional preparation time during times of emergency.

Action: Conduct a survey of critical care facilities/shelters/medical buildings/schools to determine who currently has weather radios and who needs radios/additional radios. After survey is complete develop a priority list for receiving radios, and purchase/distribute radios according to the priority list.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): Homeland Security, FEMA, Enbridge Inc.
- Project Cost: \$7,000
- Participating Agencies: Gladwin County
- Schedule: 2016
- Priority: High
- Benefit(s): Facilities will be able to receive weather warnings in a timely manner and will be able to address the situation in a more timely fashion.

Item 5 (NEW)

Complete a Community Wildfire Protection Plan for Gladwin County.

Action: Secure funding to complete a Community Wildfire Protection Plan for the residents/businesses of Gladwin County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Department of Natural Resources (DNR), FEMA
- Project Cost: \$35,000

- Participating Agencies: Gladwin County, Michigan DNR, Secord Township Fire Department, Beaverton Area Fire Department, Billings Township Fire Department, and Sherman Township Fire Department
- Schedule: TBD
- Priority: High
- Benefit(s): The Community Wildfire Protection Plan (CWPP) will address those areas most at risk for wildfires and will also develop mitigation measures to help reduce damages resulting from wildfires.

Item 6 (NEW)

Prepare the municipal facilities for the installation of generators.

Action: Upon receipt of the generator(s) for facilities within the County, each building must be inspected and modified to allow the installation of a generator. Included in the inspection is the determination of the type of generator (liquid and/or gas fueled) that is to be installed.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, Gladwin County, local governmental agencies
- Project Cost: \$2,000 per/unit
- Participating Agencies: Gladwin County, Gladwin Township, Tobacco Township, and other local municipalities (subject to availability of funds)
- Schedule: 2016
- Priority: High
- Benefit(s): The modifications to the buildings to allow a liquid and/or gas fueled generators would ensure that the generators could be installed without delay.

Item 7 (NEW)

Improve security measures for the County Courthouse.

Action: Purchase scanner for monitoring visitors to the court rooms. Add bailiffs for court and courthouse security.

- Location: County Courthouse, Gladwin
- Lead Agency: OEM
- Hazards Addressed: Sabotage/Terrorism, Civil Disturbance
- Potential Funding Source(s): FEMA, USDA, Gladwin County, local governmental agencies
- Project Cost: TBD
- Participating Agencies: Gladwin County
- Schedule: 2016
- Priority: High
- Benefit(s): The employees and visitors to the County Courthouse will have improved security to the building to conduct business.

Item 8 (NEW)

Encourage the inclusion of hazard mitigation into other planning documents

Action: Encourage municipal agencies to include hazard mitigation into master plans/comprehensive land use plans and other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Participating Agencies: Gladwin County, all townships as appropriate
- Hazards Addressed: all hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Schedule: 2016
- Priority: High
- Benefit(s): Hazard Mitigation is identified in the local municipal planning documents, thereby increasing community awareness of hazard mitigation and increasing the opportunity for community resiliency.

Item 9 (NEW)

Purchase portable emergency back-up generators that can be used for shelters and special needs population.

Action: Complete a survey of facilities that have generators/are targeted to obtain generators and develop a list of facilities that would benefit from the use of portable generators. The list would also prioritize the facilities in order of need/benefit.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Severe Weather Conditions, Infrastructure Failure
- Potential Funding Source(s): FEMA, USDA, local governmental agencies
- Project Cost: TBD (\$8,000/per unit)
- Participating Agencies: Gladwin County, City of Gladwin, Gladwin Township, and other local municipalities (subject to availability of funds)
- Schedule: 2017
- Priority: Medium
- Benefit(s): Facilities that are unable to secure a permanent generator would be eligible to secure the use of a temporary generator, thereby keeping the facility open.

Item 10

Purchase additional firefighting equipment for the firefighters.

Action: Complete an analysis of local firefighting equipment and seek funds to bring the necessary equipment to all departments.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural and scrap tire fires
- Potential Funding Source(s): FEMA, DNR, DEQ, USDA, Enbridge Inc., Private grants/donations
- Project Cost: TBD
- Participating Agencies: Gladwin County, City of Gladwin, Billings Township, and other local municipalities (subject to availability of funds)

- Schedule: 2017
- Priority: Medium
- Benefit(s): Fire fighters would benefit as they would have equipment adequate for today's standards. Property owners/residents of the County would benefit with the improved equipment to fight fires.

Item 11

Purchase smoke detectors for installing at every residence, business, and critical facility within the County.

Action: Conduct a survey to determine how many smoke detectors are needed for the entire County. Purchase the smoke detectors and distribute to all residences and businesses within the County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Structural fires
- Potential Funding Source(s): Red Cross
- Project Cost: TBD
- Participating Agencies: Gladwin County, Red Cross
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Smoke detectors, when installed/maintained properly can save lives and structures by alerting the occupants of the buildings of smoke/fire.

Item 12 (NEW)

Educate the public on the benefits of NIXLE and have them sign up for the service.

Action: Conduct a publicity campaign on the benefits of NIXLE and the importance for residents to sign up for the service.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Participating Agencies: Gladwin County, local newspapers, Billings Township, Secord Township, and Tobacco Township, and other local municipalities (subject to availability of funds)
- Schedule: 2016
- Priority: Medium
- Benefit(s): Users of the service will be provided with early warnings of storms and other disasters. In addition, other notification such as amber alerts will also be included in the service.

Item 13 (NEW)

Develop a program to educate the public on proper responses to all hazards, including meth labs and horse-drawn vehicles.

Action: Educate the public through Public Service Announcements (PSAs), Red Cross packets, and school programs on how to properly respond to warnings for hazards.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): Emergency Management/Homeland Security grants
- Project Cost: TBD
- Participating Agencies: Gladwin County, Red Cross
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): By educating the public on proper responses to hazard/weather warnings, the citizens will become more knowledgeable on hazards and less likely to panic in adverse situations.

Item 14 (NEW)

Upgrade a one-mile section of Wagarville Road in Sage Township to meet current road standards.

Action: Reconstruct Wagarville Road to meet MDOT road standards, which would allow emergency equipment to utilize the road.

- Location: Sage Township
- Lead Agency: Gladwin County Road Commission
- Hazards Addressed: Infrastructure failure, transportation accidents
- Potential Funding Source(s): Gladwin County Road Commission, MDOT, Sage Township
- Project Cost: \$2.3 million
- Participating Agencies: MDOT, Sage Township
- Schedule: TBD
- Priority: Medium
- Benefit(s): Bringing the road to current standards would allow emergency equipment to use the road, which would save time in emergency situations. The time saved could result in a life saved or property saved.

Item 15 (NEW)

Construct additional firefighting facilities to help reduce response times for fires within the County.

Action: Construct an additional 3-4 fire houses in Gladwin County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural and scrap tire fires
- Potential Funding Source(s): DEQ, FEMA, DNR, and USDA
- Project Cost: \$4 million
- Participating Agencies: Gladwin County, MDNR, Sherman Township, Sage Township, and other local municipalities (subject to availability of funds)
- Schedule: TBD
- Priority: Medium
- Benefit(s): Constructing additional fire houses would help reduce travel times to fight local fires where houses currently do not exist. When properly staffed, the result could be a house saved, lives saved.

Item 16**Work with the utilities to develop standards for the pruning of trees in the utilities' rights-of-way.**

Action: Consumers Energy and Tri Count Electric have ongoing tree trimming initiatives along the power line right-of-way.

- Location: County-wide
- Lead Agency: Consumers Energy
- Participating Agencies:
- Hazards Addressed: all hazards
- Potential Funding Source(s): Annual Budget
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Trimming trees along power lines, roads and streets mitigates damages that occur from summer and winter storm events. Fallen trees and limbs can obstruct passage on streets and roads impeding the passage of emergency vehicles. Fallen trees and limbs that damage power lines can leave vulnerable populations, particularly the elderly and disabled, without heat, air conditioning and electrical power for home medical devices, and leaves residents with residential wells without a source of water. Critical facilities such as urgent care clinics, pharmacies and gas stations can be shut down from a loss of electrical power.

Item 17 (NEW)**Retrofit at-risk structures with ignition-resistant materials.**

Action: Complete a two-phase study to determine which buildings are at-risk, and to determine steps to mitigate fire damage. Secure funds to complete improvements to buildings.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Wildfires, structural fires
- Potential Funding Source(s): FEMA, USDA, local governments
- Project Cost: TBD
- Participating Agencies: Secord Township, Sage Township, other governmental units, as funding becomes available.
- Schedule: 2018
- Priority: Medium
- Benefit(s): Completing improvements will reduce the damages that could result from wildfires and structural fires.

Item 17 (NEW)**Protect critical buildings and infrastructure from the impacts of severe winter weather conditions**

Action: Complete an inspection of critical buildings and infrastructure to determine what buildings/structures are in need of additional weather-proofing/protection from severe winter weather events. Seek funds to complete the improvements.

- Location: County-wide
- Lead Agency: OEM

- Hazards Addressed: Severe weather events
- Potential Funding Source(s): USDA, local communities
- Project Cost: TBD
- Participating Agencies: Gladwin County, Gladwin Township, other local municipalities, should funding become available.
- Schedule: 2018
- Priority: Medium
- Benefit(s): Weatherproofing and additional improvements to the critical buildings and infrastructure throughout Gladwin County will not only provide safer environments for the workers/visitors of the buildings, but also could enable these buildings to be utilized as shelters during extreme weather conditions.

Item 18 (NEW)

Protect Critical Facilities/Structures from Lightning Damage and other hazards

Action: Protect critical facilities/structures from lightning strike damage and other hazards with the installation of lightning rods and proper grounding and install/maintain surge protection on critical electronic equipment.

- Location: County-wide
- Lead Agency: Gladwin County OEM
- Participating Agencies: NA
- Hazards Addressed: all hazards
- Potential Funding Source(s): OEM Budget, grants
- Project Cost: TBD
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Facilities and critical equipment will be protected from effects of lightning strikes, thereby keeping the facilities operational during hazard events.

Item 19 (NEW)

Replace older, damaged culverts throughout the County as needed.

Action: Survey to be completed in spring 2016 to determine the number of damaged road culverts.

Replace damaged culverts as needed.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission
- Hazards Addressed: Flooding, infrastructure failure, transportation accidents
- Potential Funding Source(s): Grants, MDOT, DEQ, DNR, Trout Unlimited
- Project Cost: \$150,000
- Participating Agencies: Gladwin County, MDOT,
- Schedule: Ongoing
- Priority: Moderate
- Benefit(s): Bringing the culverts to meet local standards would result in having a better flow of water through the culverts during high water time, thereby reducing the potential for flooding.

Item 20 (NEW)**Work with the Department of Natural Resources and the Department of Environmental Quality on the impacts of fracking in Gladwin County.**

Action: Conduct a study to determine what impacts, if any, fracking causes in Gladwin County.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Subsidence, and earthquakes
- Potential Funding Source(s): DEQ
- Project Cost: \$100,000
- Participating Agencies: MDNR, FEMA, Private industry
- Schedule: TBD
- Priority: Moderate
- Benefit(s): The study would provide more information on fracking in Gladwin County and potential dangers that could result. Fracking in other parts of the US has resulted in earthquakes/ subsidence. It is important to know if fracking in the County could also result in earthquakes or other dangerous circumstances.