

Gladwin County Hazard Mitigation Plan

REVIEW VERSION

ACKNOWLEDGEMENTS

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ACRONYMS

| ACE | Army Corps of Engineers | | |
|--------|---|--|--|
| BCHAC | Bay County Hazard Advisory Committee | | |
| CDC | Center for Disease Control | | |
| CMAS | Commercial Mobile Alert System | | |
| CMI | Crop Moisture Index | | |
| CRS | Community Rating System | | |
| CSXT | CSX Transportation | | |
| DHS | United State Department of Homeland Security | | |
| DOI | United States Department of Interior | | |
| EAP | Emergency Action Plan | | |
| EAS | Emergency Alert System | | |
| EF | Enhanced Fujita | | |
| EGLE | Michigan Department of Environment, Great Lakes, and Energy | | |
| EMCOG | East Michigan Council of Governments | | |
| EMC | Emergency Management Coordinator | | |
| EMWIN | Emergency Managers Weather Information Network | | |
| EMS | Emergency Medical Services | | |
| EOC | Emergency Operations Center | | |
| EPZ | Emergency Planning Zone | | |
| FAA | Federal Aviation Administration | | |
| FEMA | Federal Emergency Management Agency | | |
| FERC | Federal Energy Regulatory Commission | | |
| GCAC | Gladwin County Advisory Committee | | |
| GIS | Geographic Information System | | |
| HHS | United States Department of Health and Human Services | | |
| HMEP | Hazardous Materials Emergency Preparedness | | |
| HMTUSA | Hazardous Materials Transportation Uniform Safety Act | | |
| HS | Homeland Security | | |
| HSPD | Homeland Security Presidential Directive | | |
| IPAWS | Integrated Public Alert & Warning System | | |
| IWIN | Interactive Weather Information Network | | |
| КРН | Kilometers Per Hour | | |
| LEIN | Law Enforcement Information Network | | |

| LEPC | Local Emergency Planning Committee | | |
|------------|--|--|--|
| LPT | Local Planning Team | | |
| MDA | Michigan Department of Agriculture | | |
| MDARD | Michigan Department of Agriculture & Rural Development | | |
| MDNR | Michigan Department of Natural Resources | | |
| MDOT | Michigan Department of Transportation | | |
| MIRIS | Michigan Resource Information System | | |
| MIWFPA | Michigan Interagency Wildland Fire Protection Association | | |
| MMR | Mobile Medical Response | | |
| MPH | Miles Per Hour | | |
| MPSC | Michigan Public Service Commission | | |
| MSP | Michigan State Police | | |
| MSP/EMHSD | Michigan State Police/Emergency Management Homeland Security Division | | |
| NA | Not Applicable | | |
| NCEI | National Center for Environmental Information | | |
| NFIP | National Flood Insurance Program | | |
| NFPA | National Fire Protection Association | | |
| NID | National Inventory of Dams | | |
| NIMS | National Incident Management System | | |
| NLSI | National Lightning Safety Institute | | |
| NOAA | National Oceanic and Atmospheric Administration | | |
| NRT | National Response Team | | |
| NTSB | National Transportation Safety Board | | |
| NWS | National Weather Service | | |
| OEM | Office of Emergency Management | | |
| PDD | Presidential Decision Directive | | |
| PEAS | Pollution Emergency Alerting System | | |
| RCRA | Resource Conservation and Recovery Act | | |
| RRTN | Regional Response Team Network | | |
| SARA | Superfund Amendments and Reauthorization Act | | |
| SNS | Strategic National Stockpile | | |
| TBD | To Be Determined | | |
| USDA | United States Department of Agriculture | | |
| USDOT | United State Department of Transportation | | |
| USDOT/OHMS | United States Department of Transportation, Office of Hazardous Materials Safety | | |
| USGS | United States Geological Survey | | |
| WMD | Weapons of Mass Destruction | | |

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 2020 US Census population figure of 26,386, 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 from the 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 of the County 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 by coordinating 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 more safely, 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 occur after damages are analyzed, and that more sound, 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") is the foundation for hazard mitigation activities within the community. Implementation of the Plan's recommendations will assist in reducing 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 Hazard Mitigation Advisory Committee (GCHMAC) 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 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 Items proposed.

This new Plan updates the previous Gladwin County Hazard Mitigation Plan that was approved in 2016. This process began in 2021, 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 find and review the information that is most relevant for their jurisdictions and areas of expertise/interest more quickly.

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 the 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

Municipalities

Gladwin County Municipalities



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 vulnerability reduction to hazards which result in repetitive and frequently 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 that have resulted in threats to the public health, safety, and welfare, as well as the community's social, economic and physical fabric. This Plan addresses such hazards as floods, tornadoes, windstorms, winter storms, forest fires, structural fires, hazardous material incidents and 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 for 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 | 2010 pop. | 2020 Est. pop. | Change | A participant in 2016 plan | A participant in 2023 plan | NFIP participant | NFIP map date |
|-------------------|--------------|----------------------|--------|-------------------------------------|-------------------------------------|---------------------|------------------|
| Gladwin County | 25,692 | 25,386 | -1.2% | YES | YES | NA | |
| City of Beaverton | 1,071 | 1,143 | 6.7% | YES | YES | YES | 08/02/18 |
| City of Gladwin | 2,933 | 3,085 | 5.2% | YES | YES | YES | 08/02/18 |
| Beaverton Twp | 1,964 | 1,859 | -5.3% | YES | | YES | 08/02/18 |
| Bentley Twp | 844 | 831 | -1.5% | | | NF | |
| Billings Twp | 2,413 | 2,316 | -4.0% | YES | YES | YES | 08/02/18 |
| Bourret Twp | 461 | 384 | -16.8% | YES | YES | NO | |
| Buckeye Twp | 1,308 | 1,361 | 4.1% | YES | YES | YES | 08/02/18 |
| Butman Twp | 1,999 | 2,078 | 4.0% | YES | YES | YES | 08/02/18 |
| Clement Twp | 901 | 893 | -0.9% | YES | YES | YES | 08/02/18 |
| Gladwin Twp | 1,116 | 1,120 | 0.4% | YES | YES | YES | 08/02/18 |
| Grim Twp | 136 | 124 | -8.9% | | | NF | |
| Grout Twp | 1,964 | 1,975 | 0.6% | YES | | NO | |
| Нау Тwp | 1,362 | 1,276 | -6.3% | YES | YES | YES | 08/02/18 |
| Sage Twp | 2,457 | 2,439 | -0.7% | YES | YES | YES | 08/02/18 |
| Secord Twp | 1,151 | 1,042 | -9.5% | YES | YES | YES | 08/02/18 |
| Sherman Twp | 1,043 | 1,004 | -3.9% | YES | YES | YES | 08/02/18 |
| Tobacco Twp | 2,566 | 2,456 | -4.3% | YES | YES | YES | 08/02/18 |

Source: U.S. Census

NFIP Participants

YES-Participant-agency has chosen to participate in the NFIP-residents within the municipality can purchase flood insurance at a lower rate.

NO-Non-participant-agency has chosen not to participate in the NFIP-residents within the municipality cannot purchase flood insurance at a lower rate.

NSFHA-Non-Special Flood Hazard Area-a low to moderate risk flood zone, flood insurance is available at a lower rate NF-No Flood zone is within the municipality, flood insurance is available

CHAPTER 2: THE PLANNING PROCESS

In 2021, the Gladwin County Emergency Management staff began the update process by hosting a meeting, both virtually and personally, at the Gladwin County Building with the East Michigan Council of Governments (EMCOG) staff. The purpose of the meeting was to advise the public and Gladwin County representatives of the need to update the 2016 Gladwin County Hazard Mitigation Plan (Plan) and the process that would be utilized.

This update was made possible after EMCOG on behalf of Gladwin County, was awarded a grant from the Federal Emergency Management Agency (FEMA) through the Michigan State Police to update their hazard mitigation plan. EMCOG staff worked with the Gladwin County Emergency Management Director (EMD), Robert (Bob) North 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, the 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. 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/agency participation, a questionnaire was completed by the municipalities/agencies on hazard impacts. A copy of the questionnaire is included in Appendix C, which also includes a summary of the responses. In addition, a compatibility assessment was also completed by the participating municipalities/agencies. A copy of the assessment and the responses is included in Appendix D. It should be noted that due to the limited personnel employed by the local municipalities (in numerous cases, there are no full-time staff) that the capabilities to address hazards is limited. One means to increase their capabilities is the awarding of grants, including a grant for a grant writer, which could include personnel to assist in the supervision of activities to mitigate hazard impacts.

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. Table 2.1 identifies the meeting dates, locations, and subject matter for the GCAC meetings. Immediately following Table 2.1 is Table 2.2, which identifies the criteria used to determine hazard impact (risk). At the end of this chapter are two tables identifying the agencies represented at the meetings (Table 2.3) and the individuals at each meeting (Table 2.4). 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) |
|-----------------|---|--|
| 12-7-2021 | Gladwin County Board Room/Virtual Capability | Attendees were located both at the County Board Room, as well as attended virtually. EMCOG staff was represented by Bill Ernat, Program Manager. Gladwin County Emergency Management Director (EMD), Robert, (Bob) North will be representing Gladwin County throughout the process. He explained that the purpose of this meeting was to inform the public on the update process and encouraged all local municipalities to participate in the update process. After the update process, questions were allowed, topics included length of update process (response was 18-24 months), how projects in the Plan are selected (by the participating agencies at the monthly meetings), why the update is necessary (to meet FEMA requirements), and when the meetings would be held (to be determined). |
| 1-13-2022 | Gladwin County Board Room/Virtual Capability | This was the first meeting of the Gladwin County Advisory Committee (GCAC). EMCOG staff explained the update process, stressed the need to have local municipalities to participate in the update process, either through attending the meetings or by responding to the municipal survey (and later the capability assessment). The GCAC then went through the list of potential hazards, as included in the 2019 State of Michigan Hazard Mitigation Plan, and identified those hazards that do or could impact Gladwin County. |
| 2-10-2022 | Gladwin County Board Room/Virtual Capability | EMCOG staff again stressed the need for participation from all local municipalities, as only those participating agencies will be eligible for mitigation projects through FEMA. He then said that he and the EMD had used data/reports from 1995 through 2021 to determine the impact of the hazards. That criteria is found in Table 2.2. The GCAC reviewed the impact recommendations and made changes to several hazards. Four hazards were modified from low to high impact based on recent events and projected impacts. The four hazards were severe winds, energy emergencies, invasive species, and cyberterrorism. |
| 3-10-2022 | Gladwin County Board Room | Municipality representatives were given the results of the hazard impacts on a county-wide basis and were asked to provide the impacts to their municipality. The municipality representatives were given the municipal survey to complete. There was also a short discussion on the |

| | | residential survey that would be available to all residents of |
|-----------|------------------------------|--|
| | | Gladwin County. |
| 4-14-2022 | Gladwin County Board Room | The GCAC began the meeting by discussing the residential survey. Several changes were recommended. The surveys would be paper only, due to problems accessing the internet. Surveys would be distributed by EMD North and were to be returned by May 5 th . In reviewing the information on the returned municipal surveys, EMCOG staff decided that the municipal representatives present would redo the survey at the meeting and if any question arose, they could ask for clarification. The surveys were then submitted. |
| 5-12-2022 | Gladwin County Board Room | The municipal survey responses were tabulated, and the hazard impacts were reevaluated based on the overall responses from the municipalities and the county-wide impact. Based on the responses, the hazards were identified as high, medium, low, and no impact hazards. The GCAC also discussed the responses to the questions from the survey. |
| 6-08-2022 | Gladwin County Board Room | The GCAC members who had not completed a residential survey were asked to do so. The GCAC began a discussion on the goals and objectives. They reviewed the goals and objectives from the 2016 Gladwin County Hazard Mitigation Plan. They modified two of the objectives and eliminated for objectives from the 2016 Plan. A discussion then ensued on the status of the projects from the 2016 Plan. Information on the status and outcome were sought. Most of the projects were completed. |
| 7-14-2022 | Gladwin County Board Room | EMCOG staff provided the results of the residential survey and provided some highlights on the responses. The GCAC was given the modified goals/objectives to review and approve, which was don. They were also provided the action list results, which they reviewed and approved. Several items were still missing information, but the responsible parties have not been in attendance. The GCAC began to review the alternative mitigation strategies, as identified in the 2019 State of Michigan Hazard Mitigation Plan. They began identifying those strategies that could be appropriate for Gladwin County. The list was not finished as it would be finished at the next meeting. |
| 8-11-2022 | Gladwin County Board Room | The GCAC finished the identification of alternative mitigation strategies. They were reminded that day-to-day activities would not be included as possible strategies. The GCAC was then asked to identify significant hazard events and significant developments that occurred since 2016. |
| 9-08-2022 | Gladwin County Board Room | The GCAC was provided the alternative mitigation strategies as revised with the day-to-day items being |

| | | removed. There were no other changes. A discussion was then held on climate change and its impacts. It was mentioned that ice storms were more prevalent and snowstorms less frequent. Many of the attendees stated that they did not agree that climate change is an issue. The GCAC was provided a list of FEMA-approved projects from other recently approved FEMA Hazard Mitigation Plans for them to look at and consider for the October meeting. EMCOG staff stressed that mitigation projects were being stressed for Plan updates. |
|------------|------------------------------|--|
| 10-13-2022 | Gladwin County Board Room | GCAC members reviewed the list of the projects that were identified in the 2016 Plan and selected those that were still considered to be relevant. They then identified projects from the FEMA-approved project list as provided in September. |
| 11-10-2022 | Gladwin County Board Room | The GCAC discussed the suggested list of projects and had no changes. A suggested addition to the list was offered and accepted by the GCAC. |
| 1-12-2023 | Gladwin County Board Room | The GCAC was given the list of projects with information on project specifics provided by the EMD and EMCOG staff. The GCAC was asked to complete the missing information on the projects for the action taken, project location, lead agency, funding source, goal and objective achieved, and project benefit. The first 20 projects were completed. |
| 2-09-2023 | Gladwin County Board Room | The list of remaining projects were reviewed, and information was provided. Several projects were not completed as they were site specific, and the person suggesting the project was not in attendance. EMCOG staff was then advised that a HUD grant had been applied for by the State of Michigan for the communities that were included in the flood 2020 disaster. |
| 3-09-2023 | Gladwin County Board Room | Missing information was provided for those projects that were not completed in the previous meetings. Several action items were deleted based on their scope of work. The GCAC was then provided the list of hazards and the projects that addressed the hazards to insure that the high impact hazards are being properly addressed. As a result to this review, two hazards, horse-drawn vehicles and seasonal population change were changed from medium impact hazards to low impact hazards. A discussion on the mapping of the floodplain in Gladwin County was discussed as the floodplains will have to be reevaluated due to the 2020 flood. |
| 4-13-2023 | Gladwin County Board Room | EMCOG staff advised the attendees of the new FEMA regulations that go into effect on 4-19-23. One of the new requirements for the Plan will be the inclusion of a capability assessment for all participating agencies seeking |

| | | to apply for FEMA funding. The assessment was distributed |
|-----------|------------------------------|---|
| | | as part of the packet and the attendees were asked to |
| | | complete the assessment for their agency. Staff was also |
| | | provided a draft of the HHPD section as provided by a Four |
| | | Lakes Task Force representative. An electronic version will |
| | | Lakes Task Force representative. An electronic version will |
| | | be provided once the section is complete. |
| | | EMCOG staff advised the attendees that the results of the |
| | | capacity assessment was sent to FEMA staff for review and |
| | | to see if the information was sufficient to meet the new |
| | | regulations. |
| | | The advisory committee members were advised that |
| | Gladwin County Board | EMCOG staff and Bob North discussed the hazard project |
| 5-11-2023 | Boom | prioritization criteria and identified hazard mitigation |
| | Koom | projects as high priority projects. The secondary criteria |
| | | was overall benefit to the community. The members |
| | | agreed with the criteria and then prioritized the projects |
| | | based on the recommendation. The attendees then |
| | | worked on the information found in the project list bullet |
| | | points. |
| | | EMCOG staff asked for volunteers to proof completed |
| | | sections of the Plan to confirm that the information is |
| | | correct. This time would also be used as part of the |
| | | County's required match to the grant. The next item that |
| 7 12 2022 | Gladwin County Board Room | was discussed was the High Hazard Potential Dam insert to |
| 7-13-2025 | | the Dian. The incert was cont to ECLE stoff for review. A |
| | | the Plan. The insert was sent to EGLE stail for review. A |
| | | response is pending. The committee members identified |
| | | projects in which they would potentially participate in |
| | | should the funding become available. |
| | Gladwin County Board | EMCOG staff asked for volunteers to proof sections as |
| | | they are completed. Proofing accomplishes two things, |
| | | the Plan information is verified, and the time spent can be |
| | | used as part of the match. The representatives did not |
| | | provide any new information for the capacity assessment. |
| 9-13-2023 | | The project information was reviewed and additional |
| | KUUIII | information on projects was provided. The information on |
| | | several projects could not be provided as the agency |
| | | representative that requested the project was not in |
| | | attendance. EMCOG staff suggested that he contact the |
| | | representatives directly. Meeting was adjourned. |
| | | The municipal representatives were asked if there were |
| 10-12-23 | | changes to the capacity assessment summation report. |
| | | There were no changes. The attendees continued |
| | Gladwin County | providing the information on projects that was previously |
| | Courthouse/Law Library | started Missing information will be sought by Rill Frnat |
| | | and Boh North A discussion ensued on the High Hazard |
| | | Potential Dam section Bill said it would be an annendiv as |
| | | the end of the Dian. The annual review process was |
| | | The end of the Plan. The annual review process was |

| | | approved. Attendees volunteering to proof were asked if |
|---------|--|--|
| | | they could proof several sections of the Plan. |
| 1-11-24 | Gladwin County Board Room | Bill Ernat provided a status of the Plan and an overview of the approval process for the Plan. He then stated that municipalities must complete the municipal survey, capacity assessment, and municipal project participation in order to be considered a participating agency to the Plan. The Project list was again reviewed, and missing information was added. Projects that had missing vital information were eliminated from the Plan. The attendees were then advised that the High Hazard Potential Dam (HHPD) section would be included in the Plan as an appendix. Bill asked for proofed materials from the volunteers. There were no questions, the meeting was adjourned. |
| 2-8-24 | Gladwin County Courthouse/Law Library | Bill provided a review of the status of the Plan and the approval process and welcomed the new representatives attending for the first time. He reminded the attendees that if they had not submitted the municipal survey, capacity assessment, or the project list that they need to do so by March 1 st in order to be considered a participating agency. These representatives stated that they would be submitted the information after speaking to staff members. Some project information was modified/corrected. Bill reminded proofers to submit their reviews and stated additional chapters would be available to proof. There were no questions, the meeting was adjourned. |
| 3-14-24 | Gladwin County Board Room | |

Gladwin County Hazard Impact (Risk) Criteria TABLE 2.2

| Hazard Impact (Risk) | Data from events between 1995 and 2021. |
|-------------------------|---|
| High Impact | Reports of human death and/or property damages from any one event in excess of |
| | \$1,000,000 |
| Medium | Reports of major human injuries and/or property damages from any one event |
| Impact | between \$500,000 and \$1,000,000 (major injuries are identified as injuries |
| | requiring hospital stays) |
| Low Impact | Reports of minor human injuries and/or property damages from any one event less |
| | than \$500,000 (minor injuries are identified as injuries not requiring hospital stays) |
| No Impact | No reports of human injuries or property damages resulting from an event |

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
- Reviewed and updated Chapter 2: Planning Process. Reviewed and updated information on the physical characteristics of Gladwin County.
- Reviewed and updated Chapter 3: Community Profile. Reviewed, updated, and modified the social and demographic data and the municipal information for Gladwin County.
- Reviewed and updated Chapter 4: Hazard Analysis. Reviewed and updated the hazard information, which include the ranking of the hazards, hazard impact, and hazard overview.
- Reviewed and updated Chapter 5: Analysis of Alternative Actions. This chapter identified the strategies and projects identified in the 2007 Plan and provided an update on those projects. This chapter was updated to provide an update on the projects identified in the 2016 Plan.
- Reviewed and updated Chapter 6: Action Plan. Reviewed the goals and objectives and updated accordingly, and evaluated the projects that were either ongoing or not yet complete to determine if they should remain in the Plan. Lastly selected new projects to address in the Plan. Project information for all the projects was completed. High priority projects were included in this chapter, with all projects included in Appendix G.
- Reviewed and updated Chapter 7: Follow-up. Reviewed and updated the follow-up process for the annual review of the Plan.
- All of the appendices of the 2010 Plan were replaced with information from the current planning process.

This update process included the review of the 2016 Gladwin County Master Plan, the 2019 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 Hazard Mitigation Agency Attendance TABLE 2.3

| Participating Agency or | | | | | | | | | | | Meetin | ng Atter | nded | | | | | | | | | | |
|--|-------------|-------------|------|------|------|------|-----|------|------|-----|--------|----------|-------------|-----|-----|------|------|------|------|-------|-------------|-----|------|
| Jurisdiction | 12-7- 21 | 1-13- 22 | 2-10 | 3-10 | 4-14 | 5-12 | 6-9 | 7-14 | 8-11 | 9-8 | 10-13 | 11-10 | 1-12- 23 | 2-9 | 3-9 | 4-13 | 5-11 | 7-13 | 9-14 | 10-12 | 1-11- 24 | 2-8 | 3-14 |
| East Michigan Council of Governments | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | х | Х |
| Gladwin County | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х |
| City of Beaverton | | | Х | | Х | Х | Х | | | Х | Х | | Х | Х | | Х | | | | | | Х | Х |
| City of Gladwin | Х | Х | Х | Х | Х | Х | Х | | Х | Х | Х | Х | | | | | | | | | | Х | Х |
| Beaverton Township | Х | | | | | | | | | | | | | | | | | | | | | | |
| Billings Township | | | | Х | Х | | Х | | | Х | Х | Х | Х | | Х | Х | | | | Х | Х | | Х |
| Bourret Township | | | Х | | Х | Х | | | | | | | | | | | | | | | | | |
| Buckeye Township | | | Х | Х | Х | Х | Х | | | | | Х | Х | | Х | | | Х | | | | | Х |
| Butman Township | Х | Х | Х | Х | Х | | Х | | | Х | Х | Х | Х | Х | Х | | Х | Х | Х | Х | | | |
| Clement Township | | | Х | Х | | | | | | | | | | | | | | | | | | | |
| Gladwin Township | | | | | Х | Х | Х | | Х | Х | | Х | Х | | | Х | | Х | | | | | |
| Grim Township | | | | | | | | | | | | | | | | Х | | | | | | | |
| Hay Township | | Х | Х | Х | Х | | Х | | Х | Х | Х | Х | Х | Х | Х | | Х | Х | Х | Х | Х | Х | |
| Sage Township | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | | Х | Х | Х | | Х | Х | Х | Х | Х | | Х |
| Secord Township | Х | Х | Х | Х | Х | | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | | | Х | Х | Х | Х |
| Sherman Township | | | Х | | Х | Х | Х | Х | Х | Х | | Х | Х | | Х | Х | Х | Х | | Х | Х | Х | Х |
| Tobacco Township | | | | Х | Х | Х | | Х | | | | | | | | | | | | | | | Х |
| Four Lakes Task Force | Х | | Х | Х | | | | | Х | | Х | Х | Х | Х | Х | Х | | Х | Х | | | | Х |
| Central Michigan District Health Department | | | х | | | | | | | | | | | | | | | | | | | | |
| Gladwin County Drain Commission | | | | | | | | | | | | | | | | х | | | | | | | |
| Gladwin County Road Commission | х | | | | | | | | | х | | | | | | | | | | | | | Х |
| Gladwin Fire Dept. | Х | Х | | | | | | | | | | | | | | | | | | | | | Х |
| Gladwin Police Dept. | | | | | | | | | | | | | | | | | | | | | | | |
| Michigan State Police | Х | | Х | | | | | | | | | | Х | | Х | | | | | | | | |

| | | | | | | | | | | | Meetir | ng Attei | nded | | | | | | | | | | |
|---|-------------|-------------|------|------|------|------|-----|------|------|-----|--------|-----------|-------------|-----|-----|------|------|------|------|-------|-------------|-----|------|
| Participating Agency or Jurisdiction | 12- 7-21 | 1-13- 22 | 2-10 | 3-10 | 4-14 | 5-12 | 6-9 | 7-14 | 8-11 | 9-8 | 10-13 | 11- 10 | 1-12- 23 | 2-9 | 3-9 | 4-13 | 5-11 | 7-13 | 9-14 | 10-12 | 1-11- 24 | 2-8 | 3-14 |
| MSU-Extension | | | Х | | | | | | | | | | | | | | | | | | | | |
| Riverwalk Place | | Х | | | | | | | | | | | | | | | | | | | | | |

AGENCY SURVEY/ASSESSMENT RESPONSE/PROJECT IDENTIFICATION TABLE 2.4

| | | | | | | Pa | rticipatir | ng Ageno | cies | | | | | |
|------------------------|---|---|---|---|---|----|------------|----------|------|---|---|---|---|---|
| | а | b | с | d | е | f | g | h | i | j | k | I | m | n |
| Municipal Survey | | Х | Х | | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х |
| Capacity Assessment | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х |
| Project Identification | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х | Х |

a-Gladwin County; b-City of Beaverton; c-City of Gladwin; d-Beaverton Township; e-Billings Township; f-Buckeye Township; g-Butman Township; h-Gladwin Township; i-Hay Township; j-Sage Township; k-Secord Township; l-Sherman Township; m-Tobacco Township; n-Four Lakes Task Force

Gladwin County Advisory Committee Meeting Attendance Table-Individuals TABLE 2.5

| | | Number of |
|-----------------|---|-----------|
| Person | Agency | Meetings |
| | | Attended |
| George Alward | City of Gladwin Fire Chief | 3 |
| Phil Andrist | Beaverton Township Fire Chief | 1 |
| Chuck Barker | MSP Lieutenant | 5 |
| Craig Bergman | Tobacco Township Supervisor | 3 |
| Melissa Blaine | | 1 |
| Nancy Bodnar | City of Gladwin Trustee | 11 |
| Sharon Campbell | City of Beaverton Community Development Coordinator | 5 |
| Kim Davis | Clement Township Trustee | 2 |
| Melissa DeRoche | Mid-Michigan Health Department District 2 | 1 |
| Bill Ernat | EMCOG | 23 |
| Brad Federchuck | Four Lakes Task Force | 1 |
| Dan Gonzalez | Butman Township Supervisor | 16 |
| Rick Grove | Gladwin County Board Member | 1 |
| Kathie Hart | | 1 |
| Chris Haupt | Gladwin County-Spongy Moth Suppression Coordinator | 1 |
| Kimberly Hines | Beaverton City Manager | 1 |
| Karrie Hulme | Gladwin County Clerk | 4 |
| Dee Jungman | City of Gladwin Mayor | 3 |
| Jean Jurgenson | Sherman Township Treasurer | 1 |
| John Jurgensen | Sherman Township Supervisor | 16 |
| Mark Justin | Gladwin County Administrator | 13 |
| Janelle Kern | Beaverton City Clerk | 3 |
| Tony Marshall | Bourret Township Supervisor | 3 |
| Diana Mella | Gladwin Township Resident | 1 |
| John Mella | Gladwin Township Trustee | 9 |
| Timothy Mester | Billings Township Supervisor | 13 |
| Rylie Miller | Gladwin County Road Commissioner | 1 |
| Karen Moore | Gladwin County Board Chairman | 3 |
| Mark Mudge | Hay Township Supervisor | 18 |
| Robert North | Emergency Management Director | 23 |
| William Oard | Tobacco Township Trustee | 3 |
| Tami O'Donnell | Gladwin County Board Member | 1 |
| Dave Pettersch | Gladwin County Road Commission Manager | 2 |
| Alan Piaskowski | Grim Township Supervisor | 1 |
| Stacy Plude | Riverwalk Place Manager | 1 |
| Julie Reed | | 2 |
| Dave Rothman | Four Lakes Task Force Board Manager | 6 |
| Mark Schafer | Secord Township Deputy Township Supervisor | 1 |
| Chris Shannon | Gladwin City Manager | 3 |

| | | Number of |
|------------------|--|-----------|
| Person | Agency | Meetings |
| | | Attended |
| Shannon Sirpilla | Beaverton City Manager | 2 |
| Mike Stumpfig | Sage Township Zoning Administrator | 20 |
| Kable Thurlow | MSU-Extension-Livestock Staff Person | 1 |
| George Uhl | Four Lakes Task force Operation Supervisor | 13 |
| Kevin Van Tiem | Buckeye Township Supervisor | 10 |
| Joel Vernier | Secord Township Supervisor | 20 |
| Terry Walters | Gladwin County Drain Commissioner | 1 |
| Kay Whalen | Sherman Township Clerk | 1 |

CHAPTER 3: COMMUNITY PROFILE



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, and Ogemaw and Roscommon to the north.

Gladwin County is composed of 516 square miles or approximately 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 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 concentrations of population found in several townships primarily along the rivers, their 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 2020 population of 3,085. Its sister city, Beaverton, eight miles south had a population of 1,143. Both are incorporated cities and

governed by a Mayor and City Council. In 2020 the overall county population was 25,386 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 Municipal Government Map MAP 3.1

Gladwin County Municipalities



| | 2010 Population | 2020 Estimated | % Change in Population |
|-----------------|--------------------|-------------------|---------------------------|
| | ropulation | Population | ropulation |
| Gladwin County | 25,692 | 25,386 | -1.2% |
| City of | 1 071 | 1 143 | 6.7% |
| Beaverton | 1,071 | 1,110 | 0.776 |
| City of Gladwin | 2,933 | 3,085 | 5.2% |
| Beaverton Twp | 1,964 | 1,859 | -5.3% |
| Bentley Twp | 844 | 831 | -1.5% |
| Billings Twp | 2,413 | 2,316 | -4.0% |
| Bourret Twp | 461 | 384 | -16.8% |
| Buckeye Twp | 1,308 | 1,361 | 4.1% |
| Butman Twp | 1,999 | 2,078 | 4.0% |
| Clement Twp | 901 | 893 | -0.9% |
| Gladwin Twp | 1,116 | 1,120 | 0.4% |
| Grim Twp | 136 | 124 | -8.9% |
| Grout Twp | 1,964 | 1,975 | 0.6% |
| Нау Тwp | 1,362 | 1,276 | -6.3% |
| Sage Twp | 2,457 | 2,439 | -0.7% |
| Secord Twp | 1,151 | 1,042 | -9.5% |
| Sherman Twp | 1,043 | 1,004 | -3.9% |
| Tobacco Twp | 2,566 | 2,456 | -4.3% |

Gladwin County Population by Municipality TABLE 3.1

Source:

Gladwin County Top Employers TABLE 3.2

| Company Name | Location | # of |
|------------------------------------|----------------|-----------|
| | | Employees |
| MyMichigan Health (Gladwin County) | Gladwin County | 308 |
| Saint Gobain | Beaverton | 305 |
| Gladwin Community Schools | Gladwin | 184 |
| Brown Machine Group | Beaverton | 160 |
| Master Electric | Gladwin | 137 |
| East Jordan Plastics | Beaverton | 126 |
| Gladwin Pines | Gladwin | 112 |
| Loose Plastics | Gladwin | 104 |
| Beaverton Schools | Beaverton | 102 |
| Gladwin County | Gladwin | 76 |

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 existing land use map is found on page 21.

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.

| 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 |

Gladwin County Open Space TABLE 3.3

Source: Michigan Information Resource System (MIRIS)

The majority of development in Gladwin County is in the cities 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 Land Use Map MAP 3.2



Gladwin County Future Land Use Map MAP 3.3



Gladwin County Future Land Use Map

| Leg | end |
|-----|----------------------------|
| _ | - Roads |
| _ | - Rivers/Drains |
| - | - Date Hybersy |
| | Sector Line |
| 57 | City Linits |
| | Residential-Farming Zoning |
| | Industrial Zenting |
| | Dwelling-1 Zoning |
| | Business-1 Zoning |
| | Business-2 Zoning |





Gladwin County Federal and State-Owned Lands Map MAP 3.4

TOPOGRAPHY

Gladwin County's topography will indicate a total relief of about 555 feet with the lower points being at the southeast corner with an elevation of 685 ft. Elevations increased moving in towards the northwestern corner of the county with an area of steeper slopes and an elevation of 1,240 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 Topography

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 gravely 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**
- 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
- Nester-Kawkawlin-Sims Nearly level to rolling, well drained to very poorly drained soils that have loamy subsoil. 14% of the County
- Graycalm-Montcalm 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 Map MAP 3.6


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) percent 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 MAP 3.7



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 forests 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 Existing Forest Type Map MAP 3.8

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 eight (8) active warning sirens; one in Billings Township, one in Butman Township, one in Secord Township, one in Sage Township, one in Hay township, on in the City of Beaverton, and two in the City of Gladwin.

Participating Municipality's Resources

Below is a listing of the participating municipalities' resources available to utilize in their mitigation efforts. These resources are different for each municipality and are based on their individual circumstances. Communities that have the resource or the capacity within their community have identified that resource with a Y. Those communities that do not have that resource or capacity within their community but have access to the resource through another agency have identified that resource with an asterisk (*).

CAPABILITIES

Few if any of the municipalities have any part-time, let alone fulltime staff to improve the current capacity of the municipalities. With limited staff available to improve the capacity of each municipality, a project has been included to the project list to seek a grant writer. Included in the grant writer responsibilities would be to seek out grants for assets/resources to improve the capabilities of the municipalities. These assets could include staff and/or funds for studies/plans/ordinances.

| Municipality . | | Resources Available | | | | | | | | | | | | |
|-----------------------|---|---------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| | Α | В | С | D | E | F | G | Н | I | J | K | L | м | Ν |
| Gladwin County | * | * | Y | | | Y | Y | Y | Y | | Y | | | * |
| City of Beaverton | Y | Y | Υ | Υ | Υ | * | Υ | | * | Υ | Y | | Υ | Υ |
| City of Gladwin | Y | Y | Υ | Υ | Υ | * | Y | | * | Υ | Y | | Υ | Y |
| Beaverton Township | | | | | | | | | | | | | | |
| Billings Township | Y | | Υ | Υ | | * | * | | * | Υ | Y | | Y | * |
| Buckeye Township | | | | | | | | | | | Y | | | |
| Butman Township | * | Y | Υ | * | | * | * | | * | * | Y | | Y | Y |
| Clement Township | Y | * | Υ | * | | * | * | | * | Υ | Y | * | Y | * |
| Gladwin Township | Y | * | Y | * | | * | * | | * | Υ | Y | | * | * |
| Hay Township | * | * | Y | * | | * | * | | * | * | Y | | Y | * |
| Sage Township | Y | * | Y | * | | * | * | | * | Υ | Y | | * | * |
| Secord Township | * | * | Y | Υ | | * | * | | * | Υ | Y | | Y | * |
| Sherman Township | | | Υ | | | | | | | | Y | | | |
| Tobacco Township | | | Υ | Υ | | | | | | | | | Y | |
| Four Lakes Task Force | | * | * | * | | * | * | | * | * | * | | * | * |

Gladwin County Participating Municipality's Resources TABLE 3.5

- A-Planning staff
- B-Public Works Department
- C-Taxing Authority/Annual Budget
- D-Building Codes
- E- Local Police Department
- F- County Sheriff
- G- Hospital/Medical Facilities Ordinance
- H- Emergency Management Staff
- I-County Emergency Staff

- J-Land Use Regulatory Capability (Zoning
 - Ordinance/Comprehensive Land Use Plan)
- K-.Ordinance Authority
- L- Full-time Fire Department w/Equip.
- M- Parttime/Volunteer Fire Department w/Equip N-Emergency Medical Services

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 Office

501West Cedar Gladwin, MI 48624 989-426-9284 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 City Police Department 109 S. Park Gladwin, MI 48624 989-426-7879 Beaverton Police Department 126 W. Brown Street Beaverton, MI 48612 989-435-9111

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.

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

Billings/Bentley Township Fire Department 1050 Estey. Rd. Beaverton, MI 48612 989-435-8430

Butman Township Fire Department 5005. N. Hockaday Rd. Gladwin, M I 48624 989-426-4351

Gladwin Rural Urban Fire Department 2001 Wagerville Road Gladwin, MI 48624 989-426-0588

DNR Wildfire Station 801 N. Silverleaf Street Gladwin. MI 48624 City of Gladwin 555 West Cedar Gladwin, MI 48624 989-426-6943

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

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

Secord Township Fire Department 2471 lakeshore Drive Gladwin, MI 48624 989-426-7445 989-426-9205

Department of Public Works (DPW)

City of Gladwin 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

128 Saginaw Street Beaverton, MI 48612 989-435-3511 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.

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

There are contracted services for waste disposal. The Town, 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.

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

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.

Health Care

Central Michigan District HealthCommunity Mental Health for Central Michigan 103 N. Bowery Ave. 343 W. Cedar Ave. Gladwin, MI 48624 Gladwin, MI 48624 989-426-9431 989-426-9295 Medical Examiner MyMichigan Gladwin

515 Quarter St. Gladwin, MI 48624 989-426-9286 25 Beds

401 W. Cedar Ave. Gladwin, MI 48624 MyMichgan Urgent Care Gladwin 1105 E. Cedar Avenue Gladwin, MI 48426 989-426-9430

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

Gladwin County Recreational Area (Old Sportsman's Club) 1365 N. Shaw Rd. Gladwin, MI 48624 Davita Gladwin Dialysis 673Quarter Street Gladwin MI 48426 989-426-0128

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

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

Ross Lake Park M-18 Beaverton, MI 48612

GOVERNMENT FACILITIES

Government facilities 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

Gladwin County Drain Commissioner

444 West Cedar
Gladwin, MI 48624
989-426-7561
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.

Michigan State University Extension – Gladwin Office

555 West Cedar, Ste. A,
County Library Building
Gladwin, MI 48624
989-426-7741
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 Street Gladwin 48624 989-426-8571 The Gladwin County EDC provides business information and business support in Gladwin County Michigan.

Gladwin County Planning Commission

401West Cedar Gladwin, MI 48624 989-426-4821 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.

Cities

City of Beaverton 128 Saginaw Street Beaverton, MI 48612 989-435-3511 Townships **Beaverton Township** Corner of Dale and Townhall Roads 989-435-3602 **Billings Township** 1050 Estey Rd. Beaverton, MI 48612 989-435-8430 **Buckeye Township** 1498 S. Hockaday Rd. Gladwin, MI 48624 989-426-7782 Clement Township 1497 East M-30, Alger, MI 48610 989-345-3915

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

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

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

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

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

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

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

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

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

Tobacco Township 1826 Dale Road Beaverton, MI 48612 989-435-3921 Sage Township 1831 North Pratt Lake Road Gladwin, MI 48624 989-246-3112

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

AMBULANCE

There is one ambulance service covering Gladwin County. That service is operated by the MyMichigan and operates out of MyMichigan Hospital Gladwin and is support by a county-wide millage.

MyMichigan Meidal Center Gladwin 515 Quarter St. Gladwin, MI 48624 989-426-9286 989-426-9305 (Ambulance Service)

HEALTH CARE

Gladwin County has one critical access hospital, MyMichigan Medical Center Gladwin a 25 licensed bed critical access hospital . A critical access hospital is a designation given to eligible rural hospitals by the Centers for Medicare and Medicaid Services . The hospital provides a range of services that include hospital care, and outpatient services, which include, but are not limited to: mammography, diagnostic imaging, and nuclear medicine. 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

Community Mental Health for Central Michigan 655 East Cedar Avenue Gladwin, MI 48624 989-426-9295

Central Michigan District Health

255 West Main Harrison, MI 48625 989-539-6731 Central Michigan District Health 103 N. Bowery Ave. Gladwin, MI 48624 989-426-9431 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.

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 three (3) private schools in Gladwin County; Christian Word Center, and the Skeels Northern Christian School. 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 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 Community Schools 401 N. Bowery, 2nd floor Gladwin, MI 48624 989-426-9255

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

Creative Learning Academy 540 Lang Road Beaverton, MI 48612 989-435*-8252 Gladwin Intermediate School 780 West 1st Street Gladwin, MI 48624-1009 989-426-4531

Beaverton Junior-Senior High School 3090 Crockett Road Beaverton, MI 48612 989-246-3010

Beaverton Elementary 440 South Ross Street Beaverton, MI 48612 989-246-3020

Clare-Gladwin RESD 4041 E. Mannsiding Road Clare, MI 48617 989-386-3851

Gladwin County School Enrollments

| TABLE 3.6 | | | | |
|--|------------|--------|--|--|
| 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 South State Street Gladwin, MI 48624 989-426-7441

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 Transit Corporation (GCTC)

615 Weaver Street Gladwin, MI 48624 989-426-6514

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. In addition, it has an agreement with Clare County to transport riders to and from Gladwin County to Mid-Michigan Community College in

Harrison. They may have resources useful for the transportation or evacuation of residents during emergency situations.

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.

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 Transportation Network Map MAP 3.10

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.

Region 3 Homeland Security Governing Board

The United States Department of Homeland Security (DHS) has identified a number of national priorities to strengthen the preparedness of the United States to prevent and respond to threatened or actual domestic terrorist attacks, major disasters, and other emergencies, including expanded regional collaboration. Major events have a regional impact, therefore the benefit of regionalism will be most evident at the community level, when a community, as a whole, can prepare for and provide an integrated response to an incident.

The State of Michigan has been divided into eight Homeland Security Regions. Alcona County, having a recognized PA 390 program is the most northern permanent member of the Region 3 Homeland Security Planning Board. City of Midland is currently the designated fiduciary and is responsible for management and administration of the Region 3 Homeland Security Grant Program funds. The Region 3 Homeland Security Planning Board consists of voting representation from the following counties: Alcona, Arenac, Bay, Genesee, Gladwin, Huron, Iosco, Lapeer, Midland, Ogemaw, Oscoda, Saginaw, Sanilac, and Tuscola.

The Region 3 Board works to achieve the following goals with funds from the Department of Homeland Security through the State Homeland Security Program and the Law Enforcement Terrorism Prevention Program.

- Goal 1: Improve response readiness within Region
- Goal 2: Develop Region-Wide Interoperable Communications
- Goal 3: Improve Critical Infrastructure and Key Resources
- Goal 4: Communities within Region 3 will build intraregional public and private partnerships to be capable of being self-sufficient for a minimum of 72 hours after the onset of All Threats and Hazards.
- Goal 5: Develop a Regional Homeland Security Strategy (RHSS)
- Goal 6: Enhance intelligence and information sharing among public and private stakeholders.

Homeland Security Presidential Directive/ HSPD-8 Subject: National Preparedness Purpose

This directive establishes policies to strengthen the preparedness of the United States to prevent and respond to threatened or actual domestic terrorist attacks, major disasters, and other emergencies by requiring a national domestic all-hazards preparedness goal, establishing mechanisms for improved preparedness. The National Preparedness Guidelines are contained within four documents that correlate to establish a vision for national preparedness and provide a systematic approach for prioritizing preparedness efforts across the nation for local, state, and federal governments. These four documents address capabilities-based preparedness for the full range of homeland security missions, from mitigation through recovery, and include: *The National Preparedness Vision, the National Planning Scenarios, the Universal Task List,* and *Core Capabilities*.

The purposes of the *Guidelines* are to:

- Organize and synchronize national (including Federal, State, local, tribal, and territorial) efforts to strengthen national preparedness;
- Guide national investments in national preparedness;

- Incorporate lessons learned from past disasters into national preparedness priorities;
- Facilitate a capability-based and risk-based investment planning process; and
- Establish readiness metrics to measure progress and a system for assessing the Nation's overall preparedness capability to respond to major events, especially those involving acts of terrorism.

Using the Core Capabilities List, local jurisdictions measure their capabilities against the list, identifying shortfalls and making corrective actions. In addition, local exercises are designed around using the national planning scenarios which allows for local jurisdictions to determine required capabilities already identified using pre-developed scenarios.

FEMA Grant Programs

FEMA has several grant programs to assist in the mitigation of hazard damages. These grants are available annually or after a federally declared disaster. The grant programs are the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and Building Resilient Infrastructure and Communities (BRIC). The HMGP provides funding to state, local, tribal, and territorial governments after a presidentially declared disaster, so that they can rebuild in a way that reduces or mitigates future disaster losses. FMA is a competitive grant programs to reduce or eliminate repetitive flood damage to buildings insured by the NFIP. Grants are available to states, local communities, federally recognized tribes, and territories. BRIC is available annually to states, local municipalities, tribes, and territories to undertake mitigation projects that reduce damages resulting from hazards and natural disasters.

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 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 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 Environment, Great Lakes and Energy (EGLE) 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 EGLE 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 EGLE 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 EGLE 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: <u>http://waterwatch.usgs.gov/new/index.php?m=dryw&r=mi</u>) by clicking on the map (or proceeding directly to the specific web page at <u>http://mi.water.usgs.gov/midroughtwatch.php</u>).

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 (EGLE/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 3.7

| 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* | EGLE/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 EGLE Surface Water Quality Division for surface water discharge facilities, and the EGLE 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 EGLE 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 EGLE 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 (EGLE), 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 EGLE 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 EGLE, 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 <u>http://www.michigan.gov/flu</u>

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

To help identify significant projects having the greatest impact to mitigate damages, the Gladwin County Advisory Committee (GCAC) ranked the hazards based on their overall impact (risk) to their community in the past 25 years. The criteria utilized was the amount of damage of personal property or deaths/injuries caused to humans over the time frame. Below is the table that was utilized in developing this prioritization.

High hazard events were identified as those hazards that resulted in causing over \$1 million in damages or a human death in any single event from 1996 to 2021. Medium hazard events were identified as those hazards that resulted in causing at least \$500,000 in damages or major human injuries (major human injuries are those injuries resulting in extensive hospital stays and/or surgeries) from a single event. Low impact hazards were identified as hazards resulting in damages less than \$500,000 or minor human injures from a single event. No impact hazards were identified as those events that did not result in property damages or human injuries from any event from that hazard.

In addition to the impact of hazards, climate change was also included as a potential factor in the evaluations. Recent studies completed by the Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA, and other agencies have shown that climate change has impacted weather-related hazards. Not all hazards are impacted by climate change. Those hazards that have been impacted by climate change include language on the impact of climate change. Those hazards that have not been impacted do not include such language.

| Event | Hazard by Impact |
|---------------------------|------------------|
| Dam Failures | High |
| Pluvial (Flash) Flooding | High |
| Public Health Emergencies | High |
| Riverine Flooding | High |
| Structural Fires | High |
| Energy Emergencies | Medium |
| Extreme cold | Medium |
| Extreme Heat | Medium |
| Hail | Medium |
| Ice/Sleet Storms | Medium |
| Infrastructure Failures | Medium |
| Invasive Species | Medium |
| Lightning | Medium |
| Severe Winds | Medium |
| Snowstorms | Medium |
| Tornadoes | Medium |
| Wildfires | Medium |

Hazard Prioritization TABLE 4.1

| Event | Hazard by Impact |
|--|------------------|
| Civil Disturbances | Low |
| Cyberterrorism | Low |
| Drought | Low |
| Fog | Low |
| Hazardous Materials Incident-Fixed Site | Low |
| Hazardous Materials Incident-Transportation | Low |
| Horse-drawn Vehicles | Low |
| Oil/Gas Well Incidents | Low |
| Passenger Transportation Accidents | Low |
| Petroleum and Natural Gas Pipeline Incidents | Low |
| Scrap Tire fires | Low |
| Seasonal Population Change | Low |
| Celestial Impacts | No Impact |
| Earthquakes | No Impact |
| Nuclear Attacks | No Impact |
| Nuclear Power Plant Failures | No Impact |
| Subsidence | No Impact |
| Sabotage/Terrorism | No Impact |

HIGH PRIORITY 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 21 dams within Gladwin County with five (5) 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.

On 5/18/2020 a major summer storm event dropped approximately 7 inches of rain on Gladwin County in a 24 hour period. Together with the heavy rain and the inadequate construction of dams, four dams in Gladwin and Midland Counties, with three dams being located in Gladwin County, failed resulting in damages of over \$15 million. The three (3) dams that were destroyed in Gladwin County were the Edenville Dam, Secord Dam, and Smallwood Dam.

Dam Failure Flooding Overview

According to the National Inventory of Dams Gladwin County has five (5) dams that are rated as a High Hazard Potential Dams and one (1) dam rated as a Significant Hazard Potential Dam. The five High Hazard Potential Dams that are located in Gladwin County are: Chappel Dam, Smallwood, Secord, Lake Lancer Dam, and Edenville Dam. The Significant Hazard Potential Dam is Beaverton Dam. Map 4.1 on the following page identifies the location of the dams in Gladwin County, the condition of the dams, and the high risk dams.

At the May 2020 event, Smallwood, Chappel, and Secord Dams were damaged, and Edenville Dam was breached by the flood. Smallwood, Secord, and Edenville Dams are under new control and are in the process of being rebuilt. A complete analysis of the high risk dams can be found in Appendix F beginning on page???

And The Federal Emergency Response Commission (FERC) has emergency planning oversight of the dams. Reconstruction of the dams will be under FERC oversight and the new owners will be required to maintain an emergency action plan (EAP). The owners will also be required to coordinate with local emergency management officials to assure consistency with local emergency operations plans. Dam failures have been given a high priority to address.

0 Nester Twp 0 C Gladwin M 33 0 Twp O Mills Twp 0 0 0 0 O CAW 0 α C 0 nt Twp River Clay 20 0 C Alger 0 Lake 0 Lancer Dam erman Twp Butman Tw 0 (M 18 0 0 0 30 Hami 0 Σ 0 on Twp Secord Dam "8 C Q 0 Chappel 0 Gladwin Twp Dam Gladwin M.61 **Gladwin County** Cedar M 61 0 843 ft Arthur Twp anch Tobac Smallwood Dam Gladwi State Park 0 0 0 Rhodes Tobacco A 0 To bacco Twp averton O Sheridan Twp Beaverton Twp Billings Twp Bentley M 18 Edenville Dam 0 EUS 10 W US 10 Edenville Two Meridian Hope Twp Wise Twp Warren Twp Ontario MNR, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS de

Gladwin County Dam Location Map MAP 4.1

Condition Assessment





PLUVIAL (FLASH) FLOODING

The accumulation of water in low-lying and inadequately drained areas, following heavy precipitation events, including structural or power failures in municipal sewage systems, causing water to flood or back-up into houses and other structures, and infrastructure.

Hazard Description

Pluvial flooding is the result of heavy rains. Flooding from heavy rains can be the result of multiple causes, several of which, include, but are not limited to: an extremely heavy rainfall where the ground becomes saturated and can no longer absorb the water, urban drainage systems are overloaded by excessive water flow; snowmelt, or lowlands that are inadequately drained. Mean monthly precipitation in Gladwin County from 1901-2000 and 2001-2023 can be found in table 4.3 on page 70.

Climate Change Impact

According to a report from the EPA in 2016, precipitation has increased by 5-10 percent and the intensity of such storms has increased with the heaviest rainfall days increasing thereby likely to increase the frequency of floods.

Pluvial Flooding in Gladwin County

There were a total of four (4) pluvial (flash) flood events identified in the National Center for Environmental Information (NCEI) impacting Gladwin County from 1998 to 2023. All of the events resulted in reported personal property damages; however, there were no reported injuries or deaths. These events are identified in Table 4.2 below. Summaries of these events follow the table.

Significant Pluvial Flood Events in Gladwin County From 1998-2023 TABLE 4.2

| Location | Date | Time | Event Type | Property Damage |
|-------------------------|------------|---------|-------------|-----------------|
| Oberlin | 07/22/2008 | 1:15 pm | Flash Flood | \$25,000 |
| Dale | 06/23/2017 | 2:30 am | Flash Flood | \$25,000 |
| Dale | 05/18/2020 | 2:00 pm | Flash Flood | \$6,500,000 |
| Gladwin Fortier Airport | 08/10/2020 | 9:20 pm | Flash Flood | \$4,000 |

Source: National Center for Environmental Information (NCEI)

On 07/22/2008 an estimated rainfall of two to four inches fell in Butman Township. The rain caused runoff that resulted in flash flooding. This flooding caused road damage reported to be \$25,000 throughout the area.

On 06/23/2017 over three inches of rain fell in Gladwin, with heavier rains estimated in the southern portion of the County. Roads were flooded with several being washout resulting in reported damages of \$25,000.

On 05/18/2020 a slow moving low pressure system dropped a reported seven (7) inches of rain over 30+ hours. This resulted flooding throughout the region and contributed to the failure of four (4) dams in Gladwin/Midland Counties and damages in excess of \$15,000,000 in Gladwin County and over \$23,000,000 in the region. Damages also resulted in the removal of numerous households on Wixom Lake further compounding the damages in property losses.

On 08/10/2020 localized rainfall of two-three inches fell in the southern portion of Gladwin County producing minor flooding. Damages in the amount of \$4,000 were reported from submerged roads in those areas.

Pluvial Flooding Overview

There were four (4) reported flash flood events in the 26-year reporting period from 1/1/1998 to 12/31/2023. This is approximately one event every seven years. Based on the number of events, there is a 15 percent probability that a flash flood event could occur in any given year. It should be noted; however, that all four events occurred in the last 16 years of the reporting period. It should also be noted that based on the climate data flooding events can be anticipated to increase based on the increased intensity of major storms.

To alleviate damages resulting from pluvial flooding, over the past several years, the Gladwin County Drain Commission and Gladwin County Road Commission have been replacing/upgrading culverts and Gladwin County Designate Drains. These two separate actions assist in the mitigation of damages to roads, farmlands, and other rural lands due to heavy rains. Pluvial flooding was given a high priority to address based on the increased number of events in recent years.

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.

An 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

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.

In the 1970's polybrominated biphenyls (PBBs) were contained in the food chain throughout Michigan as numerous farms throughout Michigan were mistakenly given PBB as a food supplement to the livestock in the State. As a result over 1 million chickens and over 35,000 livestock were destroyed that potentially contained PBB. No long-term negative impacts resulted from this event.

Public Health Emergency Events in Gladwin County

In 2009/10 the swine flu (H1N1 virus) threatened the health of U.S. citizens. There were no cases reported in Gladwin County.

In early 2020, the coronavirus (COVID-19) reached pandemic proportions in the United States. The disease is an infectious disease caused by the SARS-CoV-2 virus. It is believed that the virus originated in China and was an airborne virus. It is estimated that as of July 2023, approximately 99,500,000 people in the U.S. have had COVID-19, approximately 1,100,00 deaths. In Gladwin County, these figures are approximately 6,900 have had COVID-19, and approximately 150 deaths have occurred. Vaccines were developed and were administered beginning in December 2020, but only made available beginning in the spring of 2021. Sincere that time, three booster shots have been made available to the general public. As of March 2024, the disease is still present causing sickness and deaths, but both of these have been drastically reduced.

Public Health Emergency Overview

Influenza strains occur annually, with shots available to minimize the impact of said viruses. In addition, Michigan has had several public health emergencies in recent years, with only the COVID-19 virus causing widespread health issues and/or deaths impacting Gladwin County. Public health emergencies was given a high priority to address, based on the impact of COVID-19.

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.

Gladwin County has four watersheds that ultimately drains into the southcentral portion of the County that borders Midland County. Additionally, there is over a 500 foot elevation difference from the northwest corner of the County to the south central portion of the County further impacting the overland flow of water.

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.

| Month | Gladwin County | | | | |
|-----------|----------------|-----------|--|--|--|
| | 1901-2000 | 2001-2023 | | | |
| January | 1.51 | 1.76 | | | |
| February | 1.30 | 1.66 | | | |
| March | 1.94 | 1.95 | | | |
| April | 2.51 | 3.48 | | | |
| May | 2.93 | 3.65 | | | |
| June | 3.08 | 3.38 | | | |
| July | 2.75 | 3.12 | | | |
| August | 3.08 | 3.34 | | | |
| September | 3.18 | 2.69 | | | |
| October | 2.53 | 3.36 | | | |
| November | 2.34 | 2.20 | | | |
| December | 1.74 | 2.14 | | | |

Monthly Mean Precipitation in Gladwin County, 1901-2023 TABLE 4.3

| | Annual Average | 28.89 | 32.68 |
|---|------------------------|-----------------|-----------------|
| S | ource: National Center | for Information | Services (NCEI) |

Figures are in liquid equivalent inches.

Citing the information above, there is an increase in precipitation over the past 23 years from the previous 100 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.)

Climate Change Impact

Based on a study completed by a National Oceanic Atmospheric Administration (NOAA) Climate Adaptation Partnership (CAP)/Regional Integrated Sciences and Assessments (RISA) Team the frequency and intensity of severe storms has increased by 35 percent from 1951 to 2017. The likelihood of floods resulting from these events will also increase.

Riverine Flooding in Gladwin County

Eight (8) flood incidents were reported by the NCEI for Gladwin County, Michigan between 1/1/1998 and 12/31/2023. Of the eight events, seven had reported personal property damages. There were no reported injuries, deaths, or crop damages. All eight events are identified in Table 4.4 below, with the more significant events being summarized below the table.

| Location | Date | Time | Event Type | Property Damage |
|-------------------|------------|----------|------------|-----------------|
| Countywide | 03/05/2004 | 11:00 am | Flood | \$50,000 |
| Countywide | 05/09/2004 | 5:50 pm | Flood | \$0 |
| Countywide | 05/23/2004 | 3:00 pm | Flood | \$8,000 |
| Countywide | 03/13/2006 | 8:00 am | Flood | \$20,000 |
| City of Gladwin | 04/14/2014 | 11:30 am | Flood | \$80,000 |
| City of Beaverton | 06/23/2017 | 4:00 am | Flood | \$120,000 |
| City of Gladwin | 04/30/2020 | 6:00 am | Flood | \$4,000 |
| Countywide | 05/18/2020 | 12:00 pm | Flood | \$30,000,000 |

Significant Riverine Flood Events in Gladwin County From 1998-2023 TABLE 4.4

Source: National Center for Environmental Information (NCEI)

On 03/05/2004 over an inch of rain fell on frozen ground not allowing the ground to absorb the water. The rainfall, along with the melting snow produced flooding in Gladwin County. Several roads were closed, and others completely washed out due to the high water. Little damage resulted to private property. Reported damages were estimated to be \$50,000.

On 04/14/2014 over an inch of rain fell on frozen ground causing the Cedar River to flow over its banks. Several businesses in Gladwin experienced flooding. Reported damages were approximately \$80,000.

On 06/23/2017 a slow moving storm passed through the area dropping several inches of rain during the night. Flooding occurred throughout the region, which resulted in a Presidential Major Disaster Declaration that included Gladwin County. Reported damages were estimated to be over \$100,000.

On 05/18/2020 a major storm dropped approximately 7 inches over the region over several days causing major flooding throughout the region. Rivers rose over their banks and several dams were destroyed as a result of the flooding. A Presidential Major Disaster Declaration that included Gladwin County was issued for the region. Damages in excess of \$30,000,000 were reported.

Riverine Flooding Overview

From 1998 to 2023 there were eight (8) major floods that occurred or slightly less than one event for every three years. Based on those numbers the probability of a riverine flood resulting in personal property damages occurring is approximately 31 percent. Based on the study done by the NOAA CAP/RISA Team, the flooding events are anticipated to have a greater impact and frequency in the future.

Floodplain maps are in the process of being recalculated due to the loss of the dams in the County. Upon their completion, those maps will be included in the Plan. Thirteen of the 17 municipalities are in the National Flood Insurance Program and two other municipalities do not have flood zones located within their boundaries. 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. Riverine flooding was given a high priority to address based on the recent flood events and their impacts to the community.

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.

On 12/18/2018 a residential structure fire occurred in the City of Beaverton. Three people died and two people were injured in the fire. The house was completely destroyed and was razed shortly after the fire.

On 07/18/2023 Lambert's Meat Market was set on fire by an arsonist. Local fire departments form Gladwin, Beaverton, Butman and Secord Townships, along with the City of Harrison's Fire Department responded to the fire. There were 40 firefighters, five engines, and two towers attending the fire.

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.

MEDIUM PRIORITY HAZARDS

ENERGY EMERGENCIES

An actual or potential shortage of gasoline, electrical power, natural gas, fuel oil, or propane-of sufficient magnitude and duration to potentially threaten public health and safety, and/or economic and social stability.

Hazard Description

Michigan's citizens are dependent on energy resources to power the public and private utility infrastructure which provide essential life services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation.

Temporary loss of any one source of energy can have devastating consequences. For example, when electric 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 there is a gasoline shortage (automobile fuel) people can be left stranded and unable to leave their dwellings for shopping trips, doctor trips, or other necessary trips to maintain their household.

Energy Emergency Events

On 08/18/2003 a blackout occurred that covered seven states, including southeastern Michigan. Some homes did not have power restored for two weeks. Due to the blackout many residents of southeastern Michigan left their homes and traveled to the north and went to areas unaffected by the blackout. This resulted in food supplies shortages in numerous areas in northern Michigan.

On 08/28/2018 a line of thunderstorms hit the area causing numerous power outages in much of the Beaverton area.

On 02/21/2021 an ice storm hit the region causing numerous downed power lines and trees, resulting in power outages throughout the county for several days.

Energy Emergencies Overview

There are numerous power outage occurring that impact a small number of customers. Most of

the major energy emergencies are the result of major weather events such as floods, windstorms, snow/ice storms. The main infrastructure failures are power outages, which are normally restored in a matter of hours. Due to the potential impact that could result from the energy emergencies, they were given a medium priority to address.

EXTREME COLD TEMPERATURES

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.

Climate Change Impact

Winter temperatures have been increasing faster than temperatures during other seasons. However, extreme cold events are anticipated to continue to occur despite an increase in global temperatures. As they are not anticipated to occur as often, nor are they anticipated to occur over longer periods of time.

Extreme Cold Events in Gladwin County

There were four extreme cold events that were reported between 01/01/1998 and 12/31/2023 in Gladwin County as reported by NCEI. A summary of the events is found below. There were no reported deaths, injuries, or property damage resulting from the cold events.

On 02/04/2007 to 02/05/2007 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 01/06/2014 to 01/07/2014 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 02/14/2015 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.

On 01/31/2019 a blast of arctic air impacted the region. Temperatures dropped along with windy conditions, brought wind chills to -35 to -35 degrees in the area.

Extreme Cold Overview

There were four events occurring from 1998 to 2023 or approximately one event every 6.5 years. Based on these figures, the probability of a major event of this nature occurring is approximately 15 percent. 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. However, due to the overall impact of the events, extreme cold was given a medium priority.

EXTREME HEAT TEMPERATURES

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.

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).

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.

Climate Change Impact

According to the NOAA CAP/RISA Team, report climate change studies show that temperatures are gradually increasing. The study does not cite if there is an anticipated increase in extreme warm weather.

Extreme Heat Events in Gladwin County

There were two extreme heat events were reported by the NCEI for Gladwin County, Michigan between 1/01/1998 and 12/31/2023. There was no reported deaths, injuries, or property damages resulting from the extreme heat events. A summary of the two events is found below.

On 08/01/2001 to 08/09/2001 excessive heat lingered for several days with daytime temperatures reaching in the 90's and nighttime temperatures staying in the 70's. As a result numerous outdoor events were modified and attendance at these events was well below normal

On 06/30/2018 record highs were reported throughout the region with temperatures reaching in the upper 90's and the heat index exceeding 105.

Extreme Heat Overview

There were two excessive heat events from 1998 to 2023 or approximately one event every 13 years. The probability of an excessive heat event occurring is approximately 7.5 percent. While there have been minimal 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 airconditioned environments. Due to the overall impact of the events, excessive heat was given a medium priority to address.

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.

Climate Change Impact

According to the NOAA CAP/RISA Team, report climate change studies show that extreme storm events are increasing in both the frequency and intensity. Should that occur, the number of hail events in the future may be on the rise, as well as the intensity (size of the hail and/or duration of the storm).

Hailstorms in Gladwin County

There were 36 reported hail events on 31 days as reported by the NCEI for Gladwin County, Michigan between 01/01/1998 and 12/31/2023 a 26-year span. There were no deaths, injuries, or property damages reported/estimated; however, the data from these events is incomplete as not all damages that occurred have been reported. The table identifies those events with a minimum of 1.5" diameter hail, and summaries below provide information on the most intense hail events.

Significant Hail Events in Gladwin County From 1998-2023 TABLE 4.5

| Location | Date | Time | Magnitude (hail diameter) | Property Damage |
|-------------------|------------|---------|---------------------------|-----------------|
| Rhodes | 06/24/1998 | 4:30 pm | 1.75 inches | \$0 |
| City of Gladwin | 06/24/1998 | 5:43 pm | 2.00 inches | \$0 |
| City of Gladwin | 09/26/1998 | 6:00 am | 2.00 inches | \$0 |
| NW Gladwin County | 09/26/1998 | 6:00 am | 2.50 inches | \$0 |
| Skeels | 07/13/2003 | 3:00 pm | 1.75 inches | \$0 |
| City of Gladwin | 04/10/2011 | 6:30 am | 1.50 inches | \$0 |
| Rhodes | 05/03/2012 | 3:25 pm | 2.00 inches | \$0 |
| Skeels | 09/21/2022 | 7:06 am | 1.75 inches | \$0 |

Source: National Center for Environmental Information (NCEI)

On 09/13/1998 a storm hit Gladwin County with some hail being reported as large as 2.5" in diameter. No damages were reported that resulted from the hail.

On 07/13/2003 a series of thunderstorms came slowly across the State of Michigan from Lake Michigan. The most intense storm resulted in golf ball-sized hail on the Clare County/Gladwin County border. There were no reports of property damage.

On 05/03/2012 a line of thunderstorms crossed the State of Michigan. Multiple reports of large hail, up to 2.00 inches, were received, with the largest being in southeast Gladwin County.



Significant Hail Events in Gladwin County from 1998-2023 Map MAP 4.2

Hail Overview

From 1998 to 2023 Gladwin County had 26 hail events with 31 reported sightings. These events occurred in 14 of the 26 years examined. This is an average of I event per year. However, the probability of an event occurring in any given year is approximately 54 percent, given that there were multiple years with multiple events. Gladwin County did not have any reported deaths, injuries, or damages; however, the six surrounding counties had over \$60,000,000 reported damages, indicating that hail storms can be destructive, and that Gladwin County may not be as fortunate in the future. This hazard was given a medium priority to address.

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.

Climate Change Impact

According to the NOAA CAP/RISA Team, report climate change studies show that freezing rain frequency can vary within the Great Lakes Region and in the State of Michigan. As such, those areas that will experience more freezing rain, will also experience longer events as well.

Ice and Sleet Storms in Gladwin County

A total of four (4) ice/sleet storms were reported by the NCEI for Gladwin County, Michigan between 01/01/1998 and 12/31/2023. 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. The table below provides information on all four events, with summaries following on the events with property damages.

Significant Ice/Sleet Events in Gladwin County From 1998-2023 TABLE 4.6

| Location | Date | Time | Storm Type | Property Damage |
|------------|------------|----------|------------|-----------------|
| Countywide | 02/24/2001 | 8:30 pm | Ice Storm | \$0 |
| Countywide | 12/18/2002 | 9:45 am | Ice Storm | \$0 |
| Countywide | 04/11/2013 | 3:00 pm | Ice Storm | \$60,000 |
| Countywide | 02/21/2022 | 11:00 pm | Ice Storm | \$15,000 |

Source: National Center for Environmental Information (NCEI)

On 04/11/2013 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.

On 02/21/2022 a mixed-weather storm event lead to ice accumulations of .25 to .40 inches. The ice accumulations led to downed tree limbs and power lines resulting in power outages throughout the County. Ice-covered roads were also reported.

Ice and Sleet Storms Overview

From 1998 to 2023 there were four (4) reported ice/sleet storms, or about one event every 6.5 years. The probability of an event occurring in any given year is approximately 15 percent. 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 events were given a medium priority to address.

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).

Climate Change Impact

Infrastructure failures mostly occur as a result of weather-related events. As such, the NOAA CAP/RISA team has produced a summary that predicts an increase in extreme precipitation events, which are most likely to impact the failure of infrastructure systems.

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 medium priority due to the dangers that could result in loss of utilities.

INVASIVE SPECIES

A species whose introduction to Michigan causses or is likely to cause economic or environmental harm, or harm to human health, to an extent that outweighs the species,' known benefits.

Hazard Description

Invasive species can be transported in many ways, such as on animals, vehicles, ships, commercial goods, produce, and clothing. Although non-native species are the foundation of U.S. agriculture, and also are used to prevent erosion, to provide fishing and hunting opportunities, and as ornamental plants and pets, occasionally a non-native organism flourishes too well and causes unwanted economic, ecological, or human health impacts. The terms "invasive" or "nuisance" are used to describe such species.

Hazard Analysis

Hundreds of new species from other countries are introduced intentionally or accidentally into the United States each year. These invasive species may arrive on our shores in a variety of ways. Transportation efficiencies that make it possible to travel around the globe in hours rather than weeks make it possible for organisms to survive transportation from one continent to another. As more adaptable and generalized species are introduced to environments already impacted adversely by human activities, native species are often at a disadvantage to survive in what was previously a balanced ecosystem.

Invasive Species in Clare County

The Gladwin County Conservation District Manager provided the following list of invasive species that have an adverse impact on the County: Beech Bark Disease, Emerald Ash Borer, Spongy Moth (formerly Gypsy Moth), Quagga Mussel, Zebra Mussel, Eurasian Watermilfoil, Phragmites, Japanese Stiltgrass, Garlic Mustard, Giant Hogweed, Autumn Olive, Common Buckthorn, Glossy Buckhorn, Japanese Knotweed, Black Swallow-wort, Oriental Bittersweet, and Pale Swallow-wort. The Gladwin County Advisory Committee (GCAC) reviewed and approved the list.

Invasive Species Overview

The County continues to address several invasive species such as phragmites, emerald ash borer, and the Spongy Moth on a limited basis and will be seeking to rejuvenate the Spongy Moth program to help reduce

their impact on the County. Due to the exorbitant costs to eliminate any single one species, they can only address these species in limited fashion. In addition, there is a concern that any or all of these species could be out of control at any given time, such as the case with the emerald ash borer, whose effects are still being felt.

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.

Climate Change Impact

According to the NOAA CAP/RISA Team climate change studies show that severe storms has increased and will most like continue in the future. There is no specific reference to the impact of lightning, but as lightning occurs during severe storms, it is anticipated that lightning events will continue to increase.

Lightning Events in Gladwin County

From 01/01/1998 to 12/31/2023 there were no lightning events reported by the NCEI in Gladwin County. While there may have been lightning events, none were reported to cause death, injuries, or property damage.

Lightning Overview

From 1998 to 2023 no reported events were identified in Gladwin County. However, from 1998 to 2023 there were 14 lightning events resulting in over \$65,000 in reported damages and injuries to six (6) people in the surrounding counties. Furthermore, as reported in the NOAA climate change, it is likely that lightning events will increase in the future. Thus, while there were no events during this time period, it is not probable that there will not be a zero (0) probability event in Gladwin County any given year.

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.

Climate Change Impact

According to the NOAA CAP/RISA Team climate change studies show that severe storms have increased and will most like continue in the future. There is no specific reference to the impact of severe winds, but as severe winds occurs during severe storms, it is anticipated that severe winds events will continue to increase.

Wind Events in Gladwin County

From 01/01/1998 to 12/31/2023 53 events occurred in Gladwin County, as reported by the NCEI. A majority of these events occurred during thunderstorms, but these events were not limited to thunderstorm activity. Reported damages were greater than \$500,000, but it is not known if all damages were reported. No deaths or injuries were reported during this time frame. Those events that resulted in reported damages are identified in the table below. The major wind events are summarized after the table.

| Location | Date | Time | Storm Type | Magnitude (wind speed in knots) | Property Damage |
|-------------------|------------|----------|-------------------|---------------------------------------|--------------------|
| Countywide | 05/30/2004 | 4:30 pm | Strong Wind | 40 knots | \$5,000 |
| City of Gladwin | 06/08/2005 | 1:15 am | Thunderstorm Wind | 52 knots | \$14,000 |
| Countywide | 11/13/2005 | 5:00 am | High Wind | 54 knots | \$20,000 |
| Winegars | 05/25/2006 | 3:30 pm | Thunderstorm Wind | 52 knots | \$2,000 |
| Countywide | 10/04/2006 | 1:20 am | Thunderstorm Wind | 55 knots | \$10,000 |
| Countywide | 02/22/2007 | 11:00 am | Strong wind | 43 knots | \$6,000 |
| Countywide | 07/09/2007 | 2:35 pm | Thunderstorm Wind | 55 knots | \$8,000 |
| City of Gladwin | 06/08/2008 | 2:16 pm | Thunderstorm Wind | 52 Knots | \$3,000 |
| Gladwin Township | 06/08/2008 | 2;25 pm | Thunderstorm Wind | 55 knots | \$14,000 |
| Highwood | 06/08/2008 | 2:27 pm | Thunderstorm Wind | 55 knots | \$80,000 |
| Highwood | 06/15/2008 | 8:42 pm | Thunderstorm Wind | 54 knots | \$7,000 |
| City of Beaverton | 08/23/2008 | 3:30 pm | Thunderstorm Wind | 52 knots | \$2,000 |
| City of Gladwin | 06/24/2009 | 6:19 pm | Thunderstorm Wind | 55 knots | \$8,500 |
| Gladwin Airport | 06/08/2011 | 10:06 pm | Thunderstorm Wind | 50 knots | \$2,000 |
| City of Gladwin | 09/03/2001 | 9:25 am | Thunderstorm Wind | 55 knots | \$12,000 |
| City of Gladwin | 07/25/2012 | 9:15 pm | Thunderstorm Wind | 52 knots | \$8,000 |
| Highwood | 07/25/2012 | 9:19 pm | Thunderstorm Wind | 50 knots | \$1,000 |
| Countywide | 05/20/2013 | 3:15 pm | Thunderstorm Wind | 60 knots | \$55,000 |
| Western Gladwin | 11/17/2013 | 4:23 pm | Thunderstorm Wind | 54 knots | \$9,000 |
| City of Gladwin | 08/02/2015 | 12:25 pm | Thunderstorm Wind | 54 knots | \$12,000 |
| Countywide | 08/02/2015 | 6:38 pm | Thunderstorm Wind | 54 knots | \$9,000 |

Significant Severe Wind Events in Gladwin County From 1998-2023 TABLE 4.7

| Location | Date | Time | Storm Type | Magnitude (wind speed in knots) | Property Damage |
|----------------------------|------------|----------|-------------------|---------------------------------------|--------------------|
| Countywide | 06/06/2016 | 2:05 pm | Thunderstorm Wind | 55 knots | \$35,000 |
| Gladwin Airport | 06/06/2016 | 2:27 pm | Thunderstorm Wind | 54 knots | \$10,000 |
| City of Gladwin | 07/27/2016 | 1:45 pm | Thunderstorm Wind | 55 knots | \$30,000 |
| Countywide | 07/13/2018 | 3:46 pm | Thunderstorm Wind | 55 knots | \$12,000 |
| City of Beaverton | 08/28/2018 | 7:35 pm | Thunderstorm Wind | 58 knots | \$55,000 |
| Highwood | 06/10/2020 | 12:43 pm | Thunderstorm Wind | 54 knots | \$8,000 |
| Buckeye Township | 06/11/2021 | 2:49 pm | Thunderstorm Wind | 50 knots | \$5,000 |
| Southern Gladwin County | 06/11/2021 | 3:10 pm | Thunderstorm Wind | 50 knots | \$2,000 |
| Gladwin Airport | 08/09/2021 | 12:00 pm | Thunderstorm Wind | 50 knots | \$3,000 |
| Gladwin | 08/10/2021 | 11:13 pm | Thunderstorm Wind | 50 knots | \$7,000 |
| City of Beaverton | 08/24/2021 | 5:20 pm | Thunderstorm Wind | 50 knots | \$1,000 |
| City of Gladwin | 08/24/2021 | 5:30 pm | Thunderstorm Wind | 50 knots | \$2,000 |
| Bard | 09/07/2021 | 1:43 pm | Thunderstorm Wind | 50 knots | \$4,000 |
| Buckeye Township | 09/07/2021 | 1:55 pm | Thunderstorm Wind | 50 knots | \$4,000 |
| Countywide | 12/16/2021 | 8:15 am | High Wind | 50 knots | \$15,000 |
| Highwood | 04/24/2022 | 3:28 pm | Thunderstorm Wind | 50 knots | \$4,000 |
| Gladwin Airport | 07/23/2022 | 5:15 pm | Thunderstorm Wind | 50 knots | \$4,000 |
| City of Beaverton | 08/27/2022 | 3:22 pm | Thunderstorm Wind | 50 knots | \$12,500 |
| Skeels | 06/25/2023 | 5:48 pm | Thunderstorm Wind | 50 knots | \$3,000 |

Source: National Center for Environmental Information (NCEI)

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. Reported damages were estimated to be \$80,000.

On 05/20/2013 damaging winds and large hail were brought on by thunderstorms. Dozens of trees were downed and minor damage to homes occurred. Damages were estimated to be \$55,000.

On 06/06/2016 several strong thunderstorms moved across the State of Michigan causing numerous trees and power lines to be downed. A home was also damaged from a falling tree. Damages were estimated to be \$35,000.

O7/27/2016 scattered thunderstorms developed and reached severe levels. Trees were downed and several homes were damaged. Damages were estimated to be \$30,000.

On 08/28/2018 thunderstorms crossed the State of Michigan, producing wind damage as well as tornadoes in certain areas. Trees were downed onto several homes. Power was out in much of the Beaverton area.

Severe Winds Overview

From 1998 to 2023 there were 53 events or approximately two per year. The probability of an event occurring is approximately 100 percent; however, there were several years with multiple events and several years without an event. Thus, while there could be a chance that any given year would not have

an event. 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. With climate change there is a probability that severe storms will occur more frequently and be more intense. This could increase the impact of these events. However, based on their recent overall impact this hazard was given a medium priority.

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.

Climate Change Impact

According to the NOAA CAP/RISA Team climate change studies show that severe storms have increased and will most like continue in the future. The study also suggests that with the increasing temperatures snow will be changing to freezing rain or rain.

Snowstorms in Gladwin County

From 01/01/1998 to 12/31/2023 there were a total of 41 events on 40 days occurred in the snowstorm category (blizzards, winter storms, and heavy snows) reported by the NCEI in Gladwin County. No injuries, deaths, or property damages were reported as a result of these storms; however, the data from these events is incomplete and it is possible that not all injuries/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

From 1998 to 2023 there were 40 events or approximately 1.5 events per year. The probability of an event occurring in any given year is approximately 100 percent, as events did not occur annually and there were multiple events is several years. With climate change potentially reducing the number of snow events to rain or freezing rain events, the impact of these events may be lessened. Even with the number of events, the damages resulting from these events, has not included deaths, injuries, or property damages. However, the impact of any given event could be great, therefore, the hazard was given a medium priority.

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 4.8

| 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 | EF-5 Incredible 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

Climate Change Impact

According to the NOAA CAP/RISA Team, climate change studies show that severe storms have increased and will most like continue in the future. There is no specific reference to the impact of tornadoes, but as tornadoes occur during severe weather events, it is anticipated that tornado events will continue to increase in number or intensity, and possibly both.

Tornado Events in Gladwin County

From 01/01/1998 to 12/31/2023 two tornados were reported by the NCEI in Gladwin County. There were no reported deaths, or injuries resulting from the tornadoes. However, damages did occur from one of

the two events. Below is a table summarizing the tornadoes followed by a brief explanation of the two events. It should be noted that the two events both occurred prior to the Enhanced Fujita Scale, which became operational in 2007.

Tornadoes in Gladwin County From 1998-2023 TABLE 4.9

| Location | Date | Time | Storm Type | Magnitude | Property Damage |
|-------------------|------------|----------|------------|-----------|--------------------|
| NW Gladwin County | 05/12/2000 | 3:36 pm | Tornado | FO | \$0 |
| Gladwin County | 06/09/2001 | 5: 35 pm | Tornado | F1 | \$90,000 |

Source: National Center for Environmental Information (NCEI)

On 6/9/2001 the most destructive tornado in recent history struck Gladwin County. The tornado was an F-1 event, and damaged multiple buildings, destroyed a single building damaging six (6) others. The tornado also brought down numerous trees and power lines along a six mile stretch six miles north of the City of Gladwin. The tornado touched down on three (3) separate occasions in Gladwin County. Damages in personal property were reported at \$90,000.



Tornadoes in Gladwin County from 1998-2023 Map MAP 4.3

Tornadoes Overview

There have been two (2) reported tornadoes from 1998 to 2023 or approximately one every 13 years. The probability of an event occurring is approximately eight (8) percent in any given year. According to the NOAA CAP/RISA event, severe events are anticipated to increase both in number and/or intensity. Should that occur the number of tornadoes impacting Gladwin County may increase. However, based on the number and impact of recent events, tornadoes were given a medium priority to address.

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

From 01/01/1998 to 12/31/2023 the Michigan Department of Natural Resources (MDNR) was advised of one (1) wildfire (bushfire). However, there may have been other smaller fires that the MDNR was not advised of and did not include in their reports. Below is information on that event.

On 05/02/2021 a wildfire was reported to occur in Gladwin County. The event was under 34 acres in area. No deaths, or injuries were reported. Property damage totals were not given to the MDNR staff.

Wildfire Overview

There has been one(1) wildfire reported by the MDNR from 1998 to 2003. The probability of such an event is approximately 4 percent. However, there have been a number of smaller fires not reported to MDNR during this time frame. There have been no deaths or injuries reported from these events, with only limited property damage. However, based on the capacity to cause damage and/or personal harm wildfires were given a medium priority to address.

Wildfire Risk in Gladwin County Map MAP 4.4



Block Group

Average Wildfire Hazard Potential Score



Gladwin County Wildfire Risk

The data is from the USDA Forest Service Fire Modeling Institute. Wildfire hazard potential provides information on the relative potential for wildfire that would be difficult for fire crews to contain. "Areas with higher wildfire potential values represent fuels with a higher likelihood of experiencing high-intensity fire with torching, crowning, and other forms of extreme fire behavior."-Fire Modeling Institute. A score of 5 is very high risk and a score between 0-1 is likely non-burnable area such as water or asphalt.



LOW PRIORITY HAZARDS

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 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.

CYBERTERRORISM

Criminal activity that either targets or uses a computer, a computer network, or networked device. Most cybercrimes are committed to make money. Cybercrimes can be done by an individual or an organization.

Hazard Description

Cyberterrorism threaten businesses daily and have incrementally increased in recent years. According to Cisco, the total number of cyber-attacks have increased nearly fourfold over a 20-month period from January 2016 to October 2017. These attacks can range from the installation of malware (malicious software) to intentionally cause damage to computers or computer networks to calls to the public and defraud them from the money in their bank accounts.

Programs are being offered through law enforcement offices throughout the region to educate the public on the threat of cyberterrorism.

Cyberterrorism Events

In 2022 the City of Beaverton's financial software was attacked, and the City Manager caught the financial discrepancy and saved several hundred thousand dollars. The State Police were called to locate the source of the attack. The party responsible was not located.

Cyberterrorism Overview

While some forms of cyberattack occur every day, the main focus of cyberterrorism mitigation is two-

fold. The first concern is at the regional level and is a large-scale event or events that can be inflicted on local governments and businesses causing widespread hardship to the residents of Clare County. The second concern are telephone calls that use misrepresentation and prey upon the general public, specifically the elderly or lower income households. A disruption in monthly payment or replenishment would have severe financial hardships and could result in civil disobedience that could quickly overwhelm local resources. With most banking and financial transactions done electronically and are web-based, this is a threat that has been identified as a known concern. Because of the access of computers and the increase of occurrences, the residents are vulnerable to this hazard. Due to the ever increasing occurrences, this hazard was given a medium priority to address.

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.

Climate Change Impact

According to the 2016 EPA Climate Change Report for Michigan, the frequency of flooding is anticipated to increase. Snowfall is also anticipated to decrease according to the NOAA CAP/RISA Team report. With the predicted decrease in snowfall and gradual melting of the ice caps the spring thaw may be reduced, and the summer rainfall anticipated to increase, the condition for drought are everchanging. Drought conditions are more likely to occur in the winter/spring months rather than in the summer/fall months.

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 1/1/1998 and 12/31/ 2023.

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. As there were no deaths, injuries, or property damages reported in recent years, droughts were given a low priority to address.

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 Events in Gladwin County

From 01/01/1998 to 12/31/2023 the NCEI had no reported fog events impacting Gladwin County. It should also be noted that of the adjoining six (6) counties, only two (2) had reported a fog event. Neither of these had any reported deaths, injuries, or property damages.

Fog Overview

No major fog events occurred in Gladwin County in recent years. One major fog event is estimated to occur in Michigan approximately every two years. Therefore, the probability of such an event is not prohibited, but is given a very low percentage of occurring. 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. As there were no reported fog events since 1998, fogs were given a low priority to address.

HAZARDOUS MATERIAL INCIDENTS - FIXED SITE

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.

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.)

Hazardous Material Incidents/Industrial Accidents in Gladwin County

From 01/01/1998 to 12/31/2023 there was one (1) reported hazardous material incident that occurred 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 and 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.

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 Accidents in Gladwin County

From 01/01/1998 to 12/31/2023 there have not been any hazardous material incidents involving transportation vehicles. Gladwin County has no federal highways located in the County and has only three (3) state highways going through the County. M-18 funs north-south in the western portion of the County, M-30 runs north-south in the central part of the County, and M-61 runs east-west through the middle of the County.
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. Because there have not been any hazardous material: transportation incidents, this hazard was given a low priority to address.

HORSE-DRAWN VEHICLES

A mechanized piece of equipment pulled by one <u>horse</u> 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 <u>automobiles</u> 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 Accidents in Gladwin County

From 01/01/2018 to 12/31/2023 there have been a total of 25 reported accidents in Gladwin County involving motorized vehicles and horse-drawn vehicles. No breakdown on the number of deaths and injuries in these accidents.

Horse-drawn Vehicle Overview

The horse-drawn vehicles do have reflective triangles on the rear of the vehicles, but not necessarily lights. The utilization of lights for these vehicles would be a benefit to not only the people using these vehicles but would also benefit all vehicles in the spotting of the horse-drawn vehicles. Gladwin County is not only a destination for seasonal travelers but is also the gateway to many of the northern counties within the state and many of those travelers are not aware of the horse-drawn vehicles.

Efforts to have the horse-drawn vehicle owners to have lights, but this has not been a successful campaign by local law enforcement. Local law enforcement has also been educating the general public of the presence of the horse-drawn vehicles, which will bring a better awareness of them on the roads.

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 4.10

| 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 HS2 and must have a working knowledge of these wells that are in their areas of responsibility.

PASSENGER TRANSPORTATION ACCIDENTS

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.

Hazard Description-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 a 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 plan 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.

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

From 01/01/1998 to 12/31/2023 there were no reported 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.

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 EGLE 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

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 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. 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. Since the flood of 05/18/2020 the status of summer homes has changed on the lakes that were dried up. However, there are many other homes in the County that are used as secondary homes, thus, there is still a seasonal population change to some degree.

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

On 08/04/2003 a power outage impacted a major part of the northeastern portion of the U.S., including portions of southeastern Michigan. As a result of the power outage, 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.

In 2020 the U.S. experienced the COVID-19 pandemic. As a result of this pandemic, which required a quarantined public, some seasonal homes were temporarily being used as primary residences. Most of the households eventually returned to their primary residences but tracking of the households and their movements was not able to be completed.

Seasonal Population Increase Overview

Seasonal population increase will continue to be an issue in Gladwin County. 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 low priority to address.

OTHER HAZARDS

CELESTIAL IMPACTS

An impact or threatened impact from a meteorite, asteroid, comet, satellite, space vehicle, space debris, or similar objects that may cause physical damages or other disruptions.

Hazard Description

It has been estimated that a serious impact from an object upon the Earth occurs approximately once every 50 to 100 years. Approximately 70 percent of the Earth is covered by water, with the oceans being over 90 percent of the water. Therefore, it is more likely that such an event would more likely fall into an ocean. However, due to the ever growing population on the Earth, the impact on man of such an event continuously increases.

Celestial Impact Overview

Celestial impacts occur in many shapes and sizes; however, none have been reported in recent history in Gladwin County. While such an event could occur, it is not likely to Michigan, let alone within Gladwin County.

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.

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 though 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.)

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.

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 being 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.

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.

HAZARD IMPACT/VULNERABILITY

The tables on the following pages identify how the participating municipalities are potentially impacted by each of the hazards as well as how vulnerable they could be should a natural weather event occur.

In **Table 4.11 Hazard by Impact**, each of the participating municipalities were asked how an event could impact that municipality should it occur. High impact events could be events that resulted in multiple deaths and extensive property damage, medium impact events could be events that resulted in a death and/or injuries to multiple persons and moderate property damage, and moderate impact events could be events that resulted in injuries with minimal property damage.

In **Table 4.12**, **Asset Vulnerability**, vulnerable assets (facilities and people) for the participating municipalities were identified for the natural (weather-related) events. Those assets that could be vulnerable during an event, are identified in the appropriate column. (For example: should a hailstorm occur in the City of Brown City, the assets that would be vulnerable to damage or injury are identified in that cell.) Earthquakes have been table, as they are not significant for this part of Michigan. Even when they occur, and that is infrequently, often times they are not even felt by people.

Hazards By Impact For Gladwin County Municipalities TABLE 4.11

(Insert table here)

| Community | High Impact Hazards | Medium Impact Hazards | Low Impact Hazards | No Impact Hazards | Community | High Impact Hazards | Medium Impact Hazards | Low Impact Hazards | No Impact Hazards |
|-----------|---------------------------|-----------------------------|--------------------------|----------------------|-----------|---------------------------|-----------------------------|--------------------------|----------------------|
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HAZARDS: A-Drought; B-Invasive Species; C-Severe Weather (hail, ice/sleet storms. Lightning, thunderstorms, snowstorms); D-Tornadoes/Severe Winds; E-Civil Disturbances; F-Cyberterrorism; G-Dam Failures; H-Energy Emergencies; I-Extreme Temperatures (Hot and Cold); J-Hazard Material Incidents (Fixed Site and Transportation); K-Infrastructure Failures; L-Pipeline/Well Incidents (petroleum/gas pipelines and oil/gas well); M- Seasonal Population Changes/Special Events; N-Public Health Emergencies; O-Riverine Flooding; P-Structural Fires; Q-Terrorism/Sabotage; R-Wildfires; S-Fog; T-Transportation Accidents

Asset Vulnerability For Gladwin County Municipalities TABLE 4.12

(insert table here)

| Community | Hail | Lightning | Severe Winds | Tornados | Extreme Heat | Ice/Sleet Storms | Snowstorms | Extreme Cold | Flooding | Drought | Fog |
|-----------|------|-----------|-----------------|----------|-----------------|---------------------|------------|-----------------|----------|---------|-----|
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Assets: A-People; B-City/Village/Township Hall; C-Police Station; D-Fire Station; E-Warning Siren; F-School; G-Health Care Facility

CHAPTER 5: ANALYSIS OF ALTERNATIVE ACTIONS (2016 PLAN)

Prior to the development of the mitigation strategies, the Gladwin County Hazard Mitigation Advisory Committee (GCHMAC) developed goals and objectives. Upon the development of the goals and objectives, mitigation actions were identified, based on the six categories of mitigation activities. The goals and objectives are found on the following page, and the mitigation actions as determined for the 2016 Hazard Mitigation Plan are found in the table on the following pages. Revised goals and objectives for the 2024 Plan, as determined by the GCHMAC members, will appear in Chapter 6: 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.

The action plan items from the 2016 Plan were then evaluated and those items that were deemed complete or no longer applicable were eliminated from this Plan. The GCHMAC then reviewed the mitigation strategies found below.

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.

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

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 farmers with their livestock during times of hazard event

| GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2016-2024 | | | | | |
|---|---------------------|----------|--------|-------------|----------|
| ltem | Mitigation Activity | Priority | Status | Lead Agency | Outcomes |
| Number | | | | | |

| | HIGH PRIORITY HAZARD MITIGATION ACTIONS | | | | | | |
|---|---|------|----------------|---|--|--|--|
| 1 | Update existing sirens to meet current standards and add warning sirens where needed to fill gaps in Gladwin County's current warning system. | High | Started | Gladwin County Office of Emergency Management (OEM) | 2 sirens were purchased/installed. Program to be reevaluated to determine if additional sirens would be beneficial. | | |
| 2 | Purchase back-up generators for all municipal buildings and other critical facilities | High | Started | OEM | Multiple municipalities have purchased generators. Gladwin County, City of Gladwin, Billing Twp, Buckeye Twp, Butman Twp, Hay Twp, Sage Twp, Secord Twp, and Sherman Twp, have all purchased some generators. | | |
| 3 | Purchase battery back-up packs for generators to ensure uninterrupted power at critical facilities throughout the County | High | Not Started | OEM | No grant funds. | | |
| 4 | Purchase weather radios for critical facilities, thereby providing additional preparation time during times of emergency | High | Started | OEM | Some radios have been purchased and distributed; however, additional radios could still be distributed to local municipalities, should radios become available through grants. | | |
| 5 | Complete a Community Wildfire Protection Plan for Gladwin County | High | Not Started | OEM | Grant funds for the Plan have not been available. | | |
| 6 | Prepare municipal facilities for installation of generators | High | Started | OEM | Several municipalities prepared the facilities for the installation of generators. | | |
| 7 | Improve security measures for the County Courthouse | High | Not Started | OEM | Grant funds have not been available to complete the improvements. | | |
| 8 | Encourage the inclusion of hazard mitigation into other planning documents | High | Started | OEM | As municipalities update their master plans, they will be encouraged to include Hazard Mitigation in the Plans. | | |

| GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2016-2024 | | | | | |
|---|---------------------|----------|--------|-------------|----------|
| Item | Mitigation Activity | Priority | Status | Lead Agency | Outcomes |
| Number | | | | | |

| | MEDIUM PRIORITY HAZARD MITIGATION ACTIONS | | | | | |
|----|---|--------|----------------|--|---|--|
| 9 | Purchase portable emergency back- up generators that can be used for shelters and special needs population | Medium | Started | OEM | Several generators have been purchased and are available for use. | |
| 10 | Purchase additional firefighting equipment for firefighters | Medium | Ongoing | OEM | Equipment is purchased annually to meet state/federal standards. | |
| 11 | Purchase smoke detectors for installing at every resident, business, and critical facility within the County. | Medium | Ongoing | OEM | Grants to purchase smoke detectors was secured by local fire departments and were purchased/installed in local businesses and residences. | |
| 12 | Educate the public in the benefits of NIXLE and have them sign up for the service | Medium | Ongoing | OEM | Emergency management, and local municipalities promote the benefits of NIXLE. As a result, participation in NIXLE has increased. | |
| 13 | Develop a program to educate the public on proper responses to all hazards, including meth labs and horse-drawn vehicles | Medium | Ongoing | OEM | Promotion on responses is done by the Emergency Management Director and local municipalities through public speaking, websites, and NIXLE alerts. | |
| 14 | Upgrade a one-mile section of Wagarville Road in Sage Township to meet current road standards | Medium | Not Started | Gladwin County Road Commission (GCRC) | No funding available to upgrade the road. | |
| 15 | Construct additional firefighting facilities to help reduce response times for fires within the County | Medium | Started | OEM | Several facilities have been built in Clement and Bentley Townships. Additional facilities still desired. | |
| 16 | Work with utilities to develop standards for pruning of trees in the utilities' rights-of-way | Medium | Ongoing | Consumers Energy | Utilities have a program to trim trees and keep power lines free from tree limbs. | |
| 17 | Retrofit at-risk structure with ignition-resistant materials | Medium | Not Started | OEM | No funding, program to be reevaluated. | |
| 18 | Protect critical building and infrastructure from the impacts of severe winter weather conditions | Medium | Started | OEM | Sage Township has initiated several improvements, including the purchase of a generator. | |

| GLADWIN COUNTY IMPLEMENTATION STRATEGY TABLE: 2016-2024 | | | | | |
|---|---------------------|----------|--------|-------------|----------|
| ltem | Mitigation Activity | Priority | Status | Lead Agency | Outcomes |
| Number | | | | | |

| 19 | Protect critical facilities/ structures from lightning damage and other hazards | Medium | Started | OEM | Participating municipalities have begun the process to properly ground facilities. | |
|----|---|-------------------|----------------|------|--|--|
| | MODERATE (LOW) PRIORITY HAZARD MITIGATION ACTIONS | | | | | |
| 20 | Replace older, damaged culverts throughout the County as needed | Moderate (Low) | Ongoing | GCRC | Work proceeds as available. | |
| 21 | Work with Department of Natural Resources (DNR) and the Department of Environmental Quality (now known as Department of Energy, Great Lakes, and Environment EGLE) on the impacts of fracking in Gladwin County | Moderate (Low) | Not Started | OEM | Priorities have changed and fracking is no longer a concern as a cause of earthquakes. | |

CHAPTER 6: ACTION PLAN

Through a systematic process, that included the review of all action items identified in the Gladwin County 2016 Hazard Mitigation Plan (2007 Plan) and the possible mitigation strategies as identified in the 2016 <u>Local Hazard Mitigation Planning Workbook</u> (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 2016 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 2024 and beyond. These goals and objectives are identified below.

GOAL 1: Protect Public Health and Safety

OBJECTIVES

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

GOAL 2: Minimize damage to public and private property

OBJECTIVES

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

GOAL 3: Maintain essential services

OBJECTIVES

- a. Identify, inspect, and maintain all critical infrastructure and facilities
- b. Security for the County Courthouse
- c. Repair or replace critical infrastructure and facilities that are damaged or degraded
- d. Protect critical infrastructure and facilities from hazard damage
- e. Obtain necessary resources and equipment to insure essential services are maintained in the event of a hazard
- f. Secure funding for programs/projects in improve municipal capacity

GOAL 4: Manage growth/development

OBJECTIVES

- a. Develop hazard resistant growth policies
- b. Discourage development in high hazard areas
- c. Integrate hazard mitigation planning into land use planning
- d. Encourage sustainable resilient development
- e. Protect and conserve natural resources

The action plan items from the 2016 Plan were then evaluated and those items that were deemed complete or no longer applicable were eliminated from this plan (see review of all 2016 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 2016 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.

Items not identified in the 2016 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

Purchase generators for all critical municipal facilities. Generators to operate using propane or natural gas. Facilities to be set up for generator use

Action: Purchase and install self-starting, propane, or natural gas generators for all critical municipal facilities.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Hazards Addressed: Infrastructure failure and energy emergencies
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA), local budgets, and the United State Department of Agriculture (USDA)
- Project Cost: \$25,000 per generator
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective e
- Schedule: Ongoing, municipalities purchase the generators individually, as funds become available.
- Priority: High
- Benefit(s): Continuity of government and shelter capacity is maintained.

Action Item 2

Complete a Community Wildfire Protection Plan for Gladwin County

Action: Complete a Community Wildfire Protection Plan for Gladwin County.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Michigan Department of Natural Resources (MDNR), United State Fire Service (USFS), USDA
- Project Cost: \$20,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective a
- Schedule: Upon receipt of a grant.
- Priority: High
- Benefit(s): Develop a plan to address wildfires, for life safety and property protection purposes.

Action item 3

Encourage the inclusion of hazard mitigation into other planning documents

Action: Encourage local municipalities to include hazard mitigation into other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA

- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 4, objective c
- Schedule: Ongoing, as municipalities update their planning documents
- Priority: High
- Benefit(s): Municipal documents are consistent in their goals and objectives.

Action Item 4

Improve security measures for the County Courthouse

Action: Complete and further determine the security measures needed, guided by previous security assessments.

- Location: City of Gladwin (County Courthouse)
- Lead Agency: Presiding Judge/Sheriff's Department
- Hazards Addressed: Civil Disturbances, Sabotage/Terrorism
- Potential Funding Source(s): State of Michigan, local budgets
- Project Cost: \$200,000 (Estimated)
- Participating Agencies: Gladwin County
- Goal/Objective Achieved: goal 3, objective b
- Schedule: Ongoing, as funds become available
- Priority: High
- Benefit(s): Safer operations for employees and citizens.

Action Item 5

Purchase additional firefighting equipment for firefighters

Action: Purchase additional firefighting equipment for local municipal fire departments.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Structural Fires, Wildfires
- Potential Funding Source(s): Local fire board millages, firefighting grants
- Project Cost: \$100,000-\$750,000 annually, will vary based on equipment that is purchased
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective c
- Schedule: Ongoing, various equipment is purchased annually
- Priority: High
- Benefit(s): Capability to fight fires is improved.

Action Item 6

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

Action: Install smoke detectors at every residence, business, and critical facility within the County.

- Location: County-wide
- Lead Agency: Red Cross
- Hazards Addressed: Structural Fires
- Potential Funding Source(s): Red Cross, firefighting grants

- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Ongoing, as the smoke detectors become available
- Priority: High
- Benefit(s): Safer living, working environment for residents, employees, and visitors in Gladwin.

Action Item 7

Critical Buildings/Infrastructure Improvements

Phase I-Assessment of governmental critical buildings and infrastructure

Action: Assess governmental critical buildings and infrastructure for possible improvements which will protect them from severe weather conditions.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All weather hazards
- Potential Funding Source(s): local budgets, United States Department of Agriculture (USDA) grants
- Project Cost: \$10,000 (Estimated)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2026
- Priority: High
- Benefit(s): Determination of facilities that need to be addressed.

Phase II-Complete actions as identified in Phase I.

Action: Complete the necessary improvement to critical buildings and infrastructure as identified in Phase

١.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All weather hazards
- Potential Funding Source(s): local budgets, local foundations, and USDA grants
- Project Cost: \$300,000 (estimate, dependent upon completion of Phase I)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2027
- Priority: High
- Benefit(s): Facilities addressed and continuation of activities.

Action Item 8

Upgrade older, damaged culverts throughout the County as needed.

Action: Upgrade older, damaged culverts throughout the County as needed.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission (GCRC)

- Hazards Addressed: Infrastructure Failure, Flooding
- Potential Funding Source(s): GCRC budget
- Project Cost: \$300.00 (annual estimate)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective c
- Schedule: Ongoing
- Priority: High
- Benefit(s): Roads are better maintained, thereby maintaining travel and transportation throughout the County.

Action Item 9 (NEW)

Plant living snow fences along designated roadways.

Phase I-Work with the MDOT to assess county roads to identify potential locations for planting living snow fences

Action: Complete an assessment of roads throughout the County to identify potential live snow fence locations.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission (GCRC)
- Hazards Addressed: Severe winter weather events
- Potential Funding Source(s): Michigan Department of Transportation (MDOT), GCRC
- Project Cost: \$2,000, estimated staff time to complete the assessment
- Participating Agencies: MDOT
- Goal/Objective Achieved: goal 1, objective d
- Schedule: 2025
- Priority: High
- Benefit(s): Identify problematic sites for live snow fences, reducing dangerous sites due to severe winter weather.

Phase II- Plant live snow fences based on the assessment completed in Phase I.

Action: Plant live snow fences based on the assessment completed in Phase I.

- Location: County-wide
- Lead Agency: GCRC
- Hazards Addressed: Severe winter weather events
- Potential Funding Source(s): MDOT/GCRC
- Project Cost: \$100,000 annually (dependent upon completion of Phase I)
- Participating Agencies: MDOT
- Goal/Objective Achieved: goal 2, objective b
- Schedule: 2026
- Priority: High
- Benefit(s): Safer road conditions.

Action Item 10 (NEW)

Dam repairs to/replacement of High Risk Dams.

Action: Renovate Secord, Smallwood, Chappel, and Sugar Springs Dams, new construction of Edenville Dam

- Location: County-wide
- Lead Agency: 4 Lakes Task Force, OEM
- Hazards Addressed: Dam Failure, Flooding
- Potential Funding Source(s): Special assessments, Army Corp of Engineers (ACE), Community Development Block Grant-Disaster Recovery (CDBG-DR), State of Michigan
- Project Cost: \$300,000,000, based on engineer's estimates
- Participating Agencies: 4 Lakes Task Force, Drain Commission
- Goal/Objective Achieved: goal 1, objective d
- Schedule: In process
- Priority: High
- Benefit(s): Lakefront property restored to functional lakefront property, reestablishing local economy with the restoration of the functional lakes for recreational purposes.

Action Item 11 (NEW)

Municipalities to continue to adopt and enforce the most recent edition of the State Construction Code Action: Municipalities to continue to adopt and enforce the most recent edition of the State Construction Code.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): Local funding
- Project Cost: NA
- Participating Agencies: County Building Department
- Goal/Objective Achieved: goal 4, objective d
- Schedule: Ongoing, with updates completed accordingly
- Priority: High
- Benefit(s): Homes will be better constructed providing a safer living environment.

Action Item 12 (NEW)

County, City, and Township planning departments to continue review of zoning and land use regulations for needed revisions and actively enforce the regulations

Action: County, City, and Township planning departments to continue review of zoning and land use regulations for needed revisions and actively enforce the regulations.

- Location: County-wide
- Lead Agency: Gladwin County Planning Commission
- Hazards Addressed: Flooding
- Potential Funding Source(s): Municipal Budgets
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 4, objectives a and b
- Schedule: Ongoing, with updates completed accordingly
- Priority: High

• Benefit(s): Developments would be regulated in hazardous areas.

Action Item 13 (NEW)

Separate sanitary and storm sewers to prevent overflow during severe weather events, which can cause local flooding and public health issues

Action: Separate sanitary and storm sewers to prevent overflow during severe weather events, which can cause local flooding and public health issues.

- Location: Cities of Beaverton and Gladwin
- Lead Agency: Beaverton and Gladwin
- Hazards Addressed: Flooding, Public Health Emergencies
- Potential Funding Source(s): State Revolving Loan (SRL) Funds
- Project Cost: \$4,00,000 per community (estimate)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective a
- Schedule: 2026
- Priority: High
- Benefit(s): Sewers are not overworked, thereby reducing ne number the possibility of backups into homes.

Action Item 14 (NEW)

Install dry hydrants throughout the County to be used for emergency firefighting use

Action: Install additional dry hydrants throughout the County

- Location: Countywide
- Lead Agency: OEM/Gladwin County Fire Chiefs
- Hazards Addressed: All fires
- Potential Funding Source(s): CDBG-DR Grants
- Project Cost: \$5,000 per hydrant
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Ongoing, locations are being discussed to install the hydrants
- Priority: High
- Benefit(s): Improve capacity to fight fires throughout the County.

Action Item 15 (NEW)

Dig wells throughout the County for fire departments to utilize when fighting fires.

Action: Install wells throughout the County.

- Location: County-wide
- Lead Agency: OEM/Gladwin County Fire Chiefs
- Hazards Addressed: All fires
- Potential Funding Source(s): CDBG-DR
- Project Cost: Estimated to be \$750,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Study to determine the location of the wells has been initiated.

- Priority: High
- Benefit(s): Improve capacity to fight fires throughout the County.

Action Item 16 (NEW)

Relocate the City of Gladwin Water Treatment Plant

Action: Relocate water treatment plant out of floodplain to a location outside the floodplain.

- Location: City of Gladwin
- Lead Agency: City of Gladwin
- Hazards Addressed: Flooding
- Potential Funding Source(s):
- Project Cost: \$26,000,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2025 (Dependent upon the receipt of the grant funds.)
- Priority: High
- Benefit(s): The relocation of the treatment plant out of the floodplain would allow the plant to continue to operate during a major flood event.

Gladwin County Hazard Agency Mitigation Participation Chart TABLE 6.1

| Agency | Action Item ¹ |
|-----------------------|--|
| Gladwin County | 4,24,27,28,29,30,31,32,33,34,36,37,38,39 |
| City of Beaverton | 3,6,9,12,13,19,20,21,25,26,34,39 |
| City of Gladwin | 14,16,7,24,25,26,27,28,34,35 |
| Beaverton Twp | 6,25,26,28,35 |
| Billings Twp | 1,3,5,12,13,16,25,26,27,34,39 |
| Buckeye Twp | 1,2,3,5,6,17,18,21,23,24,38,39 |
| Butman Twp | 1,2,3,5,6,17,18,21,23,24,25,26,27,34,38,39 |
| Gladwin Twp | 1,2,3,5,6,17,18,21,23,24,38,39 |
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| Sage Twp | 1,2,3,5,6,13,17,18,21,23,24,38,39 |
| Secord Twp | 1,3,5,12,13,25,26,27,34,39 |
| Sherman Twp | 1,2,3,5,6,17,18,21,23,24,38, 39 |
| Tobacco Twp | 6,25,26,27,28,34,35 |
| Four Lakes Task Force | 1,2,3,6,17,18,21,23,24,38,39 |

1-The complete list of projects can be found in Appendix I on page 247.

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 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 Hazard Mitigation Advisory Committee (GCHMAC) 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 GCHMAC will continue to monitor the status and track the progress of the plan elements on an annual basis. The GCHMAC 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 needs 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 GCHMAC will also evaluate whether mitigation action items need to be discontinued or modified in light of new developments or changes within the County.

During the annual reviews, municipalities will be encouraged to include hazard mitigation goals and objectives when they update planning documents, Master Plans and Comprehensive Land Use Plans, as well as building codes and zoning ordinances. The Emergency Management Director will also be stressing these updates at the Gladwin County council of governments meetings he attends.

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 GCHMAC and its jurisdictions. The GCHMAC'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 annual meetings, in compliance with the Public Meetings Act.

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

• Updates to the plan.

• The Gladwin County plan has been posted on the county website 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

Gladwar County HMP Meeting Virtual Altendees 12-7-21 BILL ERNAT, EMOG Chuck BAIRKOR, MSP DEE JUNG MAN, Gladwin City Mayor Julie REED, Mellissk BLAINE, Phil Andrist, BEAUERTON FIRE DEPARTMENT
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GLADWIN COUNTY

MITIGATION PLAN UPDATE SIGN-IN SHEET

January 13, 2022 Gladwin land Kmp Mkg Alterdece Via Zon Der Jungman, Marche of Gladwins Julie Roco, Eladwins Karon Noore, Chadwins Courty Board of Commissioniers Stacy, Chadwin Priverwalk

Date January 13, 2022

GLADWIN COUNTY

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Gladwin County Steering Committee Meeting Sign-in Sheet Template. 12-1-21.docx

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GLADWIN COUNTY

MITIGATION PLAN UPDATE SIGN-IN SHEET

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Gladwin County Steering Committee Meeting Sign-in Sheet Template. 12-1-21

Gladwin County Steering Committee Meeting Sign-in Sheet Template. 12-1-21

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GLADWIN COUNTY

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APPENDIX B

VOLUNTEER RATE DOCUMENTATION

(WASHINGTON, April 20, 2021) – Today, Independent Sector, with the Do Good Institute, announces that the latest value of a volunteer hour is \$28.54 – up 4.9% from the previous year. Estimated from data collected in 2020, the figure shows the valuable contributions volunteers make to support our communities and country.

According to the Value of Volunteer Time, and using data from AmeriCorps on volunteer hours, volunteers typically contribute nearly \$200 billion to our communities. However, there is evidence that the number of hours volunteered by Americans in 2020 has decreased due to the COVID-19 pandemic. While it will take some years to assess the full extent of impact from COVID-19, a recent study by Fidelity Charitable found that 66% of volunteers have decreased the amount of time they volunteer or stopped entirely due to the pandemic.

The latest value, calculated by the University of Maryland's Do Good Institute, is measured based on hourly earnings released by the U.S. Bureau of Labor Statistics. And while the pandemic certainly had an impact on volunteerism, wages in 2020 for the employed actually increased leading to an increased Value of Volunteer time rate. Learn more about the methodology here.

"As we celebrate our volunteers during National Volunteer Week, we should know just how much value these tireless individuals contribute to creating a healthier and more equitable nation," said Daniel J. Cardinali, president and CEO of Independent Sector. "As we work through our second year of a global pandemic when people, organizations, and communities continue to suffer, the contributions of volunteers have been an often life-saving and critical component to us enduring and rebuilding for future generations to come."

"The incredible challenges presented over the last year have been met time and time again by passionate, motivated, and generous people who are ready to help their neighbors and communities," said Nathan Dietz, senior researcher, Do Good Institute and the researcher responsible for calculating the findings. "All across the country, every day, these volunteers are offering their time and expertise to implement solutions, provide services, and help rebuild communities – but their value is often overlooked or often times is incalculable. This year's Value of Volunteer Time calculations go to show the immensity of their contributions on our nation."

In addition to the national number, Independent Sector also provides the state-level value of volunteer time for all 50 states, the District of Columbia, and Puerto Rico. State level values range from \$13.74/hour for Puerto Rico to \$48.67/hour for the District of Columbia.

For more on the Value of Volunteer Time, the methodology, and to explore historical national and state-level data, visit independentsector.org/volunteer_time.

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Independent Sector is the only national membership organization that brings together a diverse community of changemakers, nonprofits, foundations, and corporations working to strengthen civil society and ensure all people in the United States thrive.

The **Do Good Institute**, housed in the School of Public Policy at the University of Maryland, provides education, programs, research and resources to develop the next generation of nonprofit leaders, social innovators and civic-minded students.

Media Contact:

Bradley Wong 202-467-6122 media@independentsector.org



Independent Sector Releases New Value of Volunteer Time of \$29.95 Per Hour

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As National Volunteer Week is celebrated, new data shows communities benefited from billions contributed through volunteerism despite pandemic challenges in 2021

April 18, 2022 13:30 ET I Source: Independent Sector

' _, !

Bellevue, April 18, 2022 (GLOBE NEWSWIRE) -- (WASHINGTON, April 18,

2022) - Independent Sector, with the DoGood Institute, announced today that the latest value of a volunteer hour is estimated to be \$29.95, which is a 4.9% increase over 2020. Estimated from data collected in 2021, the figure illustrates the valuable contributions volunteers make to support our communities and nation.

According to the Value of Volunteer Time, and using data from AmeriCorps on volunteer hours, volunteers typically contribute nearly

\$200 billion to our communities. There is evidence that the number of hours

volunteered by people in the United States in 2021 has decreased due to the

COVID-19 pandemic. While it will take some years to assess

the full extent of impact from COVID-19, <u>a study Y- FidelitY- Charitable</u> found that 66%

of volunteers have decreased the amount of time they volunteer or stopped entirely

due to the pandemic.

SECTOR

Bureau of Labor Statistics. While the pandemic certainly had an impact on volunteerism, wages in 2021 for the employed actually increased, possibly due to inflation, leading to an increased Value of Volunteer time rate. <u>Learn more about the</u> <u>methodology: here</u>.

"The essential contributions made by our nation's volunteers to lift up, strengthen, and restore communities to make them healthy and equitable for people are always deeply appreciated, but never more so than during the pandemic," said Daniel J. Cardinali, President and CEO of Independent Sector. "Despite COVID-19's devastating impact, which began in 2020 and continues through today, our country's volunteers

continued to show up, virtually and in person, with their compassion,

skills, and abilities. They often put their own lives at risk. They are the threads that connect us as a nation, constantly reinforcing the foundation of civil society and helping build pathways so we all can thrive."

"The formidable challenges presented by the pandemic that persisted throughout 2021 only served to redouble the resolve of our country's volunteers to be a source of comfort and strength for neighbors in communities nationwide," said Nathan Dietz, senior researcher, Do Good Institute, who is responsible for calculating the findings. "While the immensity of the value of their contributions can never truly be calculated, the value of Value of Volunteer Time serves to provide a measure of the significance of the support and services they provide when our communities and neighbors are in need."

In addition to the national number, Independent Sector also provides the state-level value of volunteer time for all SO states, the District of Columbia, and Puerto Rico. State level values range from \$14.11/hour for Puerto Rico to \$50.48/hour for the District of Columbia.

For more on the Value of Volunteer Time, the methodology, and to explore historical national and state-level data, visit indei:2endentsector.org/value-of-volunteer-time-2022. brings together a diverse community of changemakers at nonprofits, foundations, and corporate giving programs working to ensure all people in the United States thrive. Learn more at independentsector.org.

The Do Good Institute, housed in the School of Public Policy at the University of Maryland, provides education, programs, research, and resources to develop the next generation of nonprofit leaders, social innovators and civicminded students.



Value of Volunteer Time increase is largest since start of pandemic

{WASHINGTON, April 19, 2023) - Independent Sector, with the Do Good Institute, announced today that the latest value of a volunteer hour is estimated to be

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\$31.80 - a 6.2 percent increase over 2021. Estimated from data collected in 2022, the figure illustrates the valuable and significant contributions volunteers make every day to support our communities and nation.

Charitable organizations most frequently use the value of volunteer time to recognize the amount of community support an organization receives from its volunteers.

Corporations also use the figure to calculate the value of staff volunteer efforts in communities around the country.

The state and national estimates of the value of volunteer time are based on the method used by Independent Sector in prior years. The primary assumption is that the value of volunteer service is based on the average earnings of private sector workers, excluding those who work on farms or in managerial occupations.

The latest value, calculated by the University of Maryland's Do Good Institute, is measured based on annual average hourly earnings estimates that are available from the Bureau of Labor Statistics. Learn more about the **methodology here** (https://independentsector.org/sector-health/value-of-volunteer-timemethodology/).

The estimates may still understate the full value of volunteer service because they do not consider the many intangible benefits provided by volunteers that cannot be easily quantified.

"It is impossible to place a true dollar amount on the immeasurable contributions of time and effort that volunteers give freely to communities around our nation, whether during times of national disasters, or in daily acts of service," said Dr. Akilah Watkins, President and CEO of Independent Sector. "We do know that without their empathy, bravery, and willingness to risk their lives to ensure residents continued to receive vital services throughout the COVID pandemic, many in our communities would not have fared as well. Volunteers are the ties that bind us as a nation and deserve our highest praise for keeping our democratic ideals alive."

"With the incredible challenges presented over the last few years volunteers have been relied on more and more by mission-driven organizations to implement solutions, provide services, and help their neighbors and communities," said Nathan Dietz, Research Director, Do Good Institute and the researcher responsible for calculating the estimates. "This is the largest year-over-year increase in the value of volunteer time that we've observed since the pandemic began. It probably reflects the impact of inflation {6.5 percent in 2022) as well as the fact that volunteers are more scarce - harder to find, and thus more valuable - than they used to be."

In addition to the national number, Independent Sector also provides the state-level value of volunteer time for all 50 states, the District of Columbia, and Puerto Rico. State level values range from \$14.87 per hour for Puerto Rico to \$50 per hour for the District of Columbia.

For more on the Value of Volunteer Time, the methodology, and to explore historical national and state-level data, visit independentsector.org/resource/value-of- volunteer-time. (http://independentsector.org/resource/value-of-volunteer-time)

###

The **Do Good Institute (https:lldogood.umd.edul),** housed in the School of Public Policy at the University of Maryland, provides education, programs, research, and resources to develop the next generation of nonprofit leaders, social innovators and civic-minded students.

Independent Sector is the only national membership organization that brings together a diverse community of changemakers, nonprofits, foundations, and corporations working to strengthen civil society and ensure all people in the united States thrive.

Learn more atwww.independentsector.org(http://www.independentsector.org)

Media Contact:

Kristina Gawrgy, 202-467-6144, media@independentsector.org (mailto:media@independentsector.org)

APPENDIX C – GLADWIN COUNTY MUNICIPAL SURVEY SUBSECTION

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 community surveys. The results of the surveys 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.

Gladwin County: Rick Grove, County Board of Commissioners; Chris Haupt, Gypsy Moth Coordinator; Karrie Hulme, County Clerk; Mark Justin, County Administrator; Rylie Miller, Road Commissioner; Karen Moore, County Board Chairman; Robert North, Emergency Management Director; Dave Pettersch, Road Commission Manager; Terry Walters, Drain Commissioner City of Gladwin: George Alward, Fire Chief; Nancy Bodnar, Council Member; Dee Jungman, Mayor (2021-2022); Chris Shannon, City Manager; City of Beaverton: Sharon Campbell, Community Development Director (2022); Kimberly Hines, City Manager (2021-2022); Janelle Keen, City Clerk, Shannon Sirpilla, City Manager (2023-), Patrick Stanley, **DPW Director** Beaverton Township: Phil Andrist, Fire Chief Billings Township: Tim Mester, Supervisor; Alan Vincent, Fire Chief Buckeye Township: Kevin VanTiem, Supervisor Bourret Township: Tony Marshall, Supervisor Butman Township: Dan Gonzalez, Supervisor Gladwin Township: Diana Mella, Township Resident; John Mella, Supervisor Grout Township: Hay Township: Mark Mudge, Supervisor Sage Township: Michael Stumpfig, Zoning Administrator Secord Township: Mark Schaefer, Deputy Supervisor (2021-2022); Joel Vernier, Supervisor Sherman Township: Jean Jurgensen, Treasurer; John Jurgensen, Supervisor; Kay Whalen, Clerk Tobacco Township: Chris Bergman, Supervisor, William Oard, Trustee Four Lakes Task Force: Brad Federchuck; Dave Rothman, Board Member; Greg Uhl, Operations Supervisor

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.
MEMO

To: Gladwin County Municipal Representatives

From: Robert North, Gladwin County Emergency Management Director Bill Ernat, EMCOG Program Manager, Special Projects

RE: Community Survey

Date: March 15, 2022

As we have stated at the previous advisory committee meetings, input is mandatory for municipalities wishing to be eligible for FEMA-funded mitigation projects. One of those ways to participate is to respond to the community survey. Attached is the survey as revised at the March advisory committee meeting. All participating municipalities will be required to complete the survey, the information sought from the first three items are mandatory for inclusion in the updated Plan.

We ask that the survey, in its entirety be completed and returned via email to both Bob and Bill at the addresses below, no later than Friday, April 8th.

If you have any questions on any question in the survey, please do not hesitate to contact Bob at <u>rnorth@gladwincounty-mi.gov</u> or Bill at <u>bernat@emcog.org</u>.

Local Municipality

- Please indicated the impact that hazards have on your community. Using recent history (1995 to present) and potential, based on recent trends, please rank each of the hazards in one of the four categories found below. Based on our information, the criteria to rank the hazards by impact is as follows:
 - High Impact-human death(s) and/or property damages in excess of \$1,000,000
 - Medium Impact-major human injuries and/or property damages in excess of \$500,000
 - Low Impact-minor human injuries and/or property damages less than \$500,000
 - No Impact-no injuries and no property damages

| Hazard | High Impact | Medium | Moderate | No Impact |
|------------------------------------|-------------|--------|----------|-----------|
| Lightning | | Impact | Impact | |
| | | | | |
| Riverine Flooding | | | | |
| Pluvial (flash) Flooding | | | | |
| Dam Failures | | | | |
| Structural Fires | | | | |
| Public Health Emergencies | | | | |
| Horse-drawn Vehicles | | | | |
| Thunderstorms | | | | |
| Tornadoes | | | | |
| Wildfires | | | | |
| Ice-sleet Storms | | | | |
| Infrastructure Failures | | | | |
| Snowstorms | | | | |
| Severe Winds | | | | |
| Extreme Heat | | | | |
| Extreme Cold | | | | |
| Energy Emergencies | | | | |
| Passenger Transportation Accidents | | | | |
| Civil Disturbances | | | | |
| Cyberterrorism | | | | |
| Seasonal Population Changes | | | | |
| Drought | | | | |
| Invasive Species | | | | |
| Hail | | | | |
| Scrap Tire Vires | | | | |
| Hazard | | | | |
| Hazardous Materials Incident - | | | | |
| Transportation | | | | |

| Fog | | |
|-------------------------------------|--|--|
| Earthquakes | | |
| Nuclear Attack | | |
| Celestial Impact | | |
| Hazardous Materials Incident-Fixed | | |
| Site | | |
| Petroleum and Gas Pipeline Incident | | |
| Oil and Natural Gas Well Incident | | |
| Terrorism/Sabotage | | |
| Loose Livestock | | |

• FEMA is well aware that municipal resources vary with each municipality. Please identify those resources below that are available to your community either through your community or through another agency. If it is provided by your community, write "self" in the space provided. If the resource is provided by another agency, write "other". If the resource is not available, leave the space blank.

| Planning Staff | |
|-----------------------------|--|
| Public Works Department | |
| Taxing Authority | |
| Building Codes | |
| Local Police Department | |
| County Sheriff | |
| Hospital/Medical Facilities | |
| | |

| Emergency Management Staff | |
|-------------------------------------|--|
| County Emergency Management Staff | |
| Zoning Ordinance/Land Use Plan | |
| Ordinance Authority | |
| Fulltime Fire Department/Equipment | |
| Volunteer Fire Department/Equipment | |
| Emergency Medical Services | |

• FEMA is also looking to identify your assets that are vulnerable to natural hazards. Please indicate which assets are vulnerable to the identified hazards. (Example-which buildings have been flooded in the past.)

| Asset | People | City/ Village/ Township | Police Station | Fire Station | Water treatment Facility | Wells | Warning Siren | School | Health Care Facility |
|------------|--------|-------------------------------|-------------------|-----------------|--------------------------------|-------|------------------|--------|----------------------------|
| Hail | | Tian | | | | | | | |
| Lightning | | | | | | | | | |
| Severe | | | | | | | | | |
| Winds | | | | | | | | | |
| Tornados | | | | | | | | | |
| Extreme | | | | | | | | | |
| Heat | | | | | | | | | |
| Ice/Sleet | | | | | | | | | |
| Storms | | | | | | | | | |
| Snowstorms | | | | | | | | | |
| Extreme | | | | | | | | | |
| Cold | | | | | | | | | |
| Flooding | | | | | | | | | |
| Drought | | | | | | | | | |
| Fog | | | | | | | | | |

• What hazardous events since 1995 have resulted in damaged or loss of property and/or injury/death of human lives in your community? Please include the date and results of the event. (Hazards can be found on the previous page.)

• Does your community have large seasonal shifts in population?

Are there a significant number of seasonal homes in the community?

What is the reason for the large influx of population? Does the influx of population create a threat to your community, and if so, why?

• Are there any annual events held in the community that attract large numbers of people? If so, describe the event(s), location, dates, and approximate attendance. What extra measures are required by your community?

- Does your staff utilize data back-up systems and anti-virus software for the municipality's computers? If no, why not?
- Has your community installed lightning protection devices on the community's infrastructure? If no, why not?
- Does your staff utilize surge protectors on critical electronic equipment? If no, why not?
- What hazard from the first page do you feel your community is best prepared to mitigate (lessen the impact)? Why?
- What hazard from the first page do you feel your community is least prepared to mitigate (lessen the impact)? Why?
- What types of initiatives, improvements or efforts do you think could be implemented that would help reduce your community's vulnerability to specific hazards?

• Are you aware of any properties that have experienced flood damage to their homes on multiple occasions as a result of flood waters?

Local Municipality

Date 03-16-22

Person Completing Survey

HAZARDOUS EVENT DEFINITIONS

BLIZZARDS-includes strong winds (Over 35 mph), drifting snow, low temperatures, and blowing snow that reduces visibility.

CELSTIAL IMPACT-An impact or threatened impact from a meteorite, asteroid, comet, satellite, space vehicle, space debris, or similar objects that may cause physical damages or other disruptions.

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.

CYBERTERRORISM-Unlawful attacks and threats of attack against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political, social, or financial objectives.

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

DROUGHT-A water shortage caused unusual hydraulic conditions such as a deficiency of rainfall, and generally lasting for an extended period of time.

EARTHQUAKES-A shaking or trembling of the ground (or earth's crust) caused by tectonic activity or other seismic forces.

ENERGY EMERGENCY-An actual or potential shortage of gasoline, electrical power, natural gas, fuel oil, or propane-of sufficient magnitude and duration to potentially threaten public health and safety, and/or economic and social stability.

EXTREME TEMPERATURES (COLD)-Prolonged periods of very low temperatures often accompanied by exacerbating conditions such as heavy snowfall and high winds.

EXTREME TEMPERATURES (HEAT)-Prolonged periods of very high temperatures often accompanied by exacerbating conditions such as high humidity and lack of rain.

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

HAIL-Lumps of ice that form in weather systems such as thunderstorms and then fall to earth as solid precipitations.

HAZARDOUS MATERIAL INCIDENTS/FIXED SITE AND PROPANE STORAGE SITES-An

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

HAZARDOUS MATERIAL INCIDENTS/TRANSPORTATION-An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

HORSE-DRAWN VEHICLES-A vehicle powered by horses traveling on municipal roadways, without any hazard or lamp light.

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

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

INVASIVE SPECIES-A species whose introduction to Michigan causses or is likely to cause economic or environmental harm, or harm to human health, to an extent that outweighs the species,' known benefits.

LIGHTNING-The discharge of electricity from within a thunderstorm.

LOOSE LIVESTOCK-Loose farm livestock roaming freely in the County.

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.

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.

OIL/GAS WELL INCIDENT-An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

PASSENGER 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.

PETROLEUM AND NATURAL GAS PIPELINE ACCIDENTS-An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

PLUVIAL AND URBAN FLOODS—The accumulation of water in low-lying and inadequately drained areas, following heavy precipitation events, including structural or power failures in municipal sewage systems, causing water to flood or back-up into houses and other structures, and infrastructure.

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.

RIVERINE (FLUVIAL) FLOODING-The overflowing of rivers, streams, and channels-due to inadequate drainage capacity, drainage system failures, ice or log jams, accumulated sediments, erosion, or meandering, that results in nearby property damage, safety issues, disruption of infrastructure function and services, and/or decreased quality of life.

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.

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

SEASONAL POPULATION CHANGE-A population change for an extended time period, in the county, beyond the normal level of people to which resources are allocated.

SEVERE WINDS-Non-tornadic winds 58 miles per hour (mph) or greater.

SHORELILNE HAZARDS-water -level fluctuations, current and wave actions, and other conditions in the Great Lakes that cause flooding or erosion, or otherwise threaten life, health, and property in shoreline areas, including harmful algal blooms, ice surges, storms surges, meteotsunamis, rip currents, shoreline erosion and recession.

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

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

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

THUNDERSTORM-Weather systems accompanied by strong winds (at least 56 mph), lightning, heavy rain (that could cause flooding), hail, (at least ¼" in diameter), or tornadoes.

TORNADOS-An intense rotating column of wind that extends from the base of a severe thunderstorm to the ground.

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

Please indicated the impact that hazards have on your community. Using recent history (1995 to present) and potential, based on recent trends, please rank each of the hazards in one of the four categories found below. Based on our information, the criteria to rank the hazards by impact is as follows: High Impact-human death(s) and/or property damages in excess of \$1,000,000; Medium Impact-major human injuries and/or property damages in excess of \$500,000; Low Impact-minor human injuries and/or property damages less than \$500,000; No Impact-no injuries and no property damages. (Gladwin County did not complete the survey; however, the hazards and impacts were identified by the Gladwin County Advisory Committee prior to the survey and were used as the base for the survey.)

| Hazard | High Impact | Medium Impact | Moderate Impact | No Impact |
|--|-------------------|------------------|--------------------|----------------------------|
| Lightning | a,k | f | b,d,e,h,I,j,I,m | g |
| Riverine Flooding | a,b,d,i,k,m | f | e,h,j,l | g |
| Pluvial (flash) Flooding | a,d,f,k | b,l | e,h,i | g,j,m |
| Dam Failures | a,d,f,h,I,j,k,I,m | | b,e | g |
| Structural Fires | a,d,k | f,h,i | e,g,j,l | b,m |
| Public Health Emergencies | a,k | b,f,h,i | d,e,g,j,l | m |
| Horse-drawn Vehicles | i,k | b,g | a,d,e,l | f,h,j,m |
| Thunderstorms | а | f,i,k | b,d,e,h,l | g,j,m |
| Tornadoes | d,f | i,k | a,b,e,h,l | g,j,m |
| Wildfires | d | f,k | e,h,i | a,b,g,j,l,m |
| Ice-sleet Storms | а | b,d,f,h,i,k | e,g,l,m | J |
| Infrastructure Failures | а | d,k | b,e,f,h,i,l,m | g,j |
| Snowstorms | | a,b,f,h | d,e,I,j,k,I,m | g |
| Severe Winds | а | f,h,i.k.l | b,d,e,m | g,l |
| Extreme Heat | | а | b,d,e,f,h,i,j,k,l | g,m |
| Extreme Cold | | a,b | d,e,f,h,i,j,j,l,m | g |
| Energy Emergencies | а | b,d,i,k | e,f,h,m | g,j,l |
| Passenger Transportation Accidents | | а | b,d,f,h,I,k | e,g,j,l,m |
| Civil Disturbances | | | d,e,f,k | a,b,g,h,i,j,l,m |
| Cyberterrorism | | | b,d,f,k | a,e,g,h,i,j,l,m |
| Seasonal Population Changes | a,j | | b,d,f,h,i,k,l | e,g,m |
| Drought | а | | d,f,i,l | b,e,g,h,j,k,m |
| Invasive Species | а | b,i,k,m | d,f,h,i,j,l | е |
| Hail | а | i | b,d,e,f,j,k,l | g,h,m |
| Scrap Tire Fires | | k | b,d,f,i | a,e,g,h,j,l,m |
| Hazardous Materials Incident - Transportation | | | b,f,i,k,l | a,d,e,g,h,j,m |
| Fog | i | b | a,f | d,e,g,h,j,k,l,m |
| Earthquakes | | | а | b,d,e,f,g,h,I,j,k,I,m |
| Nuclear Attack | | | | a,b,d,e,f,g,h i,j,k,l,m |

| Celestial Impact | | | a,b,d,e,f,g,h, i,j,k,l,m |
|--|---|-----------|-----------------------------|
| Hazardous Materials Incident-Fixed Site | f | b,e,i,l,m | a,d,g,h,j,k |
| Petroleum and Gas Pipeline Incident | f | a,d,e,i,k | b,g,h,j,l,m |
| Oil and Natural Gas Well Incident | f | a,d,e,i,k | b,g,h,j,l,m |
| Terrorism/Sabotage | | | a,b,d,e,f,g,h i,j,k,l,m |
| Loose Livestock | | i,l | a,b,d,e,f,g,h,j,k,m |

a-City of Beaverton b-City of Gladwin c-Beaverton Township d-Billings Township e-Buckeye Township f-Butman Township g- Gladwin Township h-Hay Township i-Sage Township j-Secord Township k-Sherman Township I-Tobacco Township m-Four Lakes Task Force

1. FEMA is well aware that municipal resources vary with each municipality. Please identify those resources below that are available to your community either through your community or through another agency. If it is provided by your community, write "y" in the space provided. If the resource is provided by another agency, write "*". If the resource is not available, leave the space blank.

| N. unicipality | | Resources Available | | | | | | | | | | | | |
|-----------------------|---|---------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Municipality | Α | В | С | D | Е | F | G | Н | Ι | J | К | L | Μ | Ν |
| City of Beaverton | Y | Υ | Υ | Υ | Υ | * | Υ | | * | Υ | Y | Υ | | Y |
| City of Gladwin | Y | Υ | Υ | Υ | Υ | * | Y | | * | Υ | Y | | Y | Υ |
| Beaverton Township | | | | | | | | | | | | | | |
| Billings Township | Y | | Υ | Υ | | * | * | | * | Υ | Y | | Y | * |
| Bourret Township | | | | | | | | | | | | | Y | |
| Buckeye Township | | | | | | | | | | | Υ | | | |
| Butman Township | * | Υ | Υ | * | | * | * | | * | * | Y | | Y | Y |
| Clement Township | Y | * | Υ | * | | * | * | | * | Υ | Y | * | Y | * |
| Gladwin Township | Y | * | Υ | * | | * | * | | * | Υ | Y | | * | * |
| Hay Township | * | * | Y | * | | * | * | | * | * | Υ | | Y | * |
| Sage Township | Y | * | Y | * | | * | * | | * | Υ | Υ | | * | * |
| Secord Township | * | * | Y | Υ | | * | * | | * | Υ | Υ | | Y | 8 |
| Sherman Township | | | Y | | | | | | | | Υ | | | |
| Tobacco Township | | | Y | Υ | | | | | | | | | Y | |
| Four Lakes Task Force | | * | * | * | | * | * | | * | * | * | | * | * |

A-Planning staff

B-Public Works Department

C-Taxing Authority/Annual Budget

D-Building Codes

E- Local Police Department

F- County Sheriff

G- Hospital/Medical Facilities Ordinance

H- Emergency Management Staff

I-County Emergency Staff

J-Land Use Regulatory Capability (Zoning

Ordinance/Comprehensive Land Use Plan)

K-.Ordinance Authority

L- Full-time Fire Department w/Equip.

M- Parttime/Volunteer Fire Department w/Equip

N-Emergency Medical Services

1. FEMA is also looking to identify your assets that are vulnerable to natural hazards. Please indicate which assets are vulnerable to the identified hazards. (Example-which buildings have been flooded in the past.)

| Asset Hazard | People | City/ Village/ Township Hall | Police Station | Fire Station | Water treatment Facility | Wells | Warning Siren | School | Health Care Facility |
|---------------------|---------------------------|---------------------------------------|-------------------|-----------------|--------------------------------|---------|------------------|--------|----------------------------|
| Hail | a,b,d,e, f,h,l,j,k | a,d,e,f, h,i,j,k | а | a,d,f,j | a,d,f | а | d,i | а | а |
| Lightning | a,b,d,e, h,i,j,k,m | d,e,f,h i,j,k | | a,d,f,j | a,d,f | a,j | a,d,h | | |
| Severe Winds | a,d,e,f, g,h,I,k,I,m | a,d,e,f h,j,k | а | a,d,f,j | a,d,f | а | d,h | а | а |
| Tornados | a,b,d,e,f, h,i,k,m | A,b,d,e, f,h,i,k | a,b | a,b,d f,j | a,b,d,f | a,b | a,b,d,h | a,b | a,b |
| Extreme Heat | A,b,d,e,f h,i,j,k,l,m | a,d,f,h | а | a,d,f | a,d,f | а | а | а | а |
| Ice/Sleet Storms | a,b,d,e,f, h,i,j,k,l,m | a,b,d,e, f,h,j,k | a,b | a,b,d, f,j | a,b,d,f | a,j | a,b,d | a,b | a,b |
| Snowstorms | a,b,d,e,f h,i,j,k,l,m | a,b,d,e, f,h,k | a,b | a,b,d,f | a,b,d,f | а | а | a,b | a,b |
| Extreme Cold | a,b,d,e,f h,i,j,k,l,m | a,d,e, f,h,k | a,d | a,d,f | a,d,f | a,d,j | | а | а |
| Flooding | A,b,d,e,f, i,j,k,l,m | b,e,f,h, i,j,k | d | d,f,j | a,d,f | a,d,I,j | | | |
| Drought | a,b,d,e,f I,j,k,l | e,f,j | d | d,f,j | a,f | a,d,I,j | | а | |
| Fog | a,b,d,e,f i,j,k,m | е | a,b,d | a,b,d | | | | | |

a-City of Beaverton b-City of Gladwin c-Beaverton Township d-Billings Township e-Buckeye Township f-Butman Township g- Gladwin Township h-Hay Township i-Sage Township j-Secord Township k-Sherman Township I-Tobacco Township m-Four Lakes Task Force

2. What hazardous events since 1995 have resulted in damaged or loss of property and/or injury/death of human lives in your community? Please include the date and results of the event. (Hazards can be found on the previous page.)

| Municipality | Hazardous Events |
|--------------------|--------------------------------|
| City of Beaverton | |
| City of Gladwin | May 2020-Flooding |
| Beaverton Township | |
| Billings Township | May 2020-Dam Failure, Flooding |

| Buckeye Township | |
|-----------------------|--|
| Butman Township | May 2020-Flooding, Horse-drawn Vehicles |
| Gladwin Township | May 2020-Flooding, Horse-drawn Vehicle accident with motor vehicle |
| Hay Township | May 2020-Flooding |
| Sage Township | Tornadoes in 1988, 2000 |
| Secord Township | May 2020-Dam Failure |
| Sherman Township | Structural Fires, Tornadoes, Severe Winds |
| Tobacco Township | May 2020-Flooding; 2017-Flooding |
| Four Lakes Task Force | May 2020-Dam Failure, Flooding resulting in \$millions in damages |

3. Does your community have large seasonal shifts in population?

Yes-City of Beaverton, Billings Township, Bourret Township, Butman Township, Hay Township, Sage Township, Secord Township, Sherman Township, Tobacco Township, Four Lakes Task Force

No-City of Gladwin, Buckeye Township, Gladwin Township

Are there a significant number of seasonal homes in the community?

Yes-Billings Township, Butman Township, Hay Township, Sage Township, Secord Township, Sherman Township, Tobacco Township, Four Lakes Task Force

No-City of Beaverton, City of Gladwin, Buckeye Township, Gladwin Township,

What is the reason for the large influx of population? Does the influx of population create a threat to your community, and if so, why?

Billings Township-Seasonal homes. There is an increase in the number of 911 calls.

Butman Township-Seasonal homes. No threat, but increased traffic and noise complaints.

Hay Township-Seasonal homes. No threat.

Sage Township-Retirement. No threat.

Secord Township-Summer recreation. No threat.

Sherman Township-Seasonal/retirement homes (secondary). No threat.

Tobacco Township-Seasonal homes. No threat.

Four Lakes Task Force-Community is comprised of vacation homes. No threat.

4. Are there any annual events held in the community that attract large numbers of people? If so, describe the event(s), location, dates, and approximate attendance. What extra measures are required by your community?

| Municipality | Special Events | | | | | |
|--------------------|--|--|--|--|--|--|
| | July 4 th celebration includes fireworks, grand parade, Fire Cracker 5K race. | | | | | |
| City of Beaverton | Brings in several thousand people. Extra law enforcement is brought in for | | | | | |
| | the day. | | | | | |
| City of Gladwin | County Fair, Jeep Creep. Extra law enforcement is brought in for the | | | | | |
| | events. | | | | | |
| Beaverton Township | | | | | | |
| Billings Township | NA | | | | | |
| Buckeye Township | NA | | | | | |

| Butman Township | Arts and Crafts show on July 4 th . | | |
|-----------------------|--|--|--|
| Gladwin Township | NA | | |
| Hay Township | NA | | |
| Sage Township | NA | | |
| Secord Township | NA | | |
| Sherman Township | NA | | |
| Tobacco Township | NA | | |
| Four Lakes Task Force | Memorial Day, Independence Day, and Labor Day bring in numerous visitors to the lakes. Extra law enforcement is brought in for the days. | | |

5. Does your staff utilize data back-up systems and anti-virus software for the municipality's computers? If no, why not?

Yes-City of Beaverton, City of Gladwin, Billings Township, Buckeye Township, Butman Township, Gladwin Township, Hay Township, Sage Township, Sherman Township, Tobacco Township, Four Lakes Task Force

In progress-Secord Township

Has your community installed lightning protection devices on the community's infrastructure? If no, why not?
Yes-Billings Township, Butman Township, Gladwin Township, Hay Township, Sage Township, Sherman Township

No-City of Gladwin, Buckeye Township, Tobacco Township, Four Lakes Task Force In progress-City of Beaverton, Unsure-Secord Township

 Does your staff utilize surge protectors on critical electronic equipment? If no, why not? Yes-City of Gladwin, Billings Township, Bourret Township, Buckeye Township, Butman Township, Clement Township, Hay Township, Sage Township, Secord Township, Sherman Township, Tobacco Township, Four Lakes Task Force

No-In progress-City of Beaverton Not Applicable-Gladwin Township

8. What hazard from the first page do you feel your community is best prepared to mitigate (lessen the impact)? Why?

| Municipality | Hazard | | |
|--------------------|---|--|--|
| City of Beaverton | Structure fires-fire department is well-trained and equipped. | | |
| City of Gladwin | Snowstorms-well equipped | | |
| Beaverton Township | | | |
| Billings Township | Flooding, Structure Fires, and Wildfires | | |
| Buckeye Township | NA | | |
| Butman Township | Fires with education and Dam Failures with maintenance and inspections. | | |
| Gladwin Township | Structure Fires, and Horse-drawn Vehicles | | |
| Hay Township | Dam safety restoration. | | |
| Sage Township | Dam upgrades on Chappel Dam | | |

| Secord Township | Structure Fires | | |
|-----------------------|---|--|--|
| Sherman Township | NA | | |
| Tobacco Township | Structure Fires-fire department has many resources to address fires. | | |
| Four Lakes Task Force | Dam failures-recent events have made the dams more secure and future modifications will exceed State of Michigan standards. | | |

9. What hazard from the first page do you feel your community is least prepared to mitigate (lessen the impact)? Why?

| Municipality | Hazard | |
|-----------------------|--|--|
| City of Beaverton | Cyberterrorism- | |
| City of Gladwin | Flooding-no control | |
| Beaverton Township | | |
| Billings Township | Tornadoes, no training, infrequent | |
| Buckeye Township | NA | |
| Butman Township | Flooding, but any natural event. | |
| Clement Township | Civil Disturbances-limited police protection. | |
| Gladwin Township | Tornadoes | |
| Hay Township | Flooding | |
| Sage Township | Concerned with the dam withstanding major storms | |
| Secord Township | Dam Failures-insufficient funds. | |
| Sherman Township | All-no first responders are housed in this township. | |
| Tobacco Township | Flooding. Elaborate river/dam system. | |
| Four Lakes Task Force | Ice/Sleet Storms-Community does not have the wherewithal to handle | |
| | these events. | |

10. What types of initiatives, improvements or efforts do you think could be implemented that would help reduce your community's vulnerability to specific hazards?

| Municipality | Initiatives | | |
|--------------------|--|--|--|
| City of Beaverton | Critical Incident Training for staff as it relates to domestic terrorism. | | |
| City of Gladwin | Relocate Community Center out of floodplain | | |
| Beaverton Township | | | |
| Billings Township | Information, training, | | |
| Buckeye Township | NA | | |
| Butman Township | Dam maintenance, informing the public and enforcing "no burn" periods, lights on Horse-drawn Vehicles, monitoring Invasive Species, and big fines for hazardous material spills. | | |
| Gladwin Township | Sirens at townships halls with generators | | |
| Hay Township | Replacement of Heil Rd. bridge. | | |
| Sage Township | Better access to Chappel Dam. | | |
| Secord Township | Generator for Township Hall, dam repair | | |

| Sherman Township | Nixle, Village hall improvements. |
|-----------------------|--|
| Tobacco Township | Improved warning system, |
| Four Lakes Task Force | Dam Failures-limit the impact of future events with improved dams. |

11. Are you aware of any properties that have experienced flood damage to their homes on multiple occasions as a result of flood waters?

Yes-City of Beaverton, City of Gladwin, Hay Township, Sage Township, Sherman Township, Four Lakes Task Force

No-Billings Township, Buckeye Township, Butman Township, Gladwin Township, Tobacco Township

APPENDIX D -

GLADWIN COUNTY CAPABILITY ASSESSMENT

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 two questionnaires 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 Hazard Mitigation Planning Committee (GCHMPC), which was used in advisory capacity for the Gladwin County data. The GCHMPC 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 questionnaire and assessment. The results of the tow items are found in Appendices C and D, which provide feedback on the issues facing each community. A copy of the assessment is included at the end of this section. On the following page with the results of the assessments immediately following.

Local Agency

1. Please identify the Plan, its status and relationship with the Hazard Mitigation Plan in the table below.

| pability Type | Place (yes/no) | es the Plan address hazards? | n the Plan be used to carry out mitigation actions? | ten was the Plan last updated? |
|--------------------------------------|-------------------|------------------------------------|---|-----------------------------------|
| pital Improvements Plan | | | | |
| mate Change Adaption Plan | | | | |
| mmunity Wildfire Protection Plan | | | | |
| mprehensive/ Master Plan | | | | |
| ntinuity of Operations Plan | | | | |
| onomic Development Plan | | | | |
| nd Use Plan | | | | |
| cal Emergency Operations Plan (s) | | | | |
| rmwater Management Plan | | | | |
| Insportation Plan | | | | |
| her: | | | | |

2. Please identify the local ordinances that are in place in your agency.

| nd Use Planning and Ordinances | place (Yes/No) | the ordinance an effective way to reduce hazard impacts? | he ordinance adequately administered and enforced? |
|---|-------------------|---|---|
| quisition of land for open space and public recreation use | | | |
| ilding code | | | |
| od insurance rate maps | | | |
| odplain ordinances | | | |
| tural hazard-specific ordinance (stormwater, wildfire, etc.) | | | |
| odivision Ordinance | | | |
| ning Ordinances | | | |
| her | | | |

How can these capabilities be expanded and improved to reduce risk?

3. Staff and technical capabilities are critical in carrying out the mitigation actions. If local staff is not available but these activities are addressed by an outside agency, please indicate in the space provided.

| | | | Is staffing | Is staff | Is coordination |
|----------------|----------|-----------------|--------------|-------------|-----------------|
| A govern Ctoff | In place | Outside Agency | adequate to | trained on | between agency |
| Agency Starr | (Yes/No) | (If applicable) | enforce | hazards and | and staff |
| | | | regulations? | mitigation? | effective? |
| Chief Building | | | | | |
| Official | | | | | |
| Civil Engineer | | | | | |
| (including dam | | | | | |
| and levee | | | | | |
| safety) | | | | | |
| Community | | | | | |
| Planner | | | | | |
| Emergency | | | | | |
| Planner | | | | | |
| Floodplain | | | | | |
| Administrator | | | | | |
| GIS | | | | | |
| Coordinator | | | | | |
| Planning | | | | | |
| Commission | | | | | |
| Technical | | | | | |
| Grant Writing | | | | | |
| Hazard Data | | | | | |
| GIS Analysis | | | | | |
| Mutual Aid | | | | | |
| Agreements | | | | | |

4. Financial capability is also important as FEMA would like to know what financial capabilities each agency has or has access to regarding grants.

| Funding Resource | In Place (Yes/No) | Has the funding resource been used in the past and for what type of activities? | Could the resource be used to fund future mitigation actions? |
|-------------------|----------------------|---|---|
| Capital | | | |
| improvements | | | |
| project funding | | | |
| Community | | | |
| Development Block | | | |
| Grant (CDBG) | | | |

| Federal funding | | |
|--------------------|--|--|
| programs (non- | | |
| FEMA) | | |
| Fees for water, | | |
| sewer, gas, or | | |
| electric services | | |
| Impact fees for | | |
| new development | | |
| State funding | | |
| programs | | |
| Stormwater utility | | |
| fee | | |

How can these capabilities be expanded and improved to reduce risk?

5. What forms of outreach are available or could be available to be utilized to carry out mitigation activities and share mitigation information.

| gram/Organization | Place | w widespread are each of these |
|---|----------|--------------------------------|
| | (Tes/NO) | |
| mmunity newsletters | | |
| Hazard awareness campaigns (such as Firewise, | | |
| Storm Ready, Severe Weather Awareness Week, | | |
| school programs, public events) | | |
| Local news | | |
| Organization that interact with underserved and | | |
| vulnerable communities | | |

On the tables in the following pages, the columns will be the communities as identified below:

- a-County of Gladwin b-City of Beaverton
- g-Butman Township
- h- Gladwin Township
- c-City of Gladwin
- i- Hay Township j- Sage Township
- d-Beaverton Township e- Billings Township
- k- Secord Township
- f- Buckeye Township
- l- Sherman Township

- m- Tobacco Township

 - n- Four Lakes Task Force
 - o- Gladwin County Drain Commission

| Agency Capability | а | b | С | d | е | f | g | h | i | j | k | I | m | n | 0 |
|----------------------|------|------|------|----|-----|----|----|------|----|------|-----|------|-----|------|-----|
| Capital | | | | | | | | | | | | | | | |
| Improvements | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | No | No | No | No | Yes | No | No | No | Yes | No | Yes | Yes |
| Address | No | Vec | Ves | | | | | No | | | | Ves | | Ves | |
| Hazards | NO | 105 | 103 | | | | | | | | | 103 | | 103 | |
| Mitigation | No | Yes | Yes | | | | | No | | | | Yes | | Yes | |
| Actions | NO | 105 | 105 | | | | | | | | | 105 | | 105 | |
| Last updated | 2023 | 2023 | 2022 | | | | | 2022 | | | | 2023 | | 2023 | |
| Climate | | | | | | | | | | | | | | | |
| Change | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes | No |
| Community | | | | | | | | | | | | | | | |
| Wildfire | | | | | | | | | | | | | | | |
| Protection | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | Yes | No | No | No | No | No | No | No | No | NA | Yes |
| Comp Plan/ | | | | | | | | | | | | | | | |
| Master Plan | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | No | no | No | No | No | No | Yes | Yes | No | Yes | NA | Yes |
| Address | No | Voc | Voc | | | | | | | No | | | Voc | | Voc |
| Hazards | NO | Tes | Tes | | | | | | | NO | | | 165 | | 165 |
| Mitigation | No | Voc | Voc | | | | | | | Voc | | | Voc | | Voc |
| Actions | NU | 165 | 165 | | | | | | | 162 | | | 162 | | 162 |
| Last Updated | 2008 | 2020 | 2020 | | | | | | | 2020 | | | | | |

1. Please identify the Plan, its status and relationship with the Hazard Mitigation Plan in the table.

| Agency Capability | а | b | С | d | е | f | g | h | i | j | k | | М | n | 0 |
|----------------------|------|------|------|-----|------|----|----|------|----|------|------|------|----|-----|-----|
| Continuity of | | | | | | | | | | | | | | | |
| Operations | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | No | No | No | No | No | No | No | Yes | No | Yes | Yes |
| Address | | | | | | | | | | | | Yes | | Yes | Yes |
| Hazards | | | | | | | | | | | | 105 | | 105 | 105 |
| Mitigation | | | | | | | | | | | | Ves | | Ves | Ves |
| Actions | | | | | | | | | | | | 103 | | 103 | 103 |
| Last Updated | | | | | | | | | | | | 2022 | | Yes | |
| Economic | | | | | | | | | | | | | | | |
| Development | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | Yes | No | Yes | No | No | No | No | Yes | No | No | No | No | No | NA | Yes |
| Address | No | | Voc | | | | | Voc | | | | | | | 20 |
| Hazards | INO | | res | | | | | res | | | | | | | 110 |
| Mitigation | No | | Voc | | | | | | | | | | | | Voc |
| Actions | INO | | res | | | | | | | | | | | | res |
| Last Updated | 2022 | | 2022 | | | | | 2022 | | | | | | | |
| Land Use Plan | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | Yes | Yes | No | No | No | No | Yes | Yes | No | No | NA | Yes |
| Address | Nie | Vaa | | | Vaa | | | | | Vee | | | | | |
| Hazards | INO | res | | | res | | | | | res | | | | | no |
| Mitigation | No | Vec | | | Vec | | | | | Vac | | | | | Vac |
| Actions | INO | res | | | res | | | | | res | | | | | res |
| Last Updated | 2006 | 2022 | 2019 | | 2010 | | | | | 2020 | 2015 | | | | |

| Agency Capability | а | b | с | d | е | f | g | h | i | j | k | I | М | n | 0 |
|------------------------|----|------|------|------|-----|----|----|----|----|-----|----|----|----------|------|-----|
| Local | | | | | | | | | | | | | | | |
| Emergency | | | | | | | | | | | | | | | |
| Operations Plan | | | | | | | | | | | | | | | |
| In Place | No | Yes | Yes | Yes | Yes | No | No | No | No | No | No | No | Yes | Yes | Yes |
| Address Hazards | | Yes | Yes | Yes | Yes | | | | | | | | Yes | Yes | Yes |
| Mitigation | | Voc | Voc | Voc | Voc | | | | | | | | Voc | Voc | Voc |
| Actions | | 163 | 163 | 163 | 163 | | | | | | | | 163 | 163 | 163 |
| Last Updated | | 2020 | 2023 | 2023 | | | | | | | | | Annually | 2023 | |
| Stormwater | | | | | | | | | | | | | | | |
| Management | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | No | Yes | No | No | Yes | No | No | No | No | No | No | No | No | Yes | Yes |
| Address Hazards | | Yes | | | Yes | | | | No | No | No | No | | Yes | Yes |
| Mitigation | | Voc | | | Voc | | | | | | | | | Voc | Voc |
| Actions | | 163 | | | 163 | | | | | | | | | 163 | 163 |
| Last Updated | | 2020 | | | No | | | | | | | | | 2023 | |
| Transportation | | | | | | | | | | | | | | | |
| Plan | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | No | No | No | No | No | Yes | No | No | No | NA | Yes |
| Address Hazards | | | | | | | | | | | | | | | Yes |
| Mitigation | | | | | | | | | | | | | | | Voc |
| Actions | | | | | | | | | | | | | | | 162 |
| Last Updated | | | | | | | | | No | Yes | No | No | | NA | Yes |

| Agency Ordinance | а | b | с | d | е | f | g | h | i | j | k | I | m | n | 0 |
|---------------------------------------|-----|-----|-----|-----|------|----|----|-----|----|----|----|----|-----|----|-----|
| Acquisition of Land | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | No | No | No | No | No | No | No | No | No | NA | Yes |
| Effective to reduce | | | | | | | | | | | | | | | Ves |
| hazard impacts | | | | | | | | | | | | | | | 103 |
| Enforced | | | | | | | | | | | | | | | Yes |
| Building Code | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | Yes | Yes | No | No | Yes | No | No | No | No | Yes | NA | Yes |
| Effective to reduce hazard impacts | No | Yes | Yes | | No | | | Yes | | | | | | | Yes |
| Enforced | Yes | Yes | Yes | | Yes | | | Yes | | | | | | | Yes |
| Flood Insurance Rate Maps | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | No | Yes | No | No | No | No | No | No | No | No | NA | Yes |
| Effective to reduce | | | Ves | | | | | | | | | | | | Ves |
| hazard impacts | | | 105 | | | | | | | | | | | | 105 |
| Enforced | | | Yes | | | | | | | | | | | | no |
| Floodplain Ordinance | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | No | Yes | No | No | No | No | No | No | No | No | NA | Yes |
| Effective to reduce hazard impacts | | | Yes | | Yes | | | | | | | | | | no |
| Enforced | | | Yes | | 2019 | | | | | | | | | | no |
| Natural Hazard | | | | | | | | | | | | | | | |
| Ordinance | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | No | Yes | No | No | | No | No | No | No | No | No | |
| Effective to reduce | | | Yes | | Yes | | | | | | | | | | |
| Fnforced | | | Ves | | Ves | | | | | | | | | | |
| Enforced | | | res | | res | | | | | | | | | | |

2. Please identify the local ordinances that are in place in your agency.

| Agency Ordinance | а | b | с | d | е | f | g | h | i | j | k | I | m | n | 0 |
|---------------------------------------|-----|-----|-----|-----|-----|----|----|-----|----|-----|-----|----|-----|----|-----|
| Subdivision | | | | | | | | | | | | | | | |
| Ordinance | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | Yes | Yes | No | No | No | No | Yes | No | No | Yes | NA | Yes |
| Effective to reduce hazard impacts | | | Yes | | No | | | | | Yes | | | | | Yes |
| Enforced | | | Yes | | No | | | | | Yes | | | | | no |
| Zoning Ordinance | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | No | Yes | NA | Yes |
| Effective to reduce hazard impacts | No | Yes | Yes | | No | | | Yes | | Yes | | | | | Yes |
| Enforced | Yes | Yes | Yes | | No | | | Yes | | Yes | | | | | Yes |

How can these be capabilities be expanded and improved to reduce risk?

Gladwin County: Need to overlay each county plan with the Hazard Mitigation Plan when complete.

City of Beaverton:

City of Gladwin: the City of Gladwin can work closer with our strategic local partners to share resources.

Beaverton Township: No response.

Billings Township: Building codes, no building in floodplain, update Zoning Ordinance to better address hazards

Buckeye Township: Funding-personnel

Butman Township: We need people to do these and money to pay for it. No staff; no funding.

Gladwin Township: Building codes must be updated, do not build in swamps (floodplain), use of law enforcement

Grim Township: Advisory Committee to inform populus of company or corporation plans for manufacturing of large scale. Better manufacturing windmill and solar industries.

Hay Township: Assist in writing plan with legal assistance for grant funds.

Sage Township: No comment.

Secord Township: Ongoing review and update of current zoning ordinance. Floodplain to be addressed.

Sherman Township: Increased funding.

Tobacco Township: No response.

Four Lakes Task Force: The Four Lakes Task Force does not have the authority to perform land use planning or enact ordinances outside the dam properties.

Gladwin County Drain Commission: No comment.

3. Staff and technical capabilities are critical in carrying out the mitigation actions. If local staff is not available, but these activities are addressed by an outside agency, please indicate in the space provided.

| Agency Staff | а | b | С | d | е | f | g | h | i | j | k | I | m | n | 0 |
|----------------------------------|------|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Building Official | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | No | No | No | No | No | No | No | No | No | No | No | No | Yes |
| Outside Agency | | | Yes | Yes | Yes | Yes | No | | Yes | No | Yes | | Yes | Yes | |
| Staff Adequate | No | Yes | | | Yes | NA | | | Yes | | | | | Yes | Yes |
| Trained on hazards/mitigation | No | Yes | | | Yes | NA | | | ? | | | | | Yes | |
| Coordination | NA | Yes | Yes | | Yes | NA | | | ? | | | | | Yes | Yes |
| Civil Engineer | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes |
| Outside Agency | FLTF | Yes | | Yes | Yes | No | No | | Yes | No | Yes | | Yes | Yes | Yes |
| Staff Adequate | Yes | Yes | | | Yes | | | | Yes | | | | | Yes | no |
| Trained on hazards/mitigation | No | Yes | | | Yes | | | | ? | | | | | Yes | Yes |
| Coordination | Yes | Yes | | | Yes | | | | ? | | | | | Yes | Yes |
| Community Planner | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | Yes | No | No | No | No | No | No | No | No | NA | No |
| Outside Agency | No | Yes | Yes | | Yes | No | No | | No | Yes | No | | | | No |
| Staff Adequate | | Yes | Yes | | No | | | | | Yes | | | | | |
| Trained on hazards/mitigation | | Yes | Yes | | No | | | | | No | | | | | |
| Coordination | | Yes | Yes | | No | | | | | Yes | | | | | |
| Emergency Planner | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | | No | No | No | No | No | No | No | No | No | No | Yes |
| Outside Agency | | | Yes | | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | | Yes | |
| Staff Adequate | Yes | | | | | | | | No | | | | | Yes | Yes |
| Trained on hazards/mitigation | Yes | | | | | | | | Yes | | | | | Yes | Yes |
| Coordination | NA | | | | | | | | Yes | | | | | Yes | Yes |

| Agency Staff | а | b | С | d | е | f | g | h | i | j | k | I | m | n | 0 |
|---------------------|-----|-----|-----|-----|-----|------|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Floodplain | | | | | | | | | | | | | | | |
| Administrator | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | No | No | No | No | | No | No | No | No | NA | No |
| Outside Agency | | Yes | Yes | | Yes | Yes | No | Yes | | | | | | | Yes |
| Staff Adequate | | Yes | | | Yes | | | | | | | | | | no |
| Trained on hazards/ | | Voc | | | Voc | | | | | | | | | | Voc |
| mitigation | | 163 | | | 163 | | | | | | | | | | 163 |
| Coordination | | Yes | | | Yes | | | | | | | | | | Yes |
| GIS Coordinator | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | No | No | No | No | Yes | No | No | No | No | NA | Yes |
| Outside Agency | NA | Yes | Yes | Yes | Yes | No | No | | Yes | | Yes | | Yes | | |
| Staff Adequate | NA | Yes | | | Yes | | | | ? | | | | | | Yes |
| Trained on hazards/ | ΝΔ | Voc | | | Voc | | | | 2 | | | | | | Voc |
| mitigation | NA. | 163 | | | 163 | | | | : | | | | | | 163 |
| Coordination | NA | Yes | | | Yes | | | | ? | | | | | | Yes |
| Planning Commission | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | No | Yes | No | No | Yes | Yes | Yes | Yes | No | Yes | NA | Yes |
| Outside Agency | NA | NA | | Yes | | Yes | No | | Yes | | | Yes | No | | |
| Staff Adequate | Yes | Yes | Yes | | Yes | NA | | | Yes | Yes | Yes | | Yes | | Yes |
| Trained on hazards/ | Ves | Ves | Ves | | No | ΝΔ | | | 2 | No | No | | Ves | | Vec |
| mitigation | 103 | 103 | 103 | | NO | INA. | | | • | NO | NO | | 103 | | 103 |
| Coordination | Yes | Yes | Yes | | No | NA | | | ? | Yes | | | Yes | | Yes |
| Technical | | | | | | | | | | | | | | | |
| Grant Writing | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | Yes | No | No | Yes | No | No | No | No | No | Yes | Yes |
| Outside Agency | NA | Yes | | | Yes | No | No | Yes | No | | No | | | | |
| Staff Adequate | | Yes | | | No | | | | | | | | | Yes | Yes |
| Trained on hazards/ | | Yes | | | No | | | | | | | | | Yes | Yes |
| mitigation | | 103 | | | | | | | | | | | | | 105 |
| Coordination | | Yes | | | No | | | | | | | | | Yes | Yes |

| Agency | а | b | С | D | е | f | g | h | i | j | k | I | m | n | 0 |
|-----------------------------------|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|----|-----|-----|-----|
| Hazard Data | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes |
| Outside Agency | | Yes | | | Yes | No | | | No | | No | | | Yes | |
| Staff Adequate | | Yes | | | Yes | | | | | | | | | Yes | Yes |
| Trained on hazards/ mitigation | | Yes | | | Yes | | | | | | | | | Yes | Yes |
| Coordination | | Yes | | | Yes | | | | | | | | | Yes | Yes |
| GIS Analysis | | | | | | | | | | | | | | | |
| In Place | Yes | No | No | No | No | No | No | No | No | No | No | No | No | No | Yes |
| Outside Agency | | Yes | | Yes | Yes | No | No | | No | | No | | Yes | Yes | |
| Staff Adequate | Yes | Yes | | | Yes | | | | | | | | | Yes | Yes |
| Trained on hazards/ mitigation | No | No | | | Yes | | | | | | | | | Yes | Yes |
| Coordination | Yes | Yes | | | Yes | | | | | | | | | Yes | Yes |
| Mutual Aid | | | | | | | | | | | | | | | |
| Agreements | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | No | Yes | NA | Yes |
| Outside Agency | | | | | Yes | | No | | Yes | | | | | | |
| Staff Adequate | | Yes | Yes | No | Yes | | | | ? | Yes | Yes | | NA | | Yes |
| Trained on hazards/ mitigation | | Yes | Yes | Yes | Yes | | | | ? | Yes | Yes | | Yes | | Yes |
| Coordination | | Yes | Yes | Yes | Yes | | | | ? | Yes | Yes | | Yes | | Yes |

| 4. | Financial capability is also important as FEMA would like to know what financial capabilities each agency has or has access to regarding |
|----|--|
| | grants. |

| Agency Staff | а | b | С | d | е | f | g | h | i | j | k | I | m | n | 0 |
|---------------------------------|-----|-----|----------------------|----|------|------|-----------|----|------|----|----|-----|-----|-----|-----|
| Capital Improvements Funding | | | | | | | | | | | | | | | |
| In Place | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | No | No | Yes | No | Yes | Yes |
| Used in the past, for what? | i | No | Yes | | lii | i | Ι | | I | | | No | | ii | Yes |
| Mitigation? | no | No | Yes | | Yes | No | Yes | | No | | | No | | | Yes |
| CDBG | | | | | | | | | | | | | | | |
| In Place | No | Yes | Yes | No | No | No | No | No | No | No | No | No | No | No | Yes |
| Used in the past, for what? | | Yes | No | | | | | | | | | | | | |
| Mitigation? | | No | Yes | | | | | | | | | | | | |
| Federal Funding/ non-FEMA | | | | | | | | | | | | | | | |
| In Place | No | Yes | Yes | No | Yes | Yes | Yes | No | Yes | No | No | No | No | No | Yes |
| Used in the past, for what? | | Yes | EDA, HUD, USDA | | USDA | ARPA | ARPA | | ARPA | | | | | | |
| Mitigation? | | Yes | Yes | | No | | | | | | | | | | |
| Utility Fees | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | No | Yes | No | Yes | No | No | No | No | No | Yes | No | Yes |
| Used in the past, for what? | | | Maint. | | | | Sewe r | | | | | | | | |
| Mitigation? | | | Yes | | | | | | | | | | | | |
| Impact Fees | | | | | | | | | | | | | | | |
| In Place | No | No | Yes | No | No | No | No | No | No | No | No | No | No | No | |
| Used in the past, for what? | | | Yes | | | | | | | | | | | | |
| Mitigation? | | | Yes | | | | | | | | | | | | |

| Agency Staff | а | b | с | d | е | f | g | h | i | j | k | I | m | n | 0 |
|--------------------------------|-----|----|-----|----|-----|----|------|-----|----|----|----|----|-----|-----|-----|
| State Funding | | | | | | | | | | | | | | | |
| In Place | Yes | No | Yes | No | Yes | No | Yes | Yes | No | No | No | No | Yes | Yes | Yes |
| Used in the past, for what? | ii | | | | | | ARPA | | | | | | | ii | Yes |
| Mitigation? | No | | Yes | | | | | | | | | | | Yes | Yes |
| Stormwater Fees | | | | | | | | | | | | | | | |
| In Place | No | No | No | No | No | No | No | Yes | No | No | No | No | No | No | Yes |
| Used in the past, for what? | | | | | | | | | | | | | | | Yes |
| Mitigation? | | | | | | | | | | | | | | | yes |

Responses to the above answers are identified below. i: building improvements ii: law enforcement, courts, prosecutor iii: 2020 flood, USDA

How can these capabilities be expanded and improved to reduce risk?

Gladwin County: overall awareness of risks and potential harm to community

City of Beaverton: The City is actively seeking grants for assistance with water/sewer fees.

City of Gladwin: City may consider a stormwater fee.

Beaverton Township: No response.

Billings Township: Hire a grant writer to seek additional grants, specifically CDBG.

Buckeye Township: Funding-personnel

Butman Township: Need more staff and money.

Gladwin Township:

Grim Township: Information supplied to local townships through internet, news print, television, countywide escrow account with strict oversight. Hay Township: Obtain grants to fund projects and staff.

Sage Township: A local assessment committee will be needed, as few if any of these issues have considered at the township level.

Secord Township: Need expertise and funding for grants in these areas.

Sherman Township: Increased funding, source for free money.

Tobacco Township: No response.

Four Lakes Task Force: The Four Lakes Task Force has imposed a Special Assessment for operations and maintenance on benefitting properties around the lakes. Another assessment for capital improvement is in progress. This is authority that Four Lakes Task Force possesses as a delegated authority under state law.

Gladwin County Drain Commission: No comment.

5. What forms of outreach are available or could be available to be utilized to carry our mitigation activities and share mitigation information.

| Agency Staff | а | b | С | d | е | f | g | h | i | j | k | I | m | n | о |
|--|----|-----|---------|--------------|-------|----|-----|-----|--------|-----|-----|-----|--------------|-----------------|-----|
| Community Newsletters | | | | | | | | | | | | | | | |
| In place | No | Yes | Yes | No | Yes | No | Yes | Yes | No | No | No | Yes | No | Yes | No |
| How widespread. | | All | All | | All | | All | | | | | All | | All | |
| Hazard awareness campaigns. | | | | | | | | | | | | | | | |
| In place | No | Yes | Yes | Yes | Yes | No | No | No | Yes | No | No | No | Yes | Yes | Yes |
| How widespread. | | All | | All | Phone | | | | Nextel | | | | All | River gauges | |
| Local News | | | | | | | | | | | | | | | |
| In place | No | Yes | Yes | Yes | No | No | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes |
| How widespread. | | | Limited | Per event | | | All | | | | | | Per event | Local Papers | |
| Organizations interacting with underserved and vulnerable communities. | | | | | | | | | | | | | | | |
| In place | No | Yes | Yes | No | No | No | No | No | No | No | Yes | no | No | Yes | Yes |
| How widespread. | | All | Limited | | | | | | | | All | | | Yes | No |

APPENDIX E –

GLADWIN COUNTY RESIDENTIAL SURVEY RESPONSES

MEMO

- To: Gladwin County Residents
- From: Robert North, Gladwin County Emergency Management Director Bill Ernat, EMCOG Program Manager, Special Projects
- **RE:** Residential Survey

Date: April 19, 2022

Attached is a residential survey for Gladwin County residents to complete. We are seeking information regarding hazards that you have experienced since you have lived in your current residence in Gladwin County. Your information will be very helpful and will assist County volunteers and officials update the 2016 Gladwin County Hazard Mitigation Plan.

We thank you for taking time out of your schedule to assist us in this very important process.

If you have any questions on the survey itself or any questions on the survey, please do not hesitate to contact Bob North at <u>morth@gladwincounty-mi.gov</u> or Bill Ernat at <u>bernat@emcog.org</u>.

Welcome! Gladwin County is in the process of updating the 2016 Gladwin County Hazard Mitigation Plan as required by the Federal Emergency Management Agency (FEMA) to qualify for hazard mitigation funding. As part of this process, the Gladwin County Hazard Advisory Committee (Committee) would like your feedback and is seeking your assistance in identifying the concerns of Gladwin County residents as they relate to natural and man-made hazards. Please fill out the survey, as all the information will be useful in the update process. Thank you for taking the time to assist the Committee in this very important process. Please return to your local municipality city/township hall by May 5th.

| 1. | Please identify the Municipality/Township in which you live. | | | | | |
|--|--|-----|----|--|--|--|
| 2. | Do you own your home? | Yes | No | | | |
| | Is this your primary residence? | Yes | No | | | |
| 3. | Do you have internet access at home? | Yes | No | | | |
| If so, how do you access the internet? | | | | | | |
| 4. | Do you own a smart phone? | Yes | No | | | |
| 5. | How long have you lived at your current address? | | | | | |
| | | | | | | |

Please indicate below the greatest level of impact significant events for each hazard have had on you, your family, and/or your property since you have lived in your current address.
Please use the following levels:
A live and a second to the property in the property of the prop

0-No Impact1-Minor damages to the property2-Significant property damages3-Significant property damages with injuries to the occupants

| Event | No Impact | Impact but no Significant Damage | Significant Damage | Significant Damages with Injuries |
|--------------------------------|-----------|--|-----------------------|---|
| Celestial Impact | | | | |
| Civil Disturbances | | | | |
| Cyberterrorism | | | | |
| Dam Failures | | | | |
| Drought | | | | |
| Earthquakes | | | | |
| Energy Emergencies | | | | |
| Extreme Cold | | | | |
| Extreme Heat | | | | |
| Fog | | | | |
| Gas/Oil Pipeline Incidents | | | | |
| Gas/Oil Well Incidents | | | | |
| Event | No Impact | Impact but no Significant Damage | Significant Damage | Significant Damages with Injuries |
| Hail | | | | |
| Hazardous Materials Fixed Site | | | | |

| Hazardous Materials-Transportation | | |
|------------------------------------|--|--|
| Horse-Drawn Vehicles | | |
| Ice/Sleet Storms | | |
| Infrastructure Failures | | |
| Invasive Species | | |
| Lightning | | |
| Loose Livestock | | |
| Passenger Vehicle Traffic Accident | | |
| Pluvial (flash) Flooding | | |
| Public Health Emergencies | | |
| Riverine Flooding | | |
| Scrap Tire Fires | | |
| Seasonal Population Changes | | |
| Severe Winds | | |
| Snowstorms | | |
| Special Events | | |
| Structural Fires | | |
| Terrorism/Sabotage | | |
| Thunderstorms | | |
| Tornadoes | | |
| Wildfires | | |

7. How are you currently notified when there is a disaster or emergency? (Check all that apply.)

Radio/Television _____ Mobile Alert _____ Public Service Announcement _____ Other _____ Outdoor warning siren _____ Landline _____ Emergency Weather Radio _____ Not Notified _____

Is this notification system effective? Why or why not?

8 Do you currently have flood insurance?

Yes _____ No _____ Not Required _____

9. Have you taken measures to make your home/property more resilient to disasters? If Yes _____, what are they? No_____ Not Sure _____

- 10. Does your family have a Family Disaster Kit? Yes _____ No _____
- 11. Do you or a member of your family have a special needs that would require assistance during a disaster? If so, what are those needs? Yes _____ No _____

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HAZARDOUS EVENT DEFINITIONS

BLIZZARDS-includes strong winds (Over 35 mph), drifting snow, low temperatures, and blowing snow that reduces visibility.

CELSTIAL IMPACT-An impact or threatened impact from a meteorite, asteroid, comet, satellite, space vehicle, space debris, or similar objects that may cause physical damages or other disruptions.

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.

CYBERTERRORISM-Unlawful attacks and threats of attack against computers, networks, and the information stored therein when done to intimidate or coerce a government or its people in furtherance of political, social, or financial objectives.

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

DROUGHT-A water shortage caused unusual hydraulic conditions such as a deficiency of rainfall, and generally lasting for an extended period of time.

EARTHQUAKES-A shaking or trembling of the ground (or earth's crust) caused by tectonic activity or other seismic forces.

ENERGY EMERGENCY-An actual or potential shortage of gasoline, electrical power, natural gas, fuel oil, or propane-of sufficient magnitude and duration to potentially threaten public health and safety, and/or economic and social stability.

EXTREME TEMPERATURES (COLD)-Prolonged periods of very low temperatures often accompanied by exacerbating conditions such as heavy snowfall and high winds.

EXTREME TEMPERATURES (HEAT)-Prolonged periods of very high temperatures often accompanied by exacerbating conditions such as high humidity and lack of rain.

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

HAIL-Lumps of ice that form in weather systems such as thunderstorms and then fall to earth as solid precipitations.

HAZARDOUS MATERIAL INCIDENTS/FIXED SITE AND PROPANE STORAGE SITES-An uncontrolled release of hazardous materials from a fixed site, capable of posing a risk to health, safety, property, and the environment.

HAZARDOUS MATERIAL INCIDENTS/TRANSPORTATION-An uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment.

HORSE-DRAWN VEHICLES-A vehicle powered by horses traveling on municipal roadways, without any hazard or lamp light.

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

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

INVASIVE SPECIES-A species whose introduction to Michigan causses or is likely to cause economic or environmental harm, or harm to human health, to an extent that outweighs the species,' known benefits.

LIGHTNING-The discharge of electricity from within a thunderstorm.

LOOSE LIVESTOCK-Loose farm livestock roaming freely in the County.

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.

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.

OIL/GAS WELL INCIDENT-An uncontrolled release of oil or gas, or the poisonous by-product hydrogen sulfide, from wells.

PASSENGER 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.

PETROLEUM AND NATURAL GAS PIPELINE ACCIDENTS-An uncontrolled release of petroleum or natural gas, or the poisonous by-product hydrogen sulfide, from a pipeline.

PLUVIAL AND URBAN FLOODS—The accumulation of water in low-lying and inadequately drained areas, following heavy precipitation events, including structural or power failures in municipal sewage systems, causing water to flood or back-up into houses and other structures, and infrastructure.

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.

RIVERINE (FLUVIAL) FLOODING-The overflowing of rivers, streams, and channels-due to inadequate drainage capacity, drainage system failures, ice or log jams, accumulated sediments, erosion, or meandering, that results in nearby property damage, safety issues, disruption of infrastructure function and services, and/or decreased quality of life.

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.

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

SEASONAL POPULATION CHANGE-A population change for an extended time period, in the county, beyond the normal level of people to which resources are allocated.

SEVERE WINDS-Non-tornadic winds 58 miles per hour (mph) or greater.

SHORELILNE HAZARDS-water -level fluctuations, current and wave actions, and other conditions in the Great Lakes that cause flooding or erosion, or otherwise threaten life, health , and property in shoreline areas, including harmful algal blooms, ice surges, storms surges, meteotsunamis, rip currents, shoreline erosion and recession.

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

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

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

THUNDERSTORM-Weather systems accompanied by strong winds (at least 56 mph), lightning, heavy rain (that could cause flooding), hail, (at least ¼" in diameter), or tornadoes.

TORNADOS-An intense rotating column of wind that extends from the base of a severe thunderstorm to the ground.

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

GLADWIN RESIDENTIAL SURVEY RESULTS

There were 40 responses to the Gladwin County Residential Survey. Of these responses 39 were complete and one had a missing page. The results include only the responses from the completed surveys.

Question 1. Please identify the municipality/township in which you live.

| Municipality | Responses | Municipality | Responses |
|--------------------|-----------|------------------|-----------|
| City of Beaverton | 1 | Grout Township | 1 |
| City of Gladwin | 3 | Hay Township | 7 |
| Beaverton Township | 1 | Sage Township | 1 |
| Butman Township | 11 | Secord Township | 1 |
| Clement Township | 1 | Sherman Township | 9 |
| Gladwin Township | 2 | None Identified | 1 |

| Question 2. | Do yo Yes | u own your own home? 37 | No | 2 |
|-------------|----------------|-------------------------------------|----------|---|
| | ls this Yes | your primary residence? 37 | No | 2 |
| Question 3. | Do you Yes | u have internet access at hom 35 | e? No | 4 |

If so, how do you access the internet?

| Internet Source | Responses | Internet Source | Responses |
|----------------------------|-----------|-----------------|-----------|
| Cable/Spectrum | 29 | Dish | 1 |
| Hotspot | 2 | Satellite | 1 |
| Verizon | 1 | AT & T | 1 |
| None identified/No service | 3 | Charter | 1 |

| Question 4. | Do yo | ou own a smart phone? | | |
|-------------|-------|-----------------------|----|---|
| | Yes | 36 | No | 3 |

Question 5. How long have you lived at this address? Time ranged from 11 months to 50+ years.

| Event | 0 | 1 | 2 | 3 | Event | 0 | 1 | 2 | 3 |
|---------------------------------|----|----|---|---|--------------------------------|----|----|---|---|
| Celestial Impact (NI) | 39 | 0 | 0 | 0 | Invasive Species (M) | 26 | 7 | 6 | 0 |
| Civil Disturbances (L) | 36 | 3 | 0 | 0 | Lightning (M) | 27 | 11 | 1 | 0 |
| Cyberterrorism (L) | 36 | 2 | 1 | 0 | Loose Livestock (NI) | 36 | 3 | 0 | 0 |
| Dam Failures (H) | 28 | 10 | 1 | 0 | Passenger Vehicle Accident (L) | 29 | 8 | 2 | 0 |
| Drought (L) | 33 | 5 | 1 | 0 | Pluvial (flash) Flooding (H) | 30 | 7 | 2 | 0 |
| Earthquakes (NI) | 38 | 1 | 0 | 0 | Public Health Emergency (H) | 26 | 12 | 1 | 0 |
| Energy Emergencies (M) | 19 | 18 | 2 | 0 | Riverine Flooding (H) | 33 | 5 | 1 | 0 |
| Extreme Cold (M) | 21 | 15 | 3 | 0 | Scrap Tire Fires (L) | 39 | 0 | 0 | 0 |
| Extreme Heat (M) | 27 | 9 | 3 | 0 | Seasonal Population Change (M) | 28 | 10 | 1 | 0 |
| Fog (L) | 27 | 12 | 0 | 0 | Severe Winds (M) | 9 | 25 | 5 | 0 |
| Gas/Oil Pipeline Incidents (L) | 36 | 2 | 1 | 0 | Snowstorms (M) | 13 | 23 | 3 | 0 |
| Gas/Oil Well Incidents (L) | 36 | 2 | 1 | 0 | Special Events (L) | 38 | 1 | 0 | 0 |
| Hail (M) | 22 | 16 | 1 | 0 | Structural Fires (H) | 34 | 4 | 1 | 0 |
| Hazard Materials-Fixed Site (L) | 37 | 2 | 0 | 0 | Terrorism/Sabotage (NI) | 38 | 1 | 0 | 0 |
| Hazard Materials-Trans (L) | 38 | 1 | 0 | 0 | Thunderstorms (M) | 17 | 18 | 4 | 0 |
| Horse-drawn Vehicles (M) | 27 | 10 | 1 | 1 | Tornadoes (M) | 35 | 2 | 2 | 0 |
| Ice/Sleet Storms (M) | 12 | 22 | 5 | 0 | Wildfires (M) | 33 | 6 | 0 | 0 |
| Infrastructure Failures (M) | 25 | 12 | 2 | 0 | | | | | |

Question 6. Please indicate below the greatest level of impact significant events for hazard had on you, your family, and or your property since you have lived in your current address.

Question 7. How are you currently notified when there is a disaster or emergency?

| Notification Method | Responses | Notification Method | Responses |
|---------------------|-----------|---------------------|-------------|
| Radio/TV | 28 | Landline | 5 |
| Mobile Alert | 29 | Weather Radio | 7 |
| PSA | 10 | Other | Ham Radio 1 |
| | | | Email 1 |
| Warning Siren | 13 | Not notified | 3 |

Comments

| Yes, timely, | not really since I work fulltime with patients and cannot | | |
|---|--|--|--|
| | always check email alerts of new emails | | |
| It works for us | | | |
| IL WORKS TOP US. | res, usually have phone on me. | | |
| Somewhat effective, not currently aware | Yes, because I travel, and this keeps me informed with the | | |
| of what occurs in Butman Twp. | weather. | | |
| Will sign up for mobile alerts. | Yes, always know when something is happening. | | |
| Only if I am looking at phone or radio or | Yes, helps me be aware and prepare. | | |
| listening for siren. Siren not always | | | |
| heard inside. | | | |

| Yes, multiple notifications are the only way to make sure one gets through. | Not really. |
|---|---|
| Yes, instantaneous when sent. | Somewhat effective for weather events. |
| Depends. | I receive mobile alerts from the State for amber alerts and health-related mandates from the Governor. I also receive alerts of outages from my utility companies via text message or email. However if the internet or my phone service isn't working that doesn't work. And if these services are working neither is my TV so being able to see the alerts from the TV won't work either. I don't recall hearing sirens so far while living here these past few years, but I may have been elsewhere when they were used. |
| Siren is. | No, need outdoor siren. |

8. Do you currently have flood insurance?

| Yes | 2 | No | 21 |
|--------------|----|-------------|----|
| Not Required | 15 | No response | 1 |

9. Have you taken measures to make your home/property more resilient to disasters?

The following comments were received:

- Trimmed trees, diverted water from home
- Yes, have extra batteries handy
- Yes, security system with fire and water selection, wifi cameras inside and outside
- Yes, we have a generator, fire alarms, fire extinguishers and food for emergencies
- Cleared around the house for wildfire mitigation, eliminated large trees
- Backup hand pump for well water, emergency generator and manual transfer, propane camp stove
- Portable generator
- Generator
- Whole house generator and emergency food supply
- Removed trees that could have fallen on house, as well as other improvements
- Purchased whole house generator, stocked emergency supplies
- Maintain landscaping
- Purchased flood insurance, removed dead trees, secured loose outdoor furniture

In addition, there were two more yesses, but no information, and five not sure.

10. Does your family have a Disaster Kit?

Yes 13 In process 1 No 25

11. Do you or a family member have special needs?

The following comments were received:

• Children 19 months and 3 years old

- Husband has a CPAP machine
- Wife has COPD, on oxygen 24/7
- Mother-in-law is on oxygen

APPENDIX F HIGH HAZARD POTENTIAL DAMS

There are five (5) high risk dams located in Gladwin County. Four Lakes Task Force (FLTF) is the owner of three (3) dams; Smallwood Dam, Secord Dam, and Edenville Dam. They have prepared an analysis on the dams under their ownership, which begins on the following page.

The two high risk dams not under the ownership of the FLTF are Lake Lancer Dam and Chappel Dam. The analysis on those two dams begins on page ???

All Dam Risks for the Tittabawassee River Dams in Gladwin County

Four Lakes Task Force (FLTF) provides this section to the Gladwin County Hazard Mitigation Plan (HMP). This section addresses the dam risks for the High Hazard Potential Dams (HHPD) on the Tittabawassee River within Gladwin County. FLTF has jurisdiction over those three dams (Secord, Smallwood, and Edenville) and is best positioned to provide information on risks and risk mitigation. FLTF agrees with the Goals of the HMP and provides an Objective specifically related to the HHPDs in Gladwin County. FLTF will perform mitigation actions for the risks within FLTF's jurisdiction. FLTF has engaged the public and local government in the risk mitigation process for the HHPD dams.

Introduction

This document supplements other Dam Hazards discussion in the Gladwin County Hazard Mitigation Plan.

Historical Update: On May 20, 2020, a large flood caused an earth embankment breach of the Edenville Dam, resulting in uncontrolled release of the reservoir. Damage occurred on the Edenville Dam reservoir due to the high currents from rapid flow of water through the dam breach. Significant damage occurred around Sanford reservoir, due to the massive flood wave from the Edenville Dam breach plus large amounts of trees (i.e., over 4,000 uprooted mature trees) and other flood debris. Downstream of Sanford Dam, the Village of Sanford suffered massive property damage with structures flooded or washed away. Damage continued downstream to the City of Midland, with flooding and deposition of flood debris. Thankfully, there were no fatalities or injuries from the flood event due to proactive evacuation of approximately 10,000 people from the flood-threatened areas in Midland and Gladwin counties.

Through a condemnation action in late 2020, Midland and Gladwin counties acquired ownership of the four flood-damaged dams on the Tittabawassee River: Secord, Smallwood, Edenville and Sanford. Midland and Gladwin counties appointed Four Lakes Task Force (FLTF) as the Delegated Authority under Part 307 of Michigan Public Act 451 of 1994, the Natural Resources and Environmental Protection Act (NREPA). As Delegated Authority, FLTF is responsible for operations, maintenance and repairs of the dams. FLTF began a program to reconstruct the four dams in compliance with State of Michigan dam safety standards. That reconstruction program is expected to conclude in 2026, at which time the dams will have been repaired/rebuilt to meet or exceed Michigan dam safety standards. FLTF will be responsible for repair, maintenance and operation of the dams for the foreseeable future, at the pleasure of Midland and Gladwin counties.

Plans for reconstructing the dams are built around Michigan dam safety standards and findings of an Independent Forensic Team (IFT) created in mid-2020 by the Federal Energy Regulatory Commission (FERC). FERC charged the IFT with determining the root cause(s) of the Edenville and Sanford dam failures. The IFT issued its final report in May 2022:

https://damsafety-prod.s3.amazonaws.com/s3fs-public/files/Edenville-

Sanford Final%20Report Main%20Report%20and%20Appendices.pdf

FLTF consulted with the IFT team members during the IFT investigation to incorporate interim findings into the FLTF reconstruction plan for Edenville and Sanford dams. FLTF also conducted its own studies of spillway capacity and hydrology of the Tittabawassee River system around the four dams. Fundamental safety issues found were inadequate spillway capacity and need for embankment improvements on all four dams.

<u>Scope</u>

There are four Tittabawassee River dams upstream of the Village of Sanford. The purpose of this document is to address all significant risks related to only the Gladwin County dams: Secord, Smallwood

and Edenville dams in their current or pending states of reconstruction. These dams are or will be under construction, which presents different hazards than normal operation of dams. The Tittabawassee River dams are inoperable and will continue to be inoperable until reconstruction is complete and FLTF receives permits to refill the reservoirs.

At the time this document was written, all three dams were in non-operable status. In the context of this document, "non-operable" means that all spillway gates were either locked fully open (the present conditions at Secord and Smallwood) or removed and the spillway bays partially demolished (the present conditions at Edenville). The spill capacity of the Secord and Smallwood dams is at its original maximum, the spill capacity of Edenville dam has been greatly increased compared to pre-flood conditions. The spill capacities of these dams cannot be modified by dam operators. All three dams currently function as uncontrolled "run-of-the-river" structures.

Secord and Smallwood dams- These dams were damaged by the May 2020 flood, but remained intact and did not release their reservoirs. The reservoirs are drawn down as far as possible with all the spillway gates locked in the fully open position. Re-construction began in December 2022 to repair damage from the May 2020 flood and add significant dam safety improvements. This Appendix will only address dam hazards that will exist during construction. Once the dams are fully reconstructed and approved by EGLE Dam Safety, the reservoirs will be refilled, and the dams will commence operation.

Edenville Dam-This dam was partially destroyed during the May 2020 flood, suffering embankment breach and uncontrolled release of the reservoir. The dam still retains a small residual reservoir, much lower in water volume than the reservoir water volume pre-flood. The dam has been stabilized in its damaged condition through a Cooperative Agreement with the Natural Resources Conservation Service under their Emergency Watershed Protection program. Construction to rehabilitate this dam is expected to begin in late 2023 and possibly extend into 2026. This Appendix will address risks associated with the dam in its current stabilized state and during re-construction.

Interface with the Gladwin County Hazard Mitigation Plan

Prior to the May 2020 flood, there were no river gage stations on the Tittabawassee River upstream of the city of Midland. This meant that no good real-time data existed for the behavior of the Tittabawassee River flowing into and through the dam reservoirs. FLTF engaged with the US Geological Survey (USGS) in 2020 to install new river flow and stage gages in the following locations:

- 1. 04154512 Chippewa River at S Homer Road near Midland
- 2. <u>04153300</u> Tittabawassee River at Saginaw Road bridge in Sanford, MI.
- 3. <u>04153500</u> Salt River upstream of confluence with the Tittabawassee River in Sanford, MI.
- 4. <u>04152049</u> Tittabawassee River downstream of Secord Dam.

All four gages are upstream of the City of Midland, the largest municipality on the Tittabawassee River. The gages are installed, calibrated and reporting data through the USGS National Water Information System.

FLTF is in the middle of a 6-year project to repair/rebuild all three flood-damaged dams on the Tittabawassee River in Gladwin County. None of the dams met State of Michigan dam safety standards for spillway capacity based on the latest hydrology calculations. The rebuilt/repaired dams will all meet or exceed State of Michigan dam safety standards for spillway capacity. In addition, the earth embankments of the dams have known flaws, including overly steep embankment slopes, 2 of the 3 Gladwin County dams lacked an internal cutoff wall to mitigate the risk of static liquefaction (the IFT's reported cause of the 2020 Edenville Dam failure), faulty, missing or poorly maintained embankment seepage drain systems and none of the dams had adequate provisions to prevent overtopping in a flood event due to wave run-up or wind set-up. All these shortcomings are addressed by FLTF's repair/rebuilding plans, which reduce the risk of inundation from future dam failures.

Funding

Funding for dam maintenance or capital improvements was a great challenge for the former (private) owners of the dams, as they had no authority to raise funds other than through sale of hydroelectricity and securing loans, both of which were impaired by the 2018 hydroelectric license revocation for the Edenville Dam and the former owners' existing debt burden. The dams in Gladwin County are now owned by Gladwin County, while the Sanford Dam in Midland County is now owned by Midland County. FLTF is a County-appointed Delegated Authority under Michigan state law (Public Act 451 of 1994, Part 307). FLTF has the legal authority to operate, maintain and repair the dams and has the legal ability under Part 307 to fund its work through assessment of the benefitting properties around the reservoirs. A Special Assessment District was created as a source of operating and maintenance funds and was approved by Midland and Gladwin counties. An Operations and Maintenance (O&M) assessment cycles will continue funding O&M in future years if the dams are present. In addition, the State of Michigan has provided a grant of \$200 million to cover costs in rehabilitating the dams. Rehabilitation costs exceeding that amount will be covered by other funds, e.g., private donations, additional grants, loans/bonds and the Special Assessment District.

All Dam Risk

The discussion of "All Dam Risk" requires addressing the topics of Incremental Risk, Non-Breach Risk and Residual Risk for existing operable dams. Due to the inoperable, damaged conditions of the Gladwin County dams after the 2020 flood event, subsequent dam stabilization and on-going re-construction activity, this dam risk mitigation discussion will focus on the recognized risks during construction and plans to mitigate those risks. Such discussion will follow the All Dam Risk discussion below.

Incremental Risk

Edenville Dam was breached in the 2020 flood. The Edenville dam reservoir has been drained and none of the dams will be operable until fully rehabilitated in compliance with Michigan Dam Safety standards, currently scheduled for 2024 to 2026, depending on the dam.

Probable Failure Mode Analysis (PFMA) was performed for all the dams, focused on risks during the construction period. That analysis informed the comments about construction hazards and mitigation discussed later. The PFMA results were shared with Michigan Dam Safety engineers.

Secord and Smallwood dams still have their spillway gates in place and original spillway concrete intact. Before any work commences on the gated spillways, FLTF will build new auxiliary spillways to maintain the flood-handling capacity of the dams. The Secord and Smallwood dams already have steel sheetpile cutoff walls in place to reinforce and minimize seepage within the embankments and reduce the risk of embankment breach in case of overtopping in a flood.

Edenville Dam was stabilized after the 2020 flood and dam breach. Spill capacity was increased in the gated spillways by removal of all gates, demolition of concrete discharge chutes in all spillway bays and by planning for a new auxiliary spillway to be added to the dam.

Edenville Dam- In a flood of 200-year magnitude, hydrology studies indicate Edenville Dam's reservoir would rise to 2 feet above the normal lake level, which is 3.5' below the peak water level reached during the 2020 flood (estimated to be a 200-year flood event). In its current condition, the Edenville Dam presents less incremental risk of upstream flooding or damage due to dam failure than it did in 2020.

Downstream inundation due to embankment failure is less likely today in a scenario where the spillway capacities have been increased, the dam embankments have already been breached and the reservoirs have been drained.

Non-Breach Risk

All Tittabawassee River dams will operate in run-of-the-river mode when rehabilitated, just as they operate now in their post-flood condition.

The engineering designs provide spillway capacity up to the input design flood (IDF) of 5,000-year magnitude or greater for all the dams. The designs are based on flood frequency analysis and other hydrology work performed by GEI Consultants and Ayres Associates updated with annual peak flow data from 1929 through 2020. Inflow Design Flood (IDF) values were calculated for each dam based on Incremental Damage Analysis (ICA). The IDFs for the re-constructed Secord, Smallwood and Edenville dams will exceed State of Michigan dam safety standards for spillway capacity. The ICA approach to selecting an IDF is intended to identify the scale of a flood that is so large that expected downstream damage is the same with or without a dam failure.

Predictive flood hydrographs demonstrate that, barring a dam failure, the presence of the rehabilitated dams will present no more risk of flooding downstream than the undammed river would present.

Note: One Edenville Dam reservoir lakefront subdivision, Radov Drive (a short distance below Smallwood Dam), is subject to flooding even in a 2-year magnitude flood due to low land elevation within the subdivision. This is a risk created by the location of the subdivision, not by the dams. Flooding this subdivision has been a past source of complaints to the Federal Energy Regulatory Commission (FERC) by Radov Drive property owners. FERC has ruled on those complaints that the flooding is not due to improper dam operation upstream, rather due to the land elevation in the subdivision. FLTF has a communications protocol to warn the residents of this neighborhood of an impending flood that would affect them and has activated that protocol when needed.

Residual Risk

Other risks were discussed during Probable Failure Mode Analysis workshops for the construction period for all four dams. These risks may be mitigated by proper construction sequencing, monitoring or by the drained state of the reservoirs.

Secord, Smallwood and Edenville Dam

- 1. Failure of a cofferdam during construction.
- 2. Risks during installation of steel sheetpiling in the embankments.
 - a. The installation of a steel sheetpile cutoff wall at Secord Dam has been completed without incident.
 - b. Smallwood dam has a steel sheetpiling cutoff wall installed by a previous owner.
- 3. Risks due to installation of Edenville cutoff wall.
- 4. Risks due to excavation of embankment toe.
- 5. Risks due to failure of concrete powerhouse or spillway structures during demolition.
- 6. Risks due to a flood during construction.

All the risks above are being addressed in the construction plans.

Emergency Action Plan

FLTF has shared its current Emergency Action Plan with the Gladwin and Midland County Emergency Managers. If a situation on the dams threatens to develop into a hazard for the public, FLTF will put its Emergency Action Plan into operation.

Roles and Responsibilities: This Appendix describes the risks and mitigation action items that will be taken with repair/rebuilding of the dams. FLTF is the Delegated Authority of Gladwin and Midland counties and, as such, is responsible for all the dam rehabilitation mitigation actions outlined in the Appendix. FLTF has engaged the following firms as significant partners in this effort:

- 1. **Spicer Group** a civil engineering firm headquartered in Saginaw, MI. Spicer provides, for example, expertise in surveying, creating and administering special assessment districts and permitting under State of Michigan law. Spicer plays the role of Owner's Engineer.
- 2. **GEI Consultants, Inc.** a civil engineering firm practicing in Geotechnical, Environmental, Water Resources, Civil Design, and Construction Services, with offices in 23 states, including Michigan. GEI is the primary firm performing dam rehabilitation design work and dam safety studies for FLTF.

- 3. **Ayres Associates** Ayres Associates is a civil engineering firm headquartered in Eau Claire, WI. FLTF engaged Ayres to partner with GEI in hydrology studies related to flood frequency and flood magnitude as a prelude to determining the required spillway capacity for the four Tittabawassee River dams.
- 4. **AECOM**-a civil engineering firm practicing consultation on infrastructure projects world-wide. AECOM serves the role of second level review on GEI designs and dam safety studies.
- 5. **The Essex Partnership**-a civil engineering and infrastructure operations firm that operates multiple dams for clients in the USA and Canada. Essex is FLTF's consultant on best practices in dam operations.
- 6. **Fisher Construction Company**-a Midland-based construction company with experience in dam rehabilitation. Fisher won the competitive bids for repairing Secord and Smallwood dams.
- 7. **EGLE, Water Safety Division, Dam Safety Unit**-EGLE (Environment, Great Lakes and Energy) is a State of Michigan agency. The Dam Safety Unit is Michigan's dam safety regulator. FLTF works closely with the Dam Safety Unit on development, review and approval of rehabilitation plans for the four dams.
- 8. US Army Corps of Engineers-The Corps is partnering with FLTF on hydrology studies on the Tittabawassee River in Midland County. FLTF is doing the river hydrology work upstream of Sanford Dam and will pass the work product to the Corps, which will do the river hydrology work downstream of Sanford Dam to the eastern Midland County line. The goal of the work is to understand, based on up-to-date climate data and hydrologic models, how future Tittabawassee River floods can affect Midland County and the City of Midland. The Corps will consult with Midland County and City of Midland on flood damage mitigation steps those governments may take.
- 9. FLTF is engaging with other entities, such as Michigan DNR, US Fish and Wildlife Service, Central Michigan University and a number of other consultants, but not on matters of dam safety.

After the flood of 2020, FLTF also sought partnership with US Army Corps of Engineers and FEMA for financial assistance in rehabilitating the dams. Both organizations determined that rehabilitating the dams was outside their respective scopes of responsibility. As mentioned above, FLTF is partnering with the Corps on flood modeling. FLTF had no working relationship with FEMA prior to being awarded a FEMA High Hazard Potential Dam grant in September 2021, by which time the plan for rehabilitating the four dams was set and engineering was well underway.

Secord and Smallwood Dam Hazards

The following hazard analysis and mitigation information is being contributed to the community by FLTF. **Risks During Construction Period**

The dams are currently under construction and that is expected to continue through 2024.

- 1. **Risk** Secord Dam embankment could fail by the same mechanism that caused the May 2020 failure of the Edenville Dam (static liquefaction due to water seeping through the dam embankments from upstream). This would lead to uncontrolled release of the reservoir.
 - a. Mitigation
 - i. A new steel sheetpile cutoff wall has been installed in the Secord earth embankment (Smallwood Dam already has such a cutoff wall). This is the first major re-construction project on Secord Dam. Embankment cutoff walls greatly reduce the amount of water seeping through the dam embankments.
 - ii. An improved seepage drain system will be installed in the embankments of both dams to safely remove residual seepage water.
 - b. **Monitoring** Both dams have monitoring wells that are regularly inspected by FLTF operators for any increased rate of seepage.

- 2. **Risk** While spillways are under demolition and being rebuilt, coffer dams will be in place to allow work to be done "in the dry". This will result in temporary loss of gated spillway capacity that could increase the risk of property flooding on the reservoir and overtopping failure of the dam.
 - a. Mitigation- A new passive auxiliary spillway (permanent) will be constructed on each dam before any coffer dam construction, spillway demolition or rebuilding begins. There are two gated spillways planned on each dam and only one will be cofferdammed at any given time. The combined spill capacity of the new auxiliary spillway plus the functioning gated spillway will exceed the capacity of the existing gated spillways.
- 3. **Risk** heavy construction equipment operating on the earth embankments could cause collapse of the embankments, leading to a dam breach and uncontrolled release of the reservoir.
 - a. **Mitigation** This hazard has already been recognized by FLTF's design engineers. The engineers plan for an adequate safety factor during each stage of the construction process.
 - b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.
- 4. **Risk** Demolition and construction of the concrete spillways could result in a failure of the concrete structures, leading to uncontrolled release of the reservoir.
 - a. **Mitigation** This hazard has already been recognized by FLTF's design engineers. The engineers plan for an adequate safety factor during each stage of the construction process. The construction sequence is designed to minimize the risk of such failure.
 - b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.
- 5. **Risk** Presence of heavy equipment or materials on portions of the powerhouse or spillway structures will result in structural failure, collapse of the structure and uncontrolled release of the reservoir.
 - a. **Mitigation** This hazard is known from past construction projects on other structures and was carefully investigated by senior engineers during the project design stage. Load factors were calculated, and the construction sequence was designed to avoid this hazard.
 - b. **Monitoring** On-site inspectors will monitor work progress against the construction schedule.
- 6. **Risk** Replacement/repairs to the embankment seepage drain systems will lead to an embankment failure, leading to release of the reservoir contents.
 - a. **Mitigation** This hazard has already been recognized by FLTF's design engineers. The engineers plan for an adequate safety factor during each stage of the construction process.
 - b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.
- 7. **Risk-** A large flood during construction will exceed the spillway capacity of the dam and overtop the embankments, resulting in breach of the dam and uncontrolled release of the reservoir. This will create a flash flooding hazard for properties downstream of the dam, with the possibility of property damage and danger to human life.

Mitigation- The dams and reservoir levels will be subject to constant monitoring during the construction period. In the event of a developing large flood, FLTF will put the Emergency Action Plan (EAP) into action. County emergency managers will be advised of developing flood conditions and the conditions of the dams. Downstream of the dams, property owners at greatest risk will be warned about the situation by phone.

8. **Risk-** Increased seepage through dam embankments will weaken the embankments, leading to embankment failure and an uncontrolled loss of the reservoir.

Mitigation- FLTF Operations has an active Operators' Dam Safety Program (ODSP) that includes regular monitoring of seepage drains and monitoring wells on the dam embankments to detect

significant seepage rate changes or presence of sand in the seepage water, either of which would indicate increased risk of embankment failure. Actions taken are spelled out in the ODSP documentation. As dam construction progresses, the ODSP will be updated to reflect changed conditions.

Edenville Dam

Risks During Construction Period

1. **Risk**- Edenville Dam embankments could fail by the same mechanism that caused failure of the Edenville Dam (static liquefaction due to water seeping through the dam embankments from upstream).

a. Mitigation-

- i. The dam reservoir is almost completely drawn down due to the May 2020 dam breaches. A sunny day breach of embankment would result in very minor flooding downstream.
- ii. A soil/cement/bentonite cutoff wall will be installed in the Edenville Dam earth embankment ahead of beginning the overall reconstruction project. Cutoff walls reduce the amount of water seeping through the dam embankments.
- iii. An improved seepage drain system will be installed in the dam embankments to safely remove any residual seepage water.
- b. **Monitoring** Edenville Dam has monitoring wells that are regularly inspected by FLTF operators for any increased rate of seepage.
- 2. **Risk** While spillways are under demolition and reconstruction, lost spillway capacity will increase the risk of flooding on the reservoir and overtopping failure of the dam.

Mitigation-

- i. The original gates were removed and the spillway bays partially demolished. The spill capacity of the formerly gated spillways is now significantly greater than it was before the flood.
- ii. A new passive auxiliary spillway (permanent) will be constructed on the dam.
- **3. Risk** heavy construction equipment operating on the earth embankments will cause collapse of the embankments, leading to a dam breach and uncontrolled release of the reservoir.

a. Mitigation-

- i. This hazard has already been recognized by FLTF's design engineers. The engineers plan for an adequate safety factor during each stage of the construction process.
- ii. The reader is directed to **Hazard 8**, **Mitigation** for discussion of the impact of the almost completely drained reservoirs behind the dam embankments.
- b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.
- **4. Risk-** Demolition and construction of the concrete spillways will result in a failure of the concrete structures, leading to uncontrolled release of the reservoir.

a. Mitigation-

- i. This hazard has already been recognized by FLTF's design engineers. The engineers plan for an adequate safety factor during each stage of the construction process.
- ii. The reader is directed to **Hazard 8**, **Mitigation** for discussion of the impact of the almost completely drained reservoirs behind the dam embankments.
- b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.

- **5. Risk-** Replacement/repairs to the embankment seepage drain systems will lead to an embankment failure, leading to release of the reservoir contents.
 - a. Mitigation
 - i. This hazard has already been recognized by FLTF's engineers. The engineers plan for an adequate safety factor during each stage of the construction process.
 - ii. The reader is directed to **Hazard 8**, **Mitigation** for discussion of the impact of the almost completely drained reservoirs behind the dam embankments.
 - b. **Monitoring** During the construction process, contractors will be required to have a quality assurance program to make certain critical safety factors are not exceeded.
- Risk- The dam embankments will fail by the same mechanism that caused the May 2020 failure of the Edenville Dam (static liquefaction due to water seeping through the dam embankments).
 Mitigation
 - i. A soil-cement-bentonite cutoff wall will be installed at Edenville. Cutoff walls greatly reduce the amount of water seeping through the dam embankments.
 - ii. The reader is directed to **Hazard 8**, **Mitigation** for discussion of the impact of the almost completely drained reservoirs in the event of an embankment failure.
 - iii. An improved seepage drain system will be installed in the dam embankments to safely remove any residual seepage water.
- 7. Risk- A large flood during construction will exceed the spillway capacity of the dam and overtop the embankments, resulting in breach of the dam and uncontrolled release of the reservoir. This will create a flash flooding hazard for properties downstream of the dam, with the possibility of property damage and danger to human life.

Mitigation-

- The dam and reservoir level will be subject to constant monitoring during the construction period. In the event of a developing large flood, FLTF will put the Emergency Action Plan (EAP) into action. County emergency managers will be advised of developing flood conditions and the conditions of the dams.
- ii. The reader is directed to **Hazard 8**, **Mitigation** for discussion of the impact of the almost completely drained reservoirs behind the dam embankments.
- **8. Risk-** Increased seepage through dam embankments will weaken the embankments, leading to embankment failure and an uncontrolled loss of the reservoir.
 - a. **Mitigation** Operators will regularly monitor seepage drains and monitoring wells, plus visually inspect earth embankments for evidence of increased seepage through the embankments, as required by the ODSP.
 - b. During construction, reservoir water levels in the Edenville reservoir will remain greatly reduced from normal/planned levels due to the dam breach and demolished spillways. This creates safety advantages:
 - i. The danger of an embankment failure leading to uncontrolled release of the reservoir is greatly reduced by the small amount of remaining reservoir behind the dam.
 - ii. The risk of increased seepage is greatly reduced, due to the greatly reduced water pressure on the upstream side of the dam. This is due to the small amount of remaining reservoir behind the dam.
 - iii. The mostly empty reservoir can absorb considerably more flood water than the full reservoir could do without flooding shoreline properties.

- iv. The mostly empty reservoir would reduce the amplitude of the flood wave hydrograph in the event of failure of dams further upstream, reducing the flood hazard to properties downstream.
- v. The mostly empty reservoir provides a temporary safety advantage. If one or both of Secord and Smallwood dams fail, the capacity of the empty Edenville reservoir can absorb the flood volume from the upstream dams, blunting the flood damage effect on properties downstream. Note- this is strictly a temporary benefit until the Edenville reservoir is refilled. For reference, the following information is the normal water volumes of the three reservoirs.
 - 1. Secord Lake water volume- 15,000 acre-feet at normal lake level
 - 2. Smallwood Lake water volume- 6,000 acre-feet at normal lake level
 - 3. Edenville reservoir (Wixom Lake) water volume- 40,000 acre-feet at normal lake level

Edenville Dam was breached in the May 2020 flood and the reservoir drained. A partial reservoir remained on the Tobacco River side of Edenville Dam after the flood and was further drained during the dam stabilization project. The remaining reservoir contains less than 10% the volume of water in the Tobacco River side of the reservoir prior to the flood. The Tittabawassee River side of the reservoir was drained all the way down to the original river channel. Overall, the amount of water behind Edenville Dam is only slightly more than the original volume of the Tittabawassee and Tobacco rivers before the dams were built in the 1920's.

Gladwin County Inundation Maps

Inundation maps for the interim dam re-construction period have not been developed. The dams themselves, and thus the inundation zones, will be in a constant state of change due to construction activity, which is expected to extend into 2026. Keeping published, FEMA-approved inundation maps up to date is impractical. Final inundation maps will be modeled after all construction plans have been approved and permitted.

During the interim dam re-construction period, the Edenville reservoir will remain almost fully drained through 2024. Failure of both Secord and Smallwood dams, whether or not the failure led to washed out embankments on Edenville, would release less than half the volume of water experienced in the May 2020 flood (when the Edenville reservoir was full, and the dam failed). Thus, any existing inundation maps represent "beyond worst case" conditions.

Public and Local Government Involvement

Even prior to the 2020 flood, FLTF was engaged with the public and local government on plans to acquire and rehabilitate all four dams. The flood dramatically changed the scale and scope of the dam rehabilitation projects. Most public meetings were held virtually due to COVID19 and the need to enable internet access to the meetings for people on vacations or at another dwelling outside the area. Lake-Specific Public Meetings

- February 4, 2021 | Smallwood Lake | <u>Webinar</u> | <u>PowerPoint</u>
- February 11, 2021 | Secord Lake | Webinar | PowerPoint
- February 18, 2021 | Wixom Lake | Webinar | PowerPoint
- February 25, 2021 | Sanford Lake | Webinar | PowerPoint

Informational Session Public Webinars

- 2021
- Tuesday, April 13 | Rain and Flood Studies | <u>Video</u> | <u>PowerPoint</u>
- Monday, April 19 | Updated Costs | <u>Webinar</u> | <u>PowerPoint</u>

- Wednesday, April 28 | Instrumentation on Lakes, Streams and Tributaries | Video
- Thursday, May 13 | Survey Results and Restoration Plan | Video | PowerPoint
- Wednesday, June 2 | Virtual Q&A Informational Session | Webinar | PowerPoint
- Wednesday, August 18 | Video Conference Update Session | Webinar | PowerPoint
- Wednesday, October 6 | Video Conference Update Session | Webinar | PowerPoint
- Monday, December 6 | Video Conference Update Session | <u>Webinar | PowerPoint</u>
- 2022
- January 25, 2022 | Sanford and Edenville Stabilization Webinar | Webinar | PowerPoint
- April 6, 2022 | Board Communications Webinar | Webinar | PowerPoint
- May 19, 2022, | EGLE Update Webinar | Webinar
- June 15, 2022, | Deadline to Combine Parcels within the Special Assessment District
- June 16, 2022 | FLTF Informational SAD Meeting | Webinar
- June 29, 2022 | SAD Hearing for Operations Assessment | Meridian High School | <u>FLTF</u> <u>Special Assessment Roll Hearing Notice</u>
- July 12, 2022 | Joint Gladwin and Midland County Meeting on SAD | Meridian High School
- July 12, 2022 | EGLE Virtual Meeting about Permitting for Dam Repair and Restoration
- August 23, 2022 | USDA Boom Grant Meeting | Notice of Public Hearing
- September 26, 2022 | EGLE Virtual Public Hearing for Secord Dam and Smallwood Dam
- October 20, 2022 | Path to Four Lakes Restoration: An Engineering and Technical
 Symposium

Public meetings of the FLTF Board of Directors

2023 Schedule December 12, 2023 October 24, 2023 July 25, 2023 March 14, 2023

2022 December 13, 2022 No PowerPoint shared during meeting October 11, 2022 Meeting Minutes | No PowerPoint shared during meeting July 26, 2022 Meeting Minutes | No PowerPoint shared during meeting June 29, 2022 Meeting Minutes April 11, 2022 PowerPoint | Meeting Minutes March 3, 2022 PowerPoint | Meeting Minutes | Notice of TEFRA Hearing

2021 December 7, 2021 PowerPoint | Meeting Minutes October 5, 2021 <u>Meeting Minutes | PowerPoint</u> June 1, 2021 <u>Webinar | PowerPoint | Meeting Minutes</u> March 2, 2021 <u>Webinar | PowerPoint | Questions Submitted via Email | Meeting Minutes</u>

2020 December 17, 2020 Webinar | PowerPoint | Meeting Minutes September 10, 2020 Webinar | PowerPoint | Meeting Minutes Webinar was to provide an update on the 6-month plan and conduct any other business as necessary.

July 16, 2020

Webinar | PowerPoint | Notice of Meeting | Meeting Minutes

Webinar was to provide an update on the current status of FLTF and any other business as necessary.

April 16, 2020 <u>Webinar</u> | <u>PowerPoint</u> | <u>Questions Submitted by Attendees</u> | <u>Meeting Minutes</u> *Webinar was to adopt a resolution authorizing issuance of a bond anticipation note for Four Lakes Project, and review the <u>2019 Annual Report and 2020 Operating Plan</u>. January 8, 2020*

Meeting Minutes

Technical Symposium

Oct. 20, 2022- an in-person meeting was held in Midland, Michigan at the Center for the Arts to review work by FLTF, its engineering partners and EGLE on rehabilitating the four dams. The Symposium was attended by an estimated 900 persons. Booths were set up and staffed by FLTF and its partners to allow attendees to ask questions and discuss the rehabilitation of the four dams.

Local Government Involvement

FLTF required the approval of Gladwin and Midland counties to be designated as the Delegated Authority responsible for repairing, maintaining and operating the dams. This required FLTF to explain its plans to each Board of Commissioners (BOC) FLTF made verbal presentations to the Boards on the following dates: Gladwin County BOC :

- 5/9/23
- 1/10/23
- 9/13/22
- 7/12/22
- 5/24/22
- 3/8/22
- 8/3/21
- 3/16/21
- 2/8/21
- 12/9/20
- 11/24/20

Midland County BOC:

- 5/16/23
- 12/20/22
- 9/20/22
- 7/12/22
- 5/17/22
- 3/15/22
- 8/3/21
- 12/9/20
- 11/17/20

Note: FLTF experience with the public presentations is that, by far, the interest of the public was focused on only two topics:

- When will the reservoirs be refilled?
- How much will this cost us?

New Objectives for Gladwin County HMP.

(Flooding) Develop a plan to either remove the four flood-damaged dams on the Tittabawassee River or safely conduct repairs/rebuilding to restore the dams and refill the reservoirs.

All four dams were in a damaged or partially destroyed condition after the 2020 flood. The dams cannot be left in this condition for the long term, rather the dams must either be removed or repaired/rebuilt. Removing the dams would eliminate the benefit of lake frontage for 6,500 properties along the shorelines of the 4 reservoirs and eliminate the benefit of private lake access for another 2,000 properties close to the lake shorelines. Dam removal would have a permanent negative impact on property values around the reservoir shorelines, county property tax revenues, local businesses, local employment and regional recreation opportunities. A former Michigan Department of Natural Resources Fisheries Manager once remarked to an FLTF Board member that the four lakes were the best fishing lakes in southeast Michigan and the lakes were heavily used by recreational boaters during summer holidays. Repairing/rebuilding the dams would restore these benefits, at some cost to the property owners. FLTF conducted public opinion surveys among the owners of properties around the lakes and published the results in May 2021 and again in April 2022.

https://www.four-lakes-taskforce-mi.com/document-library-21/results-of-community-survey-nowavailable-news-flash

https://preview.mailerlite.com/x3l5h5d1z0

The survey results overwhelmingly (~90% of responses) supported restoring the 4 lakes (reservoirs), which requires repairing/rebuilding the dams. FLTF gained agreement to this path from Midland and Gladwin County leadership and substantial funding from the State of Michigan for the repair/rebuilding work. FLTF's current top priority is the safe rebuilding/repair of the four Tittabawassee River dams to meet or exceed Michigan state dam safety standards and address the documented root causes of the dam breaches in 2020.

Enhancing public protection from weather hazards is a goal in the Gladwin County HMP.

Analysis of Chappel Dam and Lake Lancer Dam

The Gladwin County Drain Commission is the owner of Chappel and Lake Lancer Dams. Below is an overview of the two dams. The two dam types are identified as earth dams. The Lake Lancer dam is 36 feet in height, and the Chappel Dam is 32 feet in height.

Chappel Dam

Chapple Dam is located on Wiggins Lake and empties into the Cedar River. It is an earth dam with a height of 32 feet. It is owned and operated by the Gladwin County Drain Commission. The latest Emergency Action Plan was completed in March of 2020, prior to the May 18, 2020, flood that was declared a natural disaster. The normal lake water volume is 4,280 acre-ft.

As there was minor damage resulting from the 2020 flood, the dam is currently in the process of being repaired.

Risk-flooding resulting from dam failure.

Mitigation-the dam has been properly maintained since being purchased by Gladwin Conty in 1964. The minor damages that resulted from the 2020 flood have been made.

Risk-flooding resulting from excess water flow.

Mitigation-damages caused by excess water resulting from heavy rainfall/snow melt can be mitigated to some extent by opening the gates early, which would increase the water dumped into the Cedar River. However, it would be at a slower rate than if the water were to be released at one time (a total dam failure).

Lake Lancer Dam

Lake Lancer Dam is located on Lake Lancer and empties into the Sugar River. It is an earth dam with a height of 36 feet. It is owned and operated by the Gladwin County Drain Commission. The latest Emergency Action Plan was completed in March of 2020, prior to the May 18, 2020, flood that was declared a natural disaster. The normal lake water volume is 12,500 acre-ft. No damage was reported to the Dam as a result of the 2020 flood.

Risk-flooding resulting from dam failure.

Mitigation-properly inspecting the dam, making the appropriate improvements, as necessary and maintaining the dam will lessen the incidents of dam failure

Risk-flooding resulting from excess water flow.

Mitigation-damages caused by excess water resulting from heavy rainfall/snow melt can be mitigated to some extent by opening the gates early, which would increase the water dumped into the Cedar River. However, it would be at a slower rate than if the water were to be released at one time (a total dam failure).

APPENDIX G 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 structural bracing, window shutters, laminated glass in window panes, and hail-resistant roof shingles to minimize damage to public and private structures.
- 12. Pre-planning for debris management staging and storage areas. (Debris is usually vegetation such as tree branches that have fallen under the impact of hail, or broken power or phone lines that had frozen or been weighted down by ice or fallen branches.)
- 13. Using surge protectors on critical electronic equipment.
- 14. Installing lightning protection devices on the community's communications infrastructure.
- 15. 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.
- 16. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
- 17. Establishing safe and appropriate locations for temporary debris disposal sites.
- 18. Securing loose materials, yard, and patio items indoors or where winds cannot blow them about.
- 19. Construction of concrete safe rooms in homes and shelter areas in mobile home parks, fairgrounds, shopping malls, or other vulnerable public areas.
- 20. 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, or broken power or phone lines that had frozen or been weighted down by fallen branches and trees.)

Drought

- 21. Measures or ordinances to prioritize or control water use (especially when needed to fight fires).
- 22. Encouragement of water-saving measures by consumers (especially during irrigation and farming).
- 23. Designs and plans for water delivery systems that include a consideration of drought events.

Winter Weather Hazards

- 24. Increased coverage and use of NOAA Weather Radio.
- 25. Producing and distributing family emergency preparedness information relating to severe winter weather hazards.
- 26. Including safety strategies for severe weather events in driver education classes and materials.
- 27. 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.)
- 28. Buried/protected power and utility lines.
- 29. Establishing heating centers/shelters for vulnerable populations.
- 30. Organizing outreach to isolated, vulnerable, or special-needs populations.
- 31. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
- 32. Pre-planning for debris management staging and storage areas. (Debris is usually the snow and ice itself, 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. Some storage areas will definitely be needed for snow removal during blizzards.)
- 33. Home and public building maintenance to prevent roof and wall damage from "ice dams."
- 34. 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.)
- 35. Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.
- 36. Farmer preparedness to address livestock needs/problems.
- 37. Pre-arranging for shelters for stranded motorists/travelers, and others.
- 38. Maintaining adequate road and debris clearing capabilities.
- 39. Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.
- 40. 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.)

Extreme Temperatures

- 41. 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.
- 42. Increased coverage and use of NOAA Weather Radio.
- 43. Housing/landlord codes enforcing heating requirements.
- 44. Special arrangements for payment of heating bills.

Wildfires

- 45. 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).
- 46. Safe disposal of yard and house waste rather than through open burning.
- 47. Use of fire spotters, towers, planes.
- 48. 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.
- 49. Post fire emergency telephone numbers.
- 50. Organizing neighborhood wildfire safety coalitions (to plan how the neighborhood could work together to prevent a wildfire).
- 51. Residents should plan several escape routes away from their homes by car and by foot.
- 52. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
- 53. 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).
- 54. Public education on smoking hazards and recreational fires.
- 55. Proper maintenance and separation of power lines. Ask the power company to clear branches from power lines.
- 56. Efficient response to fallen power lines.
- 57. Training and exercises for response personnel.
- 58. GIS mapping of vegetative coverage, for use in planning decisions and analyses through comparison with topography, zoning, developments, infrastructure, etc.
- 59. Media broadcasts of fire weather and fire warnings.
- 60. Create and enforce local ordinances that require burn permits and restrict campfires and outdoor burning.
- 61. Mutual aid pacts with neighboring communities.
- 62. 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.)
- 63. 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.
- 64. 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).
- 65. Enclosing the foundations of homes and buildings rather than leaving them open and the underside exposed to blown embers or materials.

- 66. 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.
- 67. 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.
- 68. Have adequate water supplies for emergency firefighting (in accordance with NFPA standards). For residents, identify and maintain an adequate outside water source such as a small pond, cistern, well, swimming pool or hydrant; have a garden hose that is long enough to reach any area of the home and other structures on the property; install freeze-proof exterior water outlets on at least two sides of the home and near other structures on the property. Install additional outlets at least 50 feet from the home; consider obtaining a portable gasoline powered pump in case electrical power is cut off.
- 69. Obtaining insurance.
- 70. Including wildfire safety information in materials provided by insurance companies to area residents.
- 71. 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.
- 72. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Dam Failures

- 73. Ensuring consistency of dam Emergency Action Plan (EAP) with the local Emergency Operations Plan (EOP).
- 74. Regulate development in the dam's hydraulic shadow (where flooding would occur if there was a severe dam failure).
- 75. Public awareness and warning systems.
- 76. Obtaining insurance.
- 77. 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.
- 78. Increased coverage and use of NOAA Weather Radio
- 79. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 80. Constructing emergency access roads to dams.
- 81. Pump and flood gate installation/automation.
- 82. Real estate disclosure laws that identify a home's location within a dam's hydraulic shadow.
- 83. Trained, equipped, and prepared search and rescue teams.
- 84. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Riverine and Urban Flooding/Shoreline Flooding and Erosion

- 85. Accurate identification and mapping of flood-prone areas.
- 86. Floodplain/coastal zone 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.

- 87. 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.
- 88. Dry floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
- 89. Wet floodproofing of structures (controlled flooding of structures to balance water forces and discourage structural collapse during floods).
- 90. Elevation of flood-prone structures above the 100-year flood level.
- 91. 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.
- 92. Government acquisition, relocation, or condemnation of structures within floodplain or floodway areas.
- 93. Public awareness of the need for permits (EGLE Part 31) for building in floodplain areas.
- 94. Inclusion of safety strategies for flooded areas in driver education classes and materials.
- 95. 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.).
- 96. Dredging and clearance of sediment and debris from drainage channels.
- 97. Protection (or restoration) of wetlands and natural water retention areas.
- 98. Enforcement of basic building code requirements related to flood mitigation.
- 99. Formation of a watershed council.
- 100. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 101. Obtaining insurance.
- 102. Joining the National Flood Insurance Program. VERY IMPORTANT!
- 103. Participating in the Community Rating System (CRS).
- 104. 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).
- 105. Drainage easements (allowing the planned and regulated public use of privately owned land for temporary water retention and drainage).
- 106. Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
- 107. Farmland and open space preservation.
- 108. Elevating mechanical and utility devices above expected flood levels.
- 109. Improved/updated floodplain mapping.
- 110. Real estate disclosure laws.
- 111. Public education and flood warning systems.
- 112. Monitoring of water levels with stream gauges and trained monitors.
- 113. Increased coverage and use of NOAA Weather Radio.
- 114. Training for local officials on flood fighting, floodplain management, floodproofing, etc.

- 115. Anchoring of manufactured homes to a permanent foundation, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas.
- 116. Road closures and traffic control in flooded areas.
- 117. Trained, equipped, and prepared search and rescue teams.
- 118. Control and securing of debris, yard items, or stored objects (including oil, gasoline, and propane tanks, and paint and chemical barrels) in floodplains that may be swept away, damaged, or pose a hazard when flooding occurs.
- 119. 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.
- 120. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts and sump pumps.
- 121. Employing techniques of erosion control in the area (bank stabilization, planting of vegetation on slopes, creation of terraces on hillsides).
- 122. 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.
- 123. Purchase or transfer of development rights to discourage development in floodplain areas.
- 124. Stormwater management ordinances or amendments.
- 125. Wetlands protection regulations and policies.
- 126. Regional/watershed cooperation.
- 127. Use of check valves, sump pumps and backflow preventers in homes and buildings.
- 128. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

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

- 129. Maintaining an active and viable Local Emergency Planning Committee (LEPC).
- 130. Developing and exercising site emergency plans and community response plans as required under SARA Title III.
- 131. 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.)
- 132. Training in and compliance with all safety procedures and systems related to the manufacture, storage, transport, use, and disposal of hazardous materials.
- 133. Policies stressing the importance of safety above other considerations.
- 134. Trained, equipped, and prepared site and local hazardous material emergency response teams.
- 135. Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA) standards.
- 136. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
- 137. Hazardous material public awareness and worker education programs.
- 138. Facility and community training and exercise programs.
- 139. Brownfield cleanup activities.
- 140. Identification of radioactive soils and high-radon areas
- 141. Proper separation and buffering between industrial areas and other land uses.
- 142. Location of industrial areas away from schools, nursing homes, etc.
- 143. Evacuation plans and community awareness of them.
- 144. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.

- 145. Public warning systems and networks for hazardous material releases.
- 146. 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).
- 147. Road closures and traffic control in accident areas.
- 148. Trained, equipped, and prepared search and rescue teams.
- 149. Compliance with all industrial, fire, and safety regulations.
- 150. Insurance coverage.
- 151. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.
- 152. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Hazardous Material Transportation Incidents

- 153. 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.
- 154. Improved design, routing, and traffic control at problem roadway areas.
- 155. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
- 156. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
- 157. Proper planning, design, maintenance of, and enhancements to designated truck routes.
- 158. Enforcement of weight and travel restrictions for truck traffic.
- 159. Training, planning, and preparedness for hazardous material incidents along roadways and railways (in addition to fixed site emergencies).
- 160. Public warning systems and networks.
- 161. 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).
- 162. Use of ITS (intelligent transportation systems) technology.
- 163. Compliance with and enforcement of USDOT and MDOT regulations regarding hazardous materials transport.
- 164. Locating schools, nursing homes, and other special facilities away from major hazardous material transportation routes.
- 165. Road closures and traffic control in accident areas.
- 166. Trained, equipped and prepared local hazardous materials emergency response teams.
- 167. Trained, equipped, and prepared search and rescue teams.
- 168. Evacuation plans and community awareness of them.
- 169. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Infrastructure Failures

- 170. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
- 171. Burying electrical and phone lines, where possible, to resist damage from severe winds, lightning, ice, and other hazards.
- 172. Redundancies in utility and communications systems, especially "lifeline" systems.
- 173. Mutual aid assistance for failures in utility and communications systems (including 9-1-1).
- 174. Alternative 9-1-1 access through radio operators whose homes are identified through special markings.
- 175. Programs/networks for contacting elderly or homebound persons during periods of infrastructure failure, to assess whether they have unmet needs.

- 176. Separation and/or expansion of sewer system to handle anticipated stormwater volumes.
- 177. Use of generators for backup power at critical facilities.
- 178. Regular maintenance and equipment checks.
- 179. "Rolling blackouts" in electrical systems that will otherwise fail completely due to overloading.
- 180. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).
- 181. Protecting electrical and communications systems from lightning strikes.
- 182. 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.)
- 183. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (1-800-482-7171).
- 184. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Oil and Natural Gas Well Accidents

- 185. Community and operator compliance with industry safety regulations and standards.
- 186. Awareness of hydrogen sulfide gas dangers and personal protection actions for these dangers.
- 187. 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.
- 188. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 189. 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.
- 190. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Public Health Emergencies

- 191. Encouraging residents to receive immunizations against communicable diseases.
- 192. Increasing public awareness of radon dangers and the prevention efforts that can be taken to reduce concentrations of radon in homes and buildings.
- 193. Maintaining community water and sewer infrastructure at acceptable operating standards.
- 194. Providing back-up generators for water and wastewater treatment facilities to maintain acceptable operating levels during power failures.
- 195. Demolition and clearance of vacant condemned structures to prevent rodent infestations.
- 196. Maintaining a community public health system with sufficient disease monitoring and surveillance capabilities to adequately protect the population from large-scale outbreaks.
- 197. Increasing public awareness of the causes, symptoms, and protective actions for disease outbreaks and other potential public health emergencies.
- 198. Community support of free or reduced-expense clinics and school health services.
- 199. Preventing public contact with contaminated sites or waters (including floodwaters).
- 200. Brownfield and urban blight clean-up activities.
- 201. Pollution control, enforcement, and cleanup; proper disposal of chemicals and scrap materials.
- 202. Proper location, installation, cleaning, monitoring, and maintenance of septic tanks.
- 203. Separation of storm and sanitary sewer systems.

Sabotage/Terrorism/Weapons of Mass Destruction (WMD)

- 204. Development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage/terrorism/WMD attack.
- 205. Alertness, awareness, and monitoring of organizations and activities that may threaten the community.
- 206. Implementing school safety and violence prevention programs.
- 207. Providing legitimate channels of political and public expression.
- 208. Heightening security at public gatherings, special events, and critical community facilities and industries.
- 209. Greater awareness of, and provision for, mental health services in schools, workplaces, and institutional settings.
- 210. Training, planning, and preparedness by local law enforcement and other responders for terrorist/sabotage/WMD attacks.
- 211. The development and testing of internal emergency plans and procedures by businesses and organizations.
- 212. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 213. Establishing avenues of reporting (and rewards) for information preventing terrorist incidents and sabotage.
- 214. Consistent use of computer data back-up systems and anti-virus software.
- 215. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.
- 216. Pre-planning for debris management staging and storage areas. (Debris could be rubble, vehicles, etc. that would get in the way or be left over following an attack or incident. The area may simultaneously need to be treated as a crime scene, site of urban search and rescue, area of hazardous materials, and/or a public health threat.

Population Increase (Seasonal/Event)

- 217. Provide personnel on a temporary basis to handle greater loads on public services.
- 218. Provide for emergency equipment to deal with higher call rates.
- 219. Develop plans for excessive traffic patterns.
- 220. Ensure water and food supplies can be maintained.
- 221. Provide training for Law, Fire, and EMS and other emergency services to meet the increased demand.
- 222. Acquire portable/changeable message signs to direct crowds and provide information.
- 223. Ensure capacities for water/sewer systems.
- 224. Maintain infrastructure such as schools, hospitals, prisons, roads, and systems for the disposal of water.
- 225. Include environmental degradation, air and traffic congestion, and pollution of all kinds, water shortages, increased crowding, and social stress.
- 226. Provide list of motel/cottages where people can stay. Provide list of alternate housing in surrounding communities.

Civil Disturbances (prison or institutional rebellions, disruptive political gatherings, violent labor disputes, urban protests or riots, or large-scale uncontrolled festivities)

- 227. Law enforcement training, staffing, and resource provision.
- 228. Incident anticipation and planning, and video documentation of events for later study and use.
- 229. Local law enforcement mutual aid, and support from the Michigan State Police and National Guard.

- 230. 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.
- 231. Insure structures and property in risky areas.
- 232. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 233. 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)

- 234. Adopt and enforce appropriate building codes.
- 235. Use of safe interior designs and furniture arrangements.
- 236. Obtain insurance.
- 237. "Harden" critical infrastructure systems to meet seismic design standards for "lifelines."
- 238. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Scrap Tire Fires

- 239. 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).
- 240. Proper siting of tire storage and processing facilities (land use planning that recognizes scrap tire sites as a real hazard and environmental threat).
- 241. Local awareness of scrap tire risk, training and preparedness of responders.
- 242. Law enforcement to prevent illegal dumping of tires at the site.
- 243. Pest-control measures for mosquitoes and other nuisances around scrap tire yards.

Structural Fires

- 244. Code existence and enforcement.
- 245. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
- 246. Public education and school programs (especially about the use of stoves, heaters, fireworks, matches/lighters, etc.)
- 247. 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).
- 248. Family members and residents should know how to use a fire extinguisher.
- 249. 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).

- 250. Safe and responsible use of electric and "space" heaters (placed at least 3 feet from objects, with space near hot elements free of combustibles).
- 251. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 252. 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.
- 253. Post fire emergency telephone numbers. (Complete)
- 254. Education and practice of safe cigarette handling and disposal (also candles, fireworks, campfires, holiday lights)
- 255. Measures to reduce urban blight and associated arson (including CPTED?).
- 256. Proper workplace procedures, training and exercising, and handling of explosive and flammable materials and substances.
- 257. Pre-planned escape routes and fire alert responses.
- 258. Improved and continuing training for emergency responders, and provision of equipment for them.
- 259. Defensible space around structures in fire-prone wildland areas.
- 260. Proper maintenance of power lines, and efficient response to fallen power lines.
- 261. 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.)
- 262. Control of civil disturbances and criminal activities that could lead to arson.
- 263. Enforced fireworks regulations.
- 264. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
- 265. Condominium-type associations for maintaining safety in attached housing/building units or multiunit structures.
- 266. Obtain insurance.
- 267. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Nuclear Attack

- 268. Community awareness of designated fallout shelters and attack warning systems.
- 269. Developing and promoting workable population protection plans (evacuation and in-place sheltering plans, as appropriate).
- 270. Construction of concrete safe rooms (or shelters) in houses, trailer parks, community facilities, and business districts.
- 271. Using laminated glass and other hazard-resistant, durable construction techniques in public buildings and critical facilities.
- 272. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 273. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).
- 274. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Nuclear Power Plant Accidents

- 275. Proper awareness of, training on, and implementation of radiological emergency procedures (to include both primary and secondary Emergency Planning Zones, as appropriate).
- 276. Community awareness of designated shelters and accident warning systems.
- 277. Increased coverage and use of NOAA Weather Radio (which can provide notification to the community during any period of emergency, including enemy attack).
- 278. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 279. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Pipeline Accidents (Petroleum and Natural Gas)

- 280. Locating pipelines away from dense development, critical facilities, special needs populations, and environmentally vulnerable areas whenever possible.
- 281. Increasing public awareness of pipeline locations and appropriate emergency procedures.
- 282. Developing site emergency plans for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, and other appropriate sites.
- 283. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800 482-7171).
- 284. Proper pipeline design, construction, maintenance and inspection.
- 285. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Subsidence

- 286. Identification, mapping, and preventing or limiting development in old mining areas or geologically unstable terrain.
- 287. Filling or buttressing subterranean open spaces (such as abandoned mines) to discourage their collapse.
- 288. Hydrological monitoring of groundwater levels in subsidence-prone areas.
- 289. Obtain insurance for subsidence hazards.
- 290. Real estate disclosure laws.
- 291. Community awareness of subsidence risks and effects.
- 292. Encourage residents to develop a Family Disaster Plan which includes the preparation of a Disaster Supplies Kit.

Transportation Accidents

- 293. 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.
- 294. Improved design, routing, and traffic control at problem roadway areas.
- 295. Long-term planning that provides more connector roads for reduced congestion of arterial roads.
- 296. Railroad inspections and improved designs at problem railway/roadway intersections (at grade crossings, rural signs/signals for RR crossing).
- 297. Enforcement of weight and travel restrictions for truck traffic.
- 298. Use of ITS (intelligent transportation systems) technology.
- 299. Use of designated truck routes.
- 300. Marine safety and general boater awareness programs.

- 301. Commercial operator training and skill enhancement programs.
- 302. Training, planning, and preparedness for mass-casualty incidents involving all modes of public transportation.
- 303. Trained, equipped, and prepared search and rescue teams.

APPENDIX H -GLADWIN COUNTY FINAL MITIGATION STRATEGIES

- 1. Increased coverage and use of NOAA Weather Radio, and public early warning systems and networks.
- 2. 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.)
- 3. Using structural bracing, window shutters, laminated glass in windowpanes, and impact-resistant roof shingles to minimize damage to public and private structures.
- 4. Using surge protectors on critical electronic equipment.
- 5. Installing lightning protection devices on the community's communications infrastructure and critical structures. More widespread use of lightning protection devices might also occur.
- 6. 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.
- 7. Proper anchoring of manufactured homes and exterior structures such as carports and porches.
- 8. 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.
- 9. Provide and publicize designated heating and cooling centers within the community, where persons in need may go to obtain relief from outdoor temperatures.
- 10. Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage, etc.
- 11. Agricultural activities to reduce impacts on crops and livestock.
- 12. Using snow fences or "living snow fences" (rows of trees or vegetation) to limit blowing and drifting of snow over critical roadway segments.
- 13. De-icing measures (for freezing fog), as would be used for other ice-related hazards.
- 14. 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 improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
- 15. 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.
- 16. Dry floodproofing of structures within known flood areas (strengthening walls, sealing openings, use of waterproof compounds or plastic sheeting on walls).
- 17. Wet floodproofing of structures (controlled flooding of structures to balance water forces and discourage structural collapse during floods).
- 18. Elevation of flood-prone structures above the 100-year flood level.
- 19. Purchase or transfer of development rights to discourage development in floodplain areas.
- 20. "Floating" architectural designs for structures inflood-prone areas.
- 21. 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.

- 22. Government acquisition, relocation, or condemnation of structures within floodplain or floodway areas.
- 23. 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.).
- 24. Protection (or restoration) of wetlands and natural water retention areas.
- 25. Higher engineering standards for drain and sewer capacity, or the expansion of infrastructure to higher capacity.
- 26. Joining the National Flood Insurance Program (NFIP).
- 27. Obtaining flood insurance. (Requires community participation in the NFIP.)
- 28. Participation in the Community Rating System (CRS).
- 29. Stormwater management-Adequate design, installation, maintenance, and monitoring of municipal storm sewer systems. Ordinances or amendments to assist in stormwater management (e.g. forbidding illicit discharges). Planning for and regulating areas prone to flooding (acceptable uses and development restrictions through comprehensive planning, code enforcement, zoning, open space requirements, subdivision regulations, purchased or transferred development rights, land use and capital improvements planning) and involving drain commissioners, hydrologic studies, etc. in these analyses and decisions.
- 30. 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).
- 31. Drainage easements (allowing the planned and regulated public use of privately-owned land for temporary water retention and drainage).
- 32. Installing (or re-routing or increasing the capacity of) storm drainage systems, including the separation of storm and sanitary sewage systems.
- 33. Farmland and open space preservation.
- 34. Elevating mechanical and utility devices above expected flood levels.
- 35. Flood warning systems and the monitoring of water levels with stream gauges and trained monitors.
- 36. Anchoring of manufactured homes to a permanent foundation in flood areas, but preferably these structures would be readily movable if necessary or else permanently relocated outside of flood-prone areas and erosion areas.
- 37. Control and securing of debris, yard items, or stored objects (including oil, gasoline, and propane tanks, and paint and chemical barrels) in floodplains that may be swept away, damaged, or pose a hazard when flooding occurs.
- 38. 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.
- 39. Detection and prevention/discouragement of illegal discharges into storm-water sewer systems, from home footing drains, downspouts, and sumppumps.
- 40. Increasing the function and capacity of sewage lift stations and treatment plants (installation, expansion, and maintenance).
- 41. Wetlands protection regulations and policies.
- 42. Use of check valves, sump pumps and backflow preventers in homes and buildings.
- 43. Landslide mitigation ideas: Do not build houses, buildings, parks, or playgrounds close to steep slopes; install flexible pipe fittings to avoid gas and water line breakage.
- 44. Garnering community support for a funding mechanism to assist dam owners in the removal or repair of dams in disrepair.
- 45. Regulate development in the dam's hydraulic shadow (where flooding would occur if a severe dam failure occurred).
- 46. Ensuring that dams meet or exceed the design criteria required by law.
- 47. Storage of water for use in drought events (especially for human needs during periods of extreme temperatures, and for responding to structural fire and wildfire events).
- 48. Legislative acts, local ordinances, and other measures to prioritize or control water use.
- 49. Encouragement of water-saving measures by consumers (including landscaping, irrigation, farming, and low-priority lawn maintenance and non-essential auto washing).
- 50. Anticipation of potential drought conditions, and the preparation of drought contingency plans.
- 51. Designs, for recreational and other water-related structures and land uses, that take into account the full range of water levels (of lakes, streams, and groundwater).
- 52. Use of structural fire mitigation systems such as interior and exterior sprinklers, smoke detectors, and fire extinguishers.
- 53. Arson prevention activities, including reduction of blight (cleaning up areas of abandoned or collapsed structures, accumulated junk or debris, and lands with a history of flammable substances stored, spilled, or dumped on them).
- 54. Public notification of fire, weather, and fire warnings.
- 55. 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 for properties should be provided to the local fire department, and an address should be visible from the road so homes can be located quickly).
- 56. 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.
- 57. Operating procedures that include back-up systems allowing complex systems (e.g. air traffic control) to continue to function when key technological systems (e.g. GPS, radio communications, satellites) malfunction. For example, some "legacy" systems might be retained as a back-up, new GPS signals and codes could be used to remove ranging errors, and protective and back-up components could be installed in vulnerable systems.
- 58. Designs that include the use of firewalls and sprinkler systems (especially in tall buildings, dormitories, attached structures, and special facilities).
- 59. 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 afire extinguisher.
- 60. Measures to reduce urban blight and associated arson (possibly including Crime Prevention through Environmental Design (CPTED)).
- 61. Encourage defensible space around structures in fire-prone wildland areas.
- 62. Transportation planning that provides roads, overpasses, etc. to maximize access and improve emergency response times to all inhabited or developed areas of a community. (Not just planning for average traffic volumes in the community.)
- 63. Elimination of clandestine methamphetamine laboratories through law enforcement and public education.
- 64. Condominium-type associations for maintaining safety in attached housing/building units or

multi-unit structures.

- 65. Compliance with/enforcement of Resource Conservation and Recovery Act (RCRA) standards.
- 66. Proper separation and buffering between industrial areas and other land uses.
- 67. Location of industrial areas away from schools, nursing homes, etc.
- 68. Enhanced security and anti-terrorist/sabotage/civil disturbance measures.
- 69. Increasing public awareness and widespread use of the "MISS DIG" utility damage prevention service (800-482- 7171).
- 70. Proper location, design, and maintenance of water and sewer systems (to include insulation of critical components to prevent damage from ground freeze).
- 71. Burying electrical and phone lines, where beneficial and appropriate, to resist damage from severe winds, lightning, ice, and other hazards.
- 72. Redundancies in utility and communications systems, especially "lifeline" systems to increase resilience-
- 73. Suggest separation and/or expansion of sewer system to handle anticipated stormwater volumes.
- 74. Use of generators for backup power at critical facilities.
- 75. Replacement or renovation of aging structures and equipment (to be made as hazard-resistant as economically possible).
- 76. Physical protection of electrical and communications systems from lightning strikes.
- 77. Airport maintenance, security, and safety programs.
- 78. Design requirements for schools, factories, office buildings, shopping malls, hospitals, correctional facilities, stadiums, recreation areas, etc. that take into consideration emergency and security needs.
- 79. Immunization programs to vaccinate against communicable diseases.
- 80. Improving ventilation techniques in areas, facilities, or vehicles that are prone to crowding, or that may involve exposure to contagion or noxious atmospheres.
- 81. Demolition and clearance of vacant condemned structures to prevent rodent infestations.
- 82. Brownfield and urban blight clean-up activities.
- 83. Separation of storm and sanitary sewer systems.
- 84. Establishing avenues of reporting (and rewards) for information preventing terrorist incidents and sabotage.
- 85. Consistent use of computer data back-up systems and anti-virus software.

APPENDIX I -GLADWIN COUNTY PROPOSED ACTION ITEMS

Action Item 1

Purchase generators for all critical municipal facilities. Generators to operate using propane or natural gas. Facilities to be set up for generator use

Action: Purchase and install self-starting, propane, or natural gas generators for all critical municipal facilities.

- Location: County-wide
- Lead Agency: Office of Emergency Management (OEM)
- Hazards Addressed: Infrastructure failure and energy emergencies
- Potential Funding Source(s): Federal Emergency Management Agency (FEMA), local budgets, and the United State Department of Agriculture (USDA)
- Project Cost: \$25,000 per generator
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective e
- Schedule: Ongoing, municipalities purchase the generators individually, as funds become available.
- Priority: High
- Benefit(s): Continuity of government and shelter capacity is maintained.

Action Item 2

Complete a Community Wildfire Protection Plan for Gladwin County

Action: Complete a Community Wildfire Protection Plan for Gladwin County.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Wildfires
- Potential Funding Source(s): Michigan Department of Natural Resources (MDNR), United State Fire Service (USFS), USDA
- Project Cost: \$20,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective a
- Schedule: Upon receipt of a grant.
- Priority: High
- Benefit(s): Develop a plan to address wildfires, for life safety and property protection purposes.

Action item 3

Encourage the inclusion of hazard mitigation into other planning documents

Action: Encourage local municipalities to include hazard mitigation into other planning documents.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA

- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 4, objective c
- Schedule: Ongoing, as municipalities update their planning documents
- Priority: High
- Benefit(s): Municipal documents are consistent in their goals and objectives.

Action Item 4

Improve security measures for the County Courthouse

Action: Complete and further determine the security measures needed, guided by previous security assessments.

- Location: City of Gladwin (County Courthouse)
- Lead Agency: Presiding Judge/Sheriff's Department
- Hazards Addressed: Civil Disturbances, Sabotage/Terrorism
- Potential Funding Source(s): State of Michigan, local budgets
- Project Cost: \$200,000 (Estimated)
- Participating Agencies: Gladwin County
- Goal/Objective Achieved: goal 3, objective b
- Schedule: Ongoing, as funds become available
- Priority: High
- Benefit(s): Safer operations for employees and citizens.

Action Item 5

Purchase additional firefighting equipment for firefighters

Action: Purchase additional firefighting equipment for local municipal fire departments.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Structural Fires, Wildfires
- Potential Funding Source(s): Local fire board millages, firefighting grants
- Project Cost: \$100,000-\$750,000 annually, will vary based on equipment that is purchased
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective c
- Schedule: Ongoing, various equipment is purchased annually
- Priority: High
- Benefit(s): Capability to fight fires is improved.

Action Item 6

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

Action: Install smoke detectors at every residence, business, and critical facility within the County.

- Location: County-wide
- Lead Agency: Red Cross
- Hazards Addressed: Structural Fires
- Potential Funding Source(s): Red Cross, firefighting grants
- Project Cost: NA

- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Ongoing, as the smoke detectors become available
- Priority: High
- Benefit(s): Safer living, working environment for residents, employees, and visitors in Gladwin.

Action Item 7

Critical Buildings/Infrastructure Improvements

Phase I-Assessment of governmental critical buildings and infrastructure

Action: Assess governmental critical buildings and infrastructure for possible improvements which will protect them from severe weather conditions.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All weather hazards
- Potential Funding Source(s): local budgets, United States Department of Agriculture (USDA) grants
- Project Cost: \$10,000 (Estimated)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2026
- Priority: High
- Benefit(s): Determination of facilities that need to be addressed.

Phase II-Complete actions as identified in Phase I.

Action: Complete the necessary improvement to critical buildings and infrastructure as identified in Phase I.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All weather hazards
- Potential Funding Source(s): local budgets, local foundations, and USDA grants
- Project Cost: \$300,000 (estimate, dependent upon completion of Phase I)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2027
- Priority: High
- Benefit(s): Facilities addressed and continuation of activities.

Action Item 8

Upgrade older, damaged culverts throughout the County as needed.

Action: Upgrade older, damaged culverts throughout the County as needed.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission (GCRC)
- Hazards Addressed: Infrastructure Failure, Flooding
- Potential Funding Source(s): GCRC budget
- Project Cost: \$300.00 (annual estimate)

- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective c
- Schedule: Ongoing
- Priority: High
- Benefit(s): Roads are better maintained, thereby maintaining travel and transportation throughout the County.

Action Item 9 (NEW)

Plant living snow fences along designated roadways.

Phase I-Work with the MDOT to assess county roads to identify potential locations for planting living snow fences

Action: Complete an assessment of roads throughout the County to identify potential live snow fence locations.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission (GCRC)
- Hazards Addressed: Severe winter weather events
- Potential Funding Source(s): Michigan Department of Transportation (MDOT), GCRC
- Project Cost: \$2,000, estimated staff time to complete the assessment
- Participating Agencies: MDOT
- Goal/Objective Achieved: goal 1, objective d
- Schedule: 2025
- Priority: High
- Benefit(s): Identify problematic sites for live snow fences, reducing dangerous sites due to severe winter weather.

Phase II- Plant live snow fences based on the assessment completed in Phase I.

Action: Plant live snow fences based on the assessment completed in Phase I.

- Location: County-wide
- Lead Agency: GCRC
- Hazards Addressed: Severe winter weather events
- Potential Funding Source(s): MDOT/GCRC
- Project Cost: \$100,000 annually (dependent upon completion of Phase I)
- Participating Agencies: MDOT
- Goal/Objective Achieved: goal 2, objective b
- Schedule: 2026
- Priority: High
- Benefit(s): Safer road conditions.

Action Item 10 (NEW)

Dam repairs.

Action: Renovate Secord and Smallwood Dams, new construction of Edenville Dam, Sugar Springs Dam

- Location: County-wide
- Lead Agency: 4 Lakes Task Force, OEM
- Hazards Addressed: Dam Failure, Flooding

- Potential Funding Source(s): Special assessments, Army Corp of Engineers (ACE), Community Development Block Grant-Disaster Recovery (CDBG-DR), State of Michigan
- Project Cost: \$300,000,000, based on engineer's estimates
- Participating Agencies: 4 Lakes Task Force, Drain Commission
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Ongoing, with the engineering currently in process
- Priority: High
- Benefit(s): Lakefront property restored to functional lakefront property, reestablishing local economy with the restoration of the functional lakes for recreational purposes.

Action Item 11 (NEW)

Municipalities to continue to adopt and enforce the most recent edition of the State Construction Code Action: Municipalities to continue to adopt and enforce the most recent edition of the State Construction Code.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): Local funding
- Project Cost: NA
- Participating Agencies: County Building Department
- Goal/Objective Achieved: goal 4, objective d
- Schedule: Ongoing, with updates completed accordingly
- Priority: High
- Benefit(s): Homes will be better constructed providing a safer living environment.

Action Item 12 (NEW)

County, City, and Township planning departments to continue review of zoning and land use regulations for needed revisions and actively enforce the regulations

Action: County, City, and Township planning departments to continue review of zoning and land use regulations for needed revisions and actively enforce the regulations.

- Location: County-wide
- Lead Agency: Gladwin County Planning Commission
- Hazards Addressed: Flooding
- Potential Funding Source(s): Municipal Budgets
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 4, objectives a and b
- Schedule: Ongoing, with updates completed accordingly
- Priority: High
- Benefit(s): Developments would be regulated in hazardous areas.

Action Item 13 (NEW)

Separate sanitary and storm sewers to prevent overflow during severe weather events, which can cause local flooding and public health issues

Action: Separate sanitary and storm sewers to prevent overflow during severe weather events, which can cause local flooding and public health issues.

- Location: Cities of Beaverton and Gladwin
- Lead Agency: Beaverton and Gladwin
- Hazards Addressed: Flooding, Public Health Emergencies
- Potential Funding Source(s): State Revolving Loan (SRL) Funds
- Project Cost: \$4,00,000 per community (estimate)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective a
- Schedule: 2026
- Priority: High
- Benefit(s): Sewers are not overworked, thereby reducing ne number the possibility of backups into homes.

Action Item 14 (NEW)

Install dry hydrants throughout the County to be used for emergency firefighting use

Action: Install additional dry hydrants throughout the County

- Location: Countywide
- Lead Agency: OEM/Gladwin County Fire Chiefs
- Hazards Addressed: All fires
- Potential Funding Source(s): CDBG-DR Grants
- Project Cost: \$5,000 per hydrant
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Ongoing, locations are being discussed to install the hydrants
- Priority: High
- Benefit(s): Improve capacity to fight fires throughout the County.

Action Item 15 (NEW)

Dig wells throughout the County for fire departments to utilize when fighting fires.

Action: Install wells throughout the County.

- Location: County-wide
- Lead Agency: OEM/Gladwin County Fire Chiefs
- Hazards Addressed: All fires
- Potential Funding Source(s): CDBG-DR
- Project Cost: Estimated to be \$750,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective d
- Schedule: Study to determine the location of the wells has been initiated.
- Priority: High
- Benefit(s): Improve capacity to fight fires throughout the County.

Action Item 16 (NEW)

Relocate the City of Gladwin Water Treatment Plant

Action: Relocate water treatment plant out of floodplain to a location outside the floodplain.

- Location: City of Gladwin
- Lead Agency: City of Gladwin
- Hazards Addressed: Flooding
- Potential Funding Source(s):
- Project Cost: \$26,000,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective d
- Schedule: 2025 (Dependent upon the receipt of the grant funds.)
- Priority: High
- Benefit(s): The relocation of the treatment plant out of the floodplain would allow the plant to continue to operate during a major flood event.

Action Item 17 (NEW)

Hire grant writer for County Municipalities

Action: Seek funds to hire grant writer to seek grants for municipalities in Gladwin County

- Location: County-wide
- Lead Agency: Gladwin County Administrator
- Hazards Addressed: All Hazards
- Potential Funding Source(s):
- Project Cost: \$100,000
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective f
- Schedule: 2026
- Priority: Medium
- Benefit(s): The hiring of a grant writer would allow the municipalities without a grant writer to seek funds currently not available to them.

Action Item 18 (NEW)

Seek grant funds to address hazards

Action: Seek grants to assist municipalities in mitigation/preparation/education activities with respect to hazards.

- Location: County-wide
- Lead Agency: Gladwin County Administrator
- Hazards Addressed: All Hazards
- Potential Funding Source(s):
- Project Cost: NA (Costs associated with this action item are included in action item 18.)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective f
- Schedule: 2027
- Priority: Medium
- Benefit(s): Grants may be secured for program/projects.

Action Item 19

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

Action: Educate the public in the benefits of NIXLE and have them sign up for the service.

• Location: County-wide

- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): Gladwin County budget
- Project Cost: \$6,200/per year
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective a
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Improved warning system for live safety matters.

Action Item 20 (NEW)

Promote the need to develop emergency evacuation plans for special events, schools, governmental agencies, and businesses

Action: Promote the need to develop emergency evacuation plans for special events, schools, governmental agencies, and businesses.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): OEM budget (NA)
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective d
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Improved life/safety for special events, schools, governmental agencies, and local businesses.

Action Item 21 (NEW)

Promote disaster awareness and continue county-wide emergency planning

Action: Promote disaster awareness and continue county-wide emergency planning.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): OEM Budget
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective b
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Better informed public regarding disaster awareness and emergency planning.

Action Item 22 (NEW)

Educate critical non-governmental agencies on the use of generators as back-up power

Action: Educate critical non-governmental agencies on the use of generators as back-up power.

• Location: County-wide

- Lead Agency: OEM
- Hazards Addressed: Infrastructure Failure and Energy Emergencies
- Potential Funding Source(s): OEM budget
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective b
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Agencies are made aware of requirements to install generators as back-up power sources.

Action Item 23 (NEW)

Educate the public on the need to develop Family Disaster Plans and prepare Family Disaster Kits, include information to public campgrounds

Action: Educate the residents and visitors to public campgrounds on the need to develop Family Disaster Plans and prepare Family Disaster Kits.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): OEM Budget
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective b
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Residents are better informed and better prepared for hazardous events.

Action Item 24 (NEW)

Training for first responders on addressing electric vehicle fires/hazards/emergencies

Action: Training for first responders on addressing electric vehicle fire/hazards/emergencies.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Vehicle Fires/Hazard Materials-Transportation
- Potential Funding Source(s): Local fire department budgets
- Project Cost: Estimated \$5,000 per class, one class per year
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective d
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): First responders are better prepared to address electric vehicle emergencies.

Action Item 25 (NEW)

Public education on chimney use/maintenance

Action: Public education on chimney use/maintenance.

- Location: County-wide
- Lead Agency: Gladwin County Fire Chiefs
- Hazards Addressed: Structural Fires
- Potential Funding Source(s):
- Project Cost: \$2,000/annually
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective d
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Reduction in house fires from chimney usage.

Action Item 26 (NEW)

Continued training for all first responders

Action: Continued training for all first responders.

- Location: County-wide
- Lead Agency: Sheriff Department, Police/Fire Chiefs
- Hazards Addressed: All hazards
- Potential Funding Source(s): Michigan Firefighting Training Council, budgets
- Project Cost: \$100,000 annually (estimated), includes coverage while training
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective c
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): First responders better trained/informed, leading to improved responses to emergencies.

Action Items 27

Purchase weather radios for critical municipal facilities

Action: Purchase weather radios for critical municipal facilities

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All weather-related hazards
- Potential Funding Source(s): FEMA grants
- Project Cost: \$50 per radio with 50 municipal critical facilities within Gladwin County (\$2,500)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective b
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Early warning for weather events, providing municipalities/residents time to seek appropriate action.

Action Item 28 (NEW)

Purchase portable electronic message signs

Action: Purchase portable electronic message signs.

- Location: County-wide
- Lead Agency: Gladwin County Road Commission
- Hazards Addressed: All hazards
- Potential Funding Source(s): USDA grants, GCRC budget
- Project Cost: \$75,000 per sign (estimate)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective b
- Schedule: 2026
- Priority: Low
- Benefit(s): Public informed on hazardous/dangerous/time delaying conditions.

Action Item 29 (NEW)

Develop a network of HAM radio operators throughout the County to notify public of hazardous events Action: Develop a network of HAM radio operators throughout the County to notify public of hazardous events.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Participating Agencies: NA (working through the Community Emergency Response Team(CERT) Team)
- Goal/Objective Achieved: goal 1, objective a
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Provides a secondary communication source for EOC and improved public awareness of hazards through an alternative notification system.

Action Item 30 (NEW)

Work with fuel suppliers to develop a list of retailers that can distribute fuel and propane during power outages and other emergencies

Action: Work with fuel suppliers to develop a list of retailers that can distribute fuel and propane during power outages and other emergencies.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Infrastructure Failure and Energy Emergencies
- Potential Funding Source(s): OEM Budget
- Project Cost: NA
- Participating Agencies: Local fuel suppliers.
- Goal/Objective Achieved: goal 3, objective e
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Maintain energy supplies during emergencies.

Action Item 31 (NEW)

Livestock emergency planning

Action: Identification of livestock and determine life/safety measures.

- Location: County-wide
- Lead Agency: MSU Extension
- Hazards Addressed: All hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Participating Agencies: OEM, Farming community
- Goal/Objective Achieved: goal 2, objective d
- Schedule: Ongoing
- Priority: Medium
- Benefit(s): Protection of livestock and providing necessary food and water.

Action Item 32 (NEW)

GIS address mapping Utilize Geographic Information System (GIS)

Action: Create various maps using GIS data to utilize in preparation for hazards.

- Location: County Offices
- Lead Agency: Equalization Department
- Hazards Addressed: All hazards
- Potential Funding Source(s): State of Michigan grants, Gladwin County budget
- Project Cost: \$2,500 annually (estimate)
- Participating Agencies: The list of participating agencies can be found in Table 6.1 on page 132.
- Goal/Objective Achieved: goal 1, objective b
- Schedule: ongoing
- Priority: Low
- Benefit(s): Utilization of the GIS maps will better prepare first responders and the public for future hazards.

Action Item 33 (NEW)

Tower site improvements for VHF or other available systems (800 MHz) for Public Safety communications

Action: Upgrade the towers to meet the 800 Mhz requirement for sirens.

- Location: County-wide
- Lead Agency: 9-1-1 Central Dispatch
- Hazards Addressed: All hazards
- Potential Funding Source(s):
- Project Cost: \$8,500,000 (Estimated at \$1,000,000 per tower and for radios to be distributed to all first responders.)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective e
- Schedule: 2026
- Priority: Low
- Benefit(s): Consistent communication available to public during emergencies.

Action Item 34 (NEW)

Public education on underground water supply and wellhead protection programs

Action: Public education on underground water supply and wellhead protection programs.

- Location: County-wide
- Lead Agency: City of Gladwin
- Hazards Addressed: Public Health Emergencies
- Potential Funding Source(s): EGLE Wellhead Protection Grant
- Project Cost: \$4,500 annually (estimate)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective e
- Schedule: Ongoing
- Priority: Low
- Benefit(s): Provision of safe potable water supply.

Action Item 35 (NEW)

Create an inventory of municipal equipment and services that can be utilized during emergencies Action: Create an inventory of municipal equipment and services that can be utilized during emergencies.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All hazards
- Potential Funding Source(s): OEM Budget
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 1, objective c
- Schedule: Ongoing
- Priority: Low
- Benefit(s): Municipal agencies are provided a list of services/equipment reducing time to locate same, thus improving response times.

Action Item 36 (NEW)

Encourage all municipalities to join/remain in the National Flood Insurance Program (NFIP) and to adopt FEMA floodplain maps

Action: Encourage all municipalities to join/remain in the National Flood Insurance Program (NFIP) and to adopt FEMA floodplain maps.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: Flooding
- Potential Funding Source(s): OEM Budget
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 4, objective b
- Schedule: Ongoing
- Priority: Low
- Benefit(s): Homeowners can obtain flood insurance, or flood insurance at a reduced cost.

Action Item 37 (NEW)

When delivering propane tanks on properties located in the floodplain, propane suppliers are to tie down the tanks so that they do not move during a hazardous event

Action: When delivering propane tanks on properties located in the floodplain, propane suppliers are to tie down the tanks so that they do not move during a hazardous event.

- Location: County-wide
- Lead Agency: Gladwin County Building Department
- Hazards Addressed: Flooding
- Potential Funding Source(s): Propane tank suppliers.
- Project Cost: NA (Cost borne by suppliers/no cost to the municipalities)
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 2, objective b
- Schedule: 2026
- Priority: Low
- Benefit(s): Reduction of dislocated tanks during severe weather events.

Action Item 38 (NEW)

Identify existing facilities to be used as emergency shelters

Action: Assess facilities throughout Gladwin County that can be used as potential shelters.

- Location: County-wide
- Lead Agency: OEM
- Hazards Addressed: All Hazards
- Potential Funding Source(s): NA
- Project Cost: NA
- Participating Agencies: Participating agencies can be found in the table on page 132.
- Goal/Objective Achieved: goal 3, objective f
- Schedule: 2024
- Priority: Low
- Benefit(s): Residents and visitors can have a place to go to during periods of power loss or destruction of property.