Hazard Mitigation Plan
for
Kent and Ottawa Counties

2017

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HAZARD MITIGATION PLAN 2017

SECTION ONE - PLANNING PRELIMINARIES

Introduction

This Hazard Mitigation Plan (HMP) is the result of a regional effort across Kent and Ottawa Counties and includes the City of Grand Rapids and other local jurisdictions within the counties. Local governments participated by reviewing and supplying information about area hazards, concerns and priorities, current prevention measures, and planned mitigation projects. This is the *second* update to the original "Pre-Hazard Mitigation Plan" that was originally approved by FEMA in 2006 and subsequently updated in 2011 and adopted in 2011 and 2012 by most jurisdictions.

Planning and Update Process

CW 1

The original 2006 plan was produced with the assistance of Tetra Tech, Inc., who had been contracted to develop a hazard mitigation plan (HMP) by the City of Grand Rapids, Kent County and Ottawa County in September, 2004. This updated 2017 edition was reviewed, revised, and produced by various officials, representatives, and subject matter experts from agencies associated with the two counties and their local sub-jurisdictions, as well as planning staff from the Michigan State Police Emergency Management and Homeland Security Division. A draft version of the updated plan was made available for public review and posted online to provide an opportunity for additional feedback to be submitted by citizens, area businesses, non-profit organizations, regional and academic institutions, and neighboring communities.

CW 1c

CW 1d

The Emergency Management Directors worked together on the update of this plan. They paralleled their inquiries and recorded responses together in one integrated plan. Each section was carefully reviewed together, and the editing divided, with frequent meetings and passing on of information and edited sections. The plan was substantially reorganized from the 2012 edition in order to better integrate information from participating communities and multiple pre-existing plans. This new format has allowed a more unified and coordinated approach to hazards that is both regional and community-specific; allowing not only consideration from both perspectives, but also the integration of both perspectives into a consolidated planning framework.

In addition to this input, applicable data from plans such as Emergency Action Guidelines (EAGs), the 2012 Michigan Hazard Mitigation Plan, Robinson Township Flood Mitigation Plan, City of Hollands' Master Plan Update "Resilient Holland", the Village of Caledonias' "General Development Plan", and the County of Kent and City of Grand Rapids' "Grand Strategy/Resilient Pure Michigan" project and the "Grand Rapids Whitewater" project was incorporated, as was information from the Water Resources Commission and other local stakeholders.

Emergency actions plans for existing dams were incorporated into the Section 2 detailing dam failure flooding. Existing extremely hazardous site (EHS) plans were examined via the Local Emergency Planning Committee and considered during development of the hazardous material section of this plan. While some existing plans are quite formal, such as the 50-Mile Radius Emergency Action Plan for the release of radioactive material from the nearby Palisades Nuclear Power Plant, other plans are less formal, yet still important and were considered in the development of this all-hazards plan. The local American Red Cross has a plan to shelter thousands of people. The local health departments have flexible plans to immunize the entire population.

A number of hazards such as flooding or dam collapse are associated with specific geographical areas of impact. In assessing the risks associated with these hazards the committee evaluated current building types, potential property damage and potential loss of life within these areas. In addition to documenting the hazard mitigation plan, GIS (geographic information system) data is collected on the vulnerable structures within the hazard impact area as part of our ongoing GIS program.

Planning Participation

CW 1b

This 2017 revision is a result of receiving input and updates from officials in the local political jurisdictions, various agencies, and the general public. The use of current public information protocols via the county's Public Information Officers ensured distribution to interested parties. The use of the county and city websites, as well as social media allowed for public feedback into the plan. This revision was also enhanced by public participation in meetings during the formulation of the FEMA resiliency grant process. During the writing of the Resilient Pure Michigan / Grand Strategy for the Grand River grant proposal, meetings with engineers, environmental advocates, state and local agencies, as well the general public provided insight and technical information, some of which is used in this plan.

CW 1a

PARTICIPATING JURISDICTIONS IN THIS PLAN

Kent County		**130**
Ada Township	**Kent County**	**136**
Algoma Township	**Kent County**	138
Alpine Township	**Kent County**	**140**
Bowne (Alto) Township	**Kent County**	144
Byron Township	**Kent County**	**146**
Caledonia Township	**Kent County**	148
Village of Caledonia	**Kent County**	**150**
Cannon Township	**Kent County**	152
Cascade Township	**Kent County**	**156**
Village of Casnovia	**Kent County**	158
City of Cedar Springs	**Kent County**	**160**
Courtland Township	**Kent County**	162
City of East Grand Rapids	**Kent County**	**164**
Gaines Township	**Kent County**	166
City of Grand Rapids	**Kent County**	**168**
Grand Rapids Township	**Kent County**	174
City of Grandville	**Kent County**	**176**
Grattan Township	**Kent County**	178
Village of Kent City	**Kent County**	**180**
City of Kentwood	**Kent County**	182
City of Lowell	**Kent County**	**186**
Lowell Township	**Kent County**	188
Nelson Township	**Kent County**	**190**
Oakfield Township	**Kent County**	192
Plainfield Township	**Kent County**	**194**
City of Rockford	**Kent County**	198
Village of Sand Lake	**Kent County**	**200**
Solon Township	**Kent County**	202

Sparta Township	**Kent County**	204
Village of Sparta	**Kent County**	206
Spencer Township	**Kent County**	208
Tyrone Township	**Kent County**	210
Vergennes Township	**Kent County**	212
City of Walker	**Kent County**	214
City of Wyoming	**Kent County**	218
Ottawa County		**220**
Allendale Township/GVSU	**Ottawa County**	224
Blendon Township	**Ottawa County**	230
Chester Township	**Ottawa County**	232
City of Coopersville	**Ottawa County**	238
Crockery Township	**Ottawa County**	240
City of Ferrysburg	**Ottawa County**	242
Georgetown Township	**Ottawa County**	246
City of Grand Haven	**Ottawa County**	250
Grand Haven Township	**Ottawa County**	252
City of Holland	**Ottawa County**	256
Holland Township	**Ottawa County**	262
City of Hudsonville	**Ottawa County**	264
Jamestown Township	**Ottawa County**	266
Olive Township	**Ottawa County**	268
Park Township	**Ottawa County**	270
Polkton Township	**Ottawa County**	272
Port Sheldon Township	**Ottawa County**	274
Robinson Township	**Ottawa County**	276
Spring Lake Township	**Ottawa County**	280
Village of Spring Lake	**Ottawa County**	284
Tallmadge Township	**Ottawa County**	286
Wright Township	**Ottawa County**	288
City of Zeeland	**Ottawa County**	290
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Each jurisdiction was asked to provide input for each of the hazards defined in the plan. For each hazard the POC was asked to describe current hazard prevention efforts and planned mitigation projects.

Other Hazard Mitigation Plan Participants

CW 2

Apart from the jurisdictions listed in the table above, other departments and subject matter experts participated:

County Administration (both counties)
County Equalization Departments
County Health Departments
County Information Technology (GIS) Departments
County Parks & Recreation Departments
County Road Commissions

County Sheriff's Offices
Courts
Department of Public Works
John Ball Park Zoo
Kent County Airport
Michigan Economic Development Corporation (MEDC)
MSU Cooperative Extension
Prosecutors
Utilities
Veterans' Affairs Office
Water Resources Commissioner

MEDC engaged national, state, regional, and local stakeholders to assist in the formation of the **Resilient Pure Michigan** proposal. These efforts began at the Rockefeller Foundation Midwest Resilience Academy where national partnerships were formulated with U.S. EPA and NOAA.

CW 3

Local residents, including vulnerable population impacted by the 2013 floods have been engaged in public meetings including meetings immediately following the floods to discuss recovery efforts with FEMA and Kent and Ottawa Counties' Emergency Management staff. Participation by local residents in the Grand Rapids Forward planning process (which includes river corridor plans and Grand Rapids Whitewater plans) has been extensive, starting in 2010 and extending to current meetings and open forums occurring every month. The types of opportunities for resident input included neighborhood meetings, surveys, radio & TV shows, websites, open houses, "pop-up" events, workshops, focus groups, elected government official meetings, school presentations, special interest group meetings, user group meetings, and speaker series presentations. A public hearing and webinar for the Resilient Pure Michigan proposal was held on March 24, 2015.

CW 19

The updated HMP will remain available on city and county websites. Input will be directed to the Emergency Management Director (EMD) of each county. Accessibility to county and city emergency management websites will provide an ongoing means by which public input can be obtained from any resident, business, agency, or stakeholder, either within the region or in adjacent communities. On an ongoing basis, the EMDs will solicit additional specialized input from knowledgeable persons and agencies. Other open meetings provide additional opportunities for public input. The EMDs may then make appropriate revisions to the HMP. The EMDs will not only target the general public, but members of business, academia, adjacent communities, special interest groups and other subject matter experts. EMDs will evaluate changing conditions and input from interested parties, and suggest changes to the existing plan. This strategy allows a convenient frame of reference for all interested persons to conceptualize and frame their concerns, in terms of either the hazard analysis or the mitigation action components of the plan.

Future projects may also be identified by local jurisdictions and integrated into the plan by the Emergency Managers. Websites will be updated accordingly and remain available for public viewing and input. These updates to this living document will then already be part of the next HMP update, due in 2022.

Resilient Pure Michigan / The Grand Strategy *

CW 4

Resilient Pure Michigan is an integrated Watershed Management and Resiliency System that will slow down, spread out, and soak up an immense volume of water and sediment.

The technical support provided by a broad spectrum of agencies, departments and subject matter experts, as well as involvement of both public and private sector shareholders. It was a collaborative initiative that includes active participation from federal, state and local government and community stakeholders who serve the communities along the Grand River.

The plan which evolved from it is a living document whose studies and activities contained therein will be used for continued enhancement of the Grand River from Kent Countys' eastern border all the way through to the mouth of the river into Lake Michigan in Ottawa County.

This proposal was submitted in 2015 for HUD resiliency grant funding. Even though the project was not selected for grant funding by HUD, the inclusive process along with technical data will greatly enhance this HMP.

Grand Rapids Climate Resiliency Report

In 2012, City of Grand Rapids mayor George Heartwell was recognized by the U.S. Conference of Mayors for the City's efforts in confronting global climate change. Along with the Climate Protection Award, the City received a $25,000 grant for use in further developing climate change protection programming. The funds were divided between Friends of Grand Rapids Parks and the West Michigan Environmental Action Council (WMEAC). WMEAC, in partnership with the Grand Rapids Office of Energy and Sustainability, embarked on a mission to investigate climate change resiliency at the local level. The outcome of the investigation was the identification of key impacts across community sectors and recommendations for confronting these impacts. The report incorporates local expertise along with climate science, research, and analysis. Twenty-five expert interviews were conducted with contributions from a broad range of community sectors. Interviewees represented the following fields: insurance, academia, regional planning, transportation, food systems, emergency preparedness, sustainability, environmental services, community infrastructure, forestry, finance, low-impact development, built environment, community essential needs, fisheries, engineering, and energy.

Grand Rapids Whitewater
Kent County Dam Plans
Plainfield Twp. Flood Plain Plan
Ottawa County Natural Hazard Analysis
Ottawa County Dam Plans
Northwest Ottawa Water System Emergency Response Plan
Robinson Twp. Hazard Mitigation Plan

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HAZARD MITIGATION PLAN 2017

SECTION TWO - HAZARD ANALYSIS

Hazard Identification

Hazards were selected for inclusion in this plan based upon records of historical occurrence, known risks, and guidance provided by the Federal Emergency Management Agency and by the Michigan State Police Emergency Management and Homeland Security Division. This Hazard Analysis section examines the twenty-four hazards listed below.

CW 7

Natural hazards occur on a fairly frequent basis in these two counties. Some degree of flooding is expected in various portions of the region every year as are thunderstorms and severe winter weather. The impact of these hazards is usually moderate, however past events *have* met the criteria for state and federal disaster declarations. Much of our daily focus is on these events in all four phases of emergency management.

CW 10

These natural hazards have affected social, educational and economic activities in the region. For example, due to advance notice of weather systems, safety has improved through school and social event closings and cancellations. Severe winter weather has affected the region economically. For example, the interruption of commercial travel temporarily affects businesses in the private sector through product shipping and delivery as well as business travel. In a long term event, the cascading effects of these natural hazards would have a profound economic impact in the region, losing nearly $31.5 million per day calculated and indicated in the table below. *(Source: The Right Place)**

State of MI GRP (2015)	GR-Wyoming MSA GRP (2015)	GR-Wyoming % of MI GRP	$ lost/day in MI (2010 dollars)	$ lost/day in MI (2015 dollars)	GR-Wyoming $ lost/day (2015)
$468,334,000,000	$53,949,000,000	11.5%	$251,000,000	$272,830,000	$31,428,224

Data Sources: Bureau of Labor Statistics; American Highway Users Alliance/IHS Global Insight

CW 5

1. Climate Change

Scientists agree that the earth's rising temperatures are fueling longer and hotter heat waves, more frequent droughts, and heavier rainfall. Heavier, and more frequent storms have been responsible for most of the observed increase in total precipitation during the last 50 years. In many areas, heavy precipitation has increased while changes in the frequency and intensity of moderate precipitation events have been less significant. Precipitation falling during heavy, multi-day wet periods has also increased dramatically.

** The Right Place a private, non-profit economic development organization that has led West Michigan's economic growth for over 30 years. They provide business growth assistance to both local and international companies including connections to regional supply chain and service providers, consultation on state and local business incentives, and more.*

2. Communication / Cyber Failure
Loss of communication infrastructure may occur anywhere in Kent and Ottawa Counties. Communication is essential to the health and safety of residents. Here too, cyber threat has increased the need for mitigation and response efforts.

3. Drought

CW 5

Kent and Ottawa Counties are situated next to one of the world's largest bodies of fresh water but are still vulnerable to drought throughout the area. Even the mild droughts experienced in Michigan can cause significant hazards in a variety of ways. Besides economic losses related to drought, the likelihood of brush and forest fires becomes an immediate concern. Longer term effects of drought are usually felt in the agriculture area and can be mitigated to some degree by crop and conservation methods. Federal assistance programs are available to ease the economic impact on the agricultural sector.

4. Earthquake

CW 5

Earthquake hazard remains low for the entire Greater Grand Rapids area. The United States Geological Survey predicts a 2% probability of an earthquake occurring in the next 50 years which is capable of peak acceleration of 4% g (gravity). This might cause damage and the possible collapse of certain unreinforced buildings constructed before 1940.

5. Electrical Failure
Electrical infrastructure failure may occur anywhere in Kent and Ottawa Counties due to local events or distant events that affect the stability of the grid. The threat of cyber attacks on SCADA systems has increased the need for mitigation and response efforts in both counties.

CW 5

6. Extreme Temperatures
Ottawa County and Kent County enjoy a relatively comfortable climate throughout much of the year, thanks to the moderating influence of nearby Lake Michigan. However, the entire area does experience significant extremes in temperature. When coupled with high humidity in summer and high winds in winter, the effects of these temperature extremes can be exacerbated and place human health and property at increased risk. Temperatures above 100 degrees and lower than -20 degrees have been recorded in the area. Statistical analysis indicates that 15 days per year with temperatures of 90 degrees or higher, and 12 days per year with temperatures below 0 degrees Fahrenheit, will be experienced on average in Kent County. In Ottawa County, 13 days per year of at least 90 degree temperatures, and 6 days per year with temperatures below 0 degrees Fahreinheit will be experienced on average. Public education about extreme temperature hazards, early warning of impending extreme temperature events, and the availability of cooling and warming shelters are some of the beneficial actions used to mitigate the impacts of these hazards.

7. Fire – General
Various types of fire may occur in places of opportunity, but generally the risk of fires other than structure or wildfires (such as those involving scrap tires or landfills), is low throughout the area.

8. Fire - Urban and Structural
Structural fires may occur in any structure, so it is logical that fire hazard increases as the concentration of structures increases. Structural loss is proportional to population concentration. The greatest loss potential is within the City of Grand Rapids.

9. Fire - Wildfire

CW 5

Wildfires in Kent and Ottawa Counties tend to occur in open areas of unmaintained grassland and dry crop land. These surface fires are common along roadways due to the nearly continuous presence of ignition sources from passing vehicles and cigarettes.

10. Flood - Dam Failure
Ottawa County has seven notable dams. Six dams are rated as low hazard, one is rated as significant hazard and none are rated as high hazard. Kent County has thirteen notable dams. Five dams are rated as low hazard, six are rated as significant hazard, and two are rated as high hazard. Kent County could expect loss of life due to hazard posed by some dams.

CW 5

11. Flood - Riverine
Riverine flooding tends to be exacerbated in the springtime from a combination of frozen ground (less able occurred in the Greater Grand Rapids area in the past 100 years, causing significant economic impact. Floodplain maps describe locations prone to flooding.

CW 5

12. Flood - Shoreline Flooding and Erosion
Shoreline erosion is a natural process which is affected by human activities on the west edge of Ottawa County. The rate of erosion had slowed since the time that the level of Lake Michigan had been relatively low, and since shoreline protection had been added. The lake level has been returning to normal in recent years. Low levels had been causing shallow depths in marinas and river mouths, with a significant impact on watercraft, marinas, and the shipping industry.

13. Flood – Urban
Urban flooding is a hazard in metropolitan areas of Greater Grand Rapids. Long term commitment to the prevention of combined sewer overflow has and will continue to reduce this hazard.

14. Hazardous Material Release
The potential release of hazardous materials exists wherever that material may be located. Higher potential for release coincides with the location of storage sites at fixed facilities and along transportation routes such as major roadways and rail lines.

15. Intentional Acts
Intentional human acts, such as terrorism, crime, and civil disturbances, pose various degrees of hazard to the entire area. Terrorism risk is higher in the metropolitan Grand Rapids area as well as some critical infrastructure.

CW 5

16. Landslide
While landslides may occur in the bluff area of the shoreline of Ottawa County, the relatively flat terrain and ground cover of the area as well as other factors combine to form a low overall hazard from landslides throughout the vast majority of the region's land area.

17. Nuclear Power Plant
Kent and Ottawa Counties do not have a nuclear power plant within their boundaries; however, portions of both counties lie within the 50 mile zone of concern from the Palisades plant in Van Buren County.

18. Public Health Emergency
Communicable disease is a threat to all Kent and Ottawa County residents. Disease is more easily transmitted between people in areas of concentrated population, and in public gathering areas, schools, businesses, etc. Activities such as disease outbreak monitoring, vaccinations, education and other mitigation programs help safeguard public health.

19. Sanitary Sewer System Failure
Loss of sanitary sewer infrastructure can lead to significant environmental, health and safety risks, and

public health crisis by encouraging the unchecked growth of pathogens. Flooding of structures and low-lying areas may occur as a result of interrupted lines or loss of lift stations. The system may also be overwhelmed by extreme precipitation.

CW 5

20. Severe Weather - Winter (Blizzards, Snow, and Ice)
West Michigan is in the crosshairs of one of the biggest snow machines in the country—Lake Michigan. Significant snowfalls and strong winds can often affect all the residents of Kent and Ottawa Counties. Deep, drifting snows frequently disrupt normal life or at least slow travel considerably. Snow plowing, snow removal, vehicle damage from snow and ice-caused accidents, and damage from ice storms have a significant economic impact on the counties.

CW 5

21. Severe Weather - Thunderstorm (Hail, Lightning and Wind)
Thunderstorms are probably the most frequently occurring natural hazards in Kent and Ottawa Counties. Lightning, heavy rain, hail, strong winds and the potential to spawn devastating tornadoes can kill, injure and destroy property. Even moderate thunderstorms may disrupt and inconvenience modern life. Because of the regularity of severe thunderstorm weather in Western Michigan, those charged with public safety continually work to improve the monitoring of and warnings about threatening weather. Educational efforts also need to continue to inform the public with knowledge of what to do before and during severe weather.

CW 5

22. Severe Weather - Tornado
Tornadoes occur in Michigan every year with grim regularity. NOAA places most of Michigan's lower peninsula in the high-risk category. Damage from these violent storms ranges from minor to devastating. Deaths and property loss are frequent by-products of these vicious winds. The Greater Grand Rapids Area has experienced more tornadoes than most of the state has. Kent County is tied for 2nd place with two other counties as having experienced the most tornadoes in Michigan since 1950. In addition to casualties directly caused by a storm, injuries can also occur during rescue and clean-up efforts afterward. Improved public education about tornado safety, through community efforts and media coverage, have increased the public's awareness of potential hazards from tornadoes and their response to those hazards. The National Weather Service has improved warning lead times from six to thirteen minutes. Local TV can also provide advanced warning with Doppler radar. Education and early awareness need to be continually improved to mitigate tornado hazards.

23. Transportation Accident
Unsurprisingly, transportation accidents occur more frequently in high traffic areas across the entire Kent and Ottawa County area.

24. Water System Failure
Loss of functional water system infrastructure would most likely be secondary to loss of electrical power. Single point interruptions can be circumvented with looped mains and linked systems. Redundancy and back-up components help assure that outages can be quickly remedied. With adequate back up electrical supply, loss of the water system caused by a natural disaster seems unlikely.

Risk Scoring Evaluation Measures

To profile and evaluate hazards, a set of 12 weighted evaluation measures was used to evaluate each hazard facing the community. The following list summarizes the 12 evaluation measures, listed in order of priority.

1. Historical Occurrence
Historical occurrence measures the frequency with which a particular hazard occurs in the area. The more

frequently a hazard event occurs, the more potential there is for damage and negative impact on the community.

2. Seriously Affected Population
Seriously affected population refers to the number of people in the County who can expect to be directly affected by a particular hazard event, either because they receive physical injury, property damage, economic hardship, or because their day to day activities are severely disrupted because of severe damage to their community of residence or work.

3. Collateral Damage
Collateral Damage refers to the possibility of a particular hazard event causing secondary damage and impacts. For example, blizzards and ice storms cause power outages, which can cause loss of heat, which can lead to hypothermia and possible death or serious injury. Generally, the more collateral damage a hazard event causes, the more serious a threat the hazard is to a community.

4. Population Impact
Population impact refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs.

5. Economic Effects
Economic effects are the monetary damages incurred from a hazard event, and include both public and private damage. Direct physical damage costs, as well as indirect impact costs such as lost business and tax revenue, are included as part of the total monetary damages.

6. Affected Area
Each hazard affects a geographical area. For example, a blizzard might affect the entire County, while a flood might only affect a portion of a community. Although size of the affected area is not always indicative of the destructive potential of the hazard, generally the larger the affected area, the more problematic the hazard event is on a community.

7. Duration
Duration refers to the time period the hazard event is actively present and causing damage (often referred to as the "time on the ground"). Duration is not always indicative of the damage potential of a hazard event, however, in most cases the longer an event is "active" and causing damage, the greater the total damages will be.

8. Availability of Warnings
Availability of warnings indicates the ease with which the public can be warned of a hazard. This measure does not address the availability of warning systems in a community. Rather, it looks at the overall availability of warning in general for a particular hazard event. For example, a community might receive warning that a flood will occur within 24 hours, but receive no warning when a large fire occurs. Generally, hazards that have little or no availability of warning tend to be more problematic for a community from a population protection and response standpoint.

9. Speed of Onset
Speed of onset refers to the amount of time it typically takes for a hazard event to develop. Speed of onset is an important evaluation measure because the faster an event develops, the less time local governments have to warn the potentially impacted population of appropriate protective actions.

10. Seasonal Pattern
Seasonal pattern refers to the time of the year in which a particular hazard event can reasonably be expected to occur. Some hazard events can occur at any time of the year, while others occur primarily during one particular season. Oftentimes, hazard patterns coincide with peak tourism seasons and other times of temporary population increases, greatly increasing the vulnerability of the population to the negative impacts of certain hazard events.

11. Predictability
Predictability refers to the ease with which a particular hazard event can be predicted, in terms of time of occurrence, location, and magnitude. Predictability is important because the more predictable a hazard event is, the more likely it is a community will be able to warn the potentially impacted population and take other preventative measures to minimize loss of life and property.

12. Mitigation Potential
Mitigation potential refers to the relative ease with which the impacts of a particular hazard event can be mitigated through the application of structural or non-structural (or both) mitigation measures. Generally, the easier a hazard event is to mitigate, the less of a future threat it may pose to a community in terms of loss of life and property.

Hazard Scoring

In order to rank the hazards from most severe threat to least threat to the area, each of the 12 evaluation measures was assigned a specific point value of 10, 7, 4, or 1 point, based on each element's relative severity and negative impacts. The more severe the potential impact from a hazard event, the more points that hazard was assigned. Next, each evaluation measure was assigned a "weight." The purpose of weighting the 12 measures was to stress measures that were deemed more important, and thus produce a more valid assessment of the relative significance of each hazard. All 12 measures were weighted, with the most important measure receiving a weight of 12, and the least important measure receiving a weight of 1. When the point value of a particular measure was multiplied by the weight, the measure received more emphasis (points) than measures that had not been assigned such a heavy weight. In this way, a quantitative profile more accurately reflects those areas deemed most important by experienced emergency management personnel.

The following is a list of the hazard evaluation measures and their assigned weights:

Historical Occurrence	12
Seriously Affected Population	11
Collateral Damage	10
Population Impact	9
Economic Effects	8
Affected Area	7
Duration	6
Availability of Warning	5
Speed of Onset	4
Seasonal Pattern	3
Predictability	2
Mitigation Potential	1

The quantitative result (score) for each hazard is obtained by multiplying each measure's benchmark factor point value by the weight for each particular measure, then totaling the points for all the measures

to find a total hazard score. The results ranged from a minimum of 78 to a maximum of 780, and these were also assigned appropriate values on a standardized scale from 0 to 100, for ease of interpretation.

Hazard / Risk Ranking

The total hazard scores determined each hazard's ranking, with the highest scores for hazards posing the greatest threat to the most people. The following is a summary of the total hazard score results and the hazard rankings.

The ranking process is not intended to discount the threat of any particular hazard, for those hazards elaborated on in this plan all present significant elements of threat.
Rather, the hazard ranking process allows us to compare the hazards to each other, to determine which hazards are the greatest threats to the greatest number of people in the region as a whole. This means that the hazards which have the likelihood of injuring or killing the most people in the area and causing the greatest economic hardship across the greatest area have received the highest ranking. For example, shoreline flooding and erosion is a serious threat to the homes and businesses located along the lakeshore, but does not directly affect people living in inland areas. On the other hand, severe winter weather such as a blizzard typically has a greater direct impact upon communities throughout the region.

RISK ASSESSMENT SCORE RANKING

Raw	Score	Standardized Hazard
561	68.8	Severe Winter Weather
504	60.7	Electrical Failure
456	53.8	Tornado
447	52.6	Riverine Flooding
444	52.1	Cyber / Communications Failure
435	50.9	Thunderstorm
411	47.4	Urban Flooding
408	47.0	Intentional Acts
393	44.9	Transportation Accidents
393	44.9	Hazardous Materials Release
390	44.4	Urban and Structural Fire
384	43.6	Water System Failure
384	43.6	Dam Failure (Kent County)
381	43.2	Natural Epidemic
366	41.0	Sanitary Sewer Failure
357	39.7	Extreme Temperature
354	39.3	Dam Failure (Ottawa County)
342	37.6	Shoreline Flooding and Erosion
339	37.2	Nuclear Power Plant Accident

330	35.9	Wildfire
327	35.5	Earthquake
321	34.6	Drought (all but Grand Rapids)
276	28.2	Other Fire
273	27.8	Drought (in Grand Rapids)
243	23.5	Landslide (all but Grand Rapids)
240	23.1	Landslide (in Grand Rapids)

Individual hazard risk assessment scores are ranked greatest to least

HAZARD OVERVIEW

The FEMA list of natural hazards was reviewed for applicability to each jurisdiction's area. The selection of those hazards for discussion was reflective of the region's experience with those hazards. As a result, the potential threat categories of avalanche, coastal storm, expansive soils, land subsidence, tsunami and volcano were eliminated as not being relevant enough to the region to include in this analysis.

Other hazards were identified as being of significant concern to governmental units and were therefore added to the modified FEMA list. They are broadly categorized as infrastructure failures (including electrical, communication, water and sewer failure types), public health emergencies (natural epidemics), and human induced events (including hazardous materials releases, transportation accidents, nuclear power plant accidents, and intentional acts).

Each hazard begins with a basic summary for a quick overview. The hazard is described, affected areas identified, and its potential impact discussed. Historically significant and related events chronicle the hazards' past human, economic, and environmental impact. Existing prevention programs at local, state and federal levels identify current efforts to mitigate or eliminate the hazards' threat.

1. Climate Change

CW 5

(1.) Summary

According to the University of Michigan's Graham Center for Sustainability's Cities Impacts & Adaptation Tool, the difference between the current 1981-2010 period and the historical 1951-1980 shows that the Grand Rapids area has experienced a 1.04 degree Fahrenheit annual temperature increase. This same tool projects that between the period of 2041-2070 and current conditions, temperatures will increase anywhere from 2.03 to 6.43 degrees. (Source: http://graham-maps.miserver.it.umich.edu/ciat/home.xhtml)

In addition to the temperature increase, an increase in extreme precipitation is one of the clearest climate changes observed in the Great Lakes region. The amount of precipitation falling in the most intense 1% of precipitation events increased by 37% in the Midwest from 1958 through 2012. From 1951-1980 to 1981-2010, the average of 224 observational stations in the Great Lakes region recorded that the heaviest 1% of daily precipitation events have become 5% more intense. Similarly, the frequency of these same heavy storms increased by 23.3% and the amount of precipitation falling in those storms increased by 24.5%.

(1.) Hazard Description

According to the Great Lakes Integrated Sciences + Assessments, these heavier, more

frequent storms have been responsible for most of the observed increase in total precipitation during the last 50 years. In many areas, heavy precipitation has increased while changes in the frequency and intensity of moderate precipitation events have been less significant. Precipitation falling during heavy, multi-day wet periods has also increased dramatically.

CW 8

(1.) Historically Significant and Related Events

From 1931 through 1996, the amount of precipitation falling during week-long, once a year precipitation events increased by 25% to 100% in a broad region from the central Great Plains through the southern Great Lakes basin. Precipitation events lasting two days that occurred, on average, once in 5, 10, and 20 years all became substantially more frequent since the early 1960s (http://glisa.umich.edu/climate/extreme-precipitation).

CW 10

(1.) Community Impact

As temperatures warm, the potential for both wetter and drier conditions can increase. While annual precipitation totals have generally increased, the seasonal and regional distribution of precipitation can also change. In the Great Lakes region, precipitation totals during the Fall, Winter, and Spring have increased in most locations, while summer precipitation has remained relatively stable or even declined. These effects, the clustering of precipitation into heavier storms and the polarization of wet and dry seasons, can allow for a greater chance of both extreme precipitation and of prolonged dry periods by extending the time between rainfalls.

Despite a projected increase in precipitation, many climate change models predict future decreases in lake levels. The reduction in lake levels is expected to be caused by increased evaporation as well as increased evapotranspiration, reducing the contribution of lateral flow and percolations that contributes to groundwater recharge.

As Hanrahan, et al. noted in *Connecting past and present climate variability to the water levels of Lakes Michigan and Huron*, "While the lake level fluctuations prior to 1980 were predominately driven by changes in precipitation, it is now found that for the first time in our years of record, evaporation has begun to significantly contribute to lake level changes. Summertime evaporation rates have more than doubled since 1980 as a result of increasing water-surface temperatures, which are significantly correlated with decreasing wintertime ice cover."

Predicted drops in water levels in the Great Lakes and the Mississippi River Basin, will make shipping there much more difficult. From 1997 to 2001 lake water levels decreased and ships in the Great Lakes were forced to carry less cargo. Future decreases in water level would again require cargo restrictions or perhaps the redesign of vessels. Either option increases the cost of shipping on interior waterways. Decreased depths could be mitigated by increased dredging, but at a substantial financial and environmental cost.
<http://www.epa.gov/sectors/pdf/ports-planing-for-cci-white-paper.pdf>

Climate change resiliency planning is a wicked problem. It has complex roots and no definitive end. It is part of an open system, is the symptom of other problems, and leaves little room for mistakes by decision makers.

According to the MAGICC/SCENGEN model used in this analysis, and other climate research conducted for the Midwest and the State of Michigan, Grand Rapids will be impacted by climate change. This community is fortunate to be buffered against its most extreme impacts, such as coastal flooding tied to increasingly strong storms or the extreme drought and heat experienced in more arid regions. Grand Rapids can expect both warmer temperatures and increased precipitation. Annual average temperature is predicted to rise from a baseline of 47.3 °F to 49.28 °F by 2022, then to 51.26 °F by 2042. Precipitation is expected to increase from a baseline annual average of 7.6 cm to 7.8 cm and 8.3 cm in 2022 and 2042,

respectively. These increases may seem insignificant, but research shows that such annual changes to temperature and precipitation averages can have major effects on hydrologic cycles, vegetation growth patterns, seasonal weather patterns, and air quality. Importantly, they may cause an increase in the occurrence of extreme-weather events (such as days above 90 °F and 90% humidity), storms producing one inch of rain within 24 hours, and more freeze-thaw cycles within a year.

However, the true nature of the problem that climate change poses to the resiliency of the community becomes clear when we consider that the predicted climate changes will likely impact each sector of the Grand Rapids community to a certain extent. Grand Rapids represents a complex system in which each of the subsystems does not function in isolation, but rather has unique relationships to the others and to the residents who rely upon them. Decisions made regarding the transportation system have implications for several other subsystems, such as food and healthcare, by inhibiting or enhancing access to certain locations. Understanding that interdependent characteristic of the community system is vital for any planning effort.
Resiliency for Grand Rapids means the ability to simultaneously balance ecosystem and human functions in an uncertain and dynamic climate future. Grand Rapids must continue to mitigate its contribution to climate change while also preparing to adapt to the predicted impacts in a way that enhances residents' freedom to flourish.

CW 9

(1.) Risk/Likelihood

The authors of *Climate Change and Great Lakes Water Resources,* (see http://online.nwf.org/site/DocServer/Climate_Change_and_Great_Lakes_Water_Resources_Report_FI.pdf) predict increased variability in timing, intensity, and duration of precipitation under global warming conditions, which may also increase the frequency of droughts, and floods in the Great Lakes region. Overall, stream runoff is expected to decrease, and base flow—the contribution of groundwater to streamflow—could drop by nearly 20% by 2030. When intense precipitation does occur, projections indicate that soil erosion, land and water quality degradation, flooding, and infrastructure failure will be more likely to occur, and overflowing combined sewers could contaminate lakes. Michigan constitutes roughly 50% of the entire US portion of the Great Lakes watershed. See also (http://www.lre.usace.army.mil/Portals/69/docs/GreatLakesInfo/docs/CoordinatedGreatLakesPhysicalData/CoordinatedGreatLakesPhysicalData-May1977-MediumRes.pdf)

Changing Land use, Increased Precipitation Intensity Leads to More Flooding

The Third National Climate Assessment for the Great Lakes Region from June 2014 reported that changing land use and expanding urbanization are reducing water infiltration into the soil and increasing surface runoff. These changes exacerbate impacts, including flooding, caused by increased precipitation intensity. Impervious surfaces, combined with more frequent extreme precipitation events, have led to over-taxed storm water systems failing throughout the Great Lakes region. These failures resulted in combined sewer overflows and wastewater treatment plant shut downs. While this would be a problem for any community, this is especially problematic for the Great Lakes since they provide drinking water to more than 40 million people and are home to more than 500 beaches (Patz et al. 2008).

Increased precipitation intensity also increases erosion, damaging ecosystems and augmenting delivery of sediment to the rivers and eventually to the ports. Increased storm induced agricultural runoff and rising water temperatures have increased non-point source pollution problems in recent years (Mishra et al. 2010). This has led to increased phosphorus and nitrogen loading, which in turn is contributing to more and prolonged occurrences of low oxygen "dead-zones" and to harmful, lengthy, and dense algae growth in the Great Lakes and other Midwest water bodies (Scavia et al. 2014; Michalak et al. 2013). Watershed planning can

be used to reduce water quantity and quality problems due to changing climate and land use.

In the absence of a storm water management plan that includes low-impact development and green infrastructure, more and stronger precipitation could also affect harbor channels. Increased erosion and buildup of underwater silt and debris will decrease channel depth resulting in a need for more dredging.

(1.) Existing Prevention Programs

In recent years, funds available for dredging have been limited. According to the Great Lakes Commission's March 2013 Legislative Priority Fact Sheet, several years of inadequate funding for the U.S. Army Corps of Engineers' (USACE) operations and maintenance budget for the Great Lakes have created an 18 million cubic yard, $200 million backlog for dredging of channels and commercial harbors. Because of the shallow depths caused by inadequate dredging and low water levels, the largest U.S.-flag cargo vessels on the lakes have been forced to leave more than 10,000 tons of cargo per trip at the dock in recent years. As a result, core regional industries – such as steel manufacturing, electrical power generation, construction and agriculture – are at risk by this ongoing under-funding of the Great Lakes transportation system.

Shallow-draft recreational harbors in the Great Lakes (14 feet or less of authorized depth) are also impacted by a severe dredging backlog. Administration policy has not allowed the USACE to include funding for dredging recreational harbors in the President's budget. In addition, Congressional policy prohibiting earmarks has eliminated funds for dredging these harbors to be directly named in appropriations bills. These harbors not only provide access to the lakes for more than 4 million recreational boats registered in the eight Great Lakes states, but also serve as harbors of refuge during dangerous weather conditions and operational bases for charter fishing fleets, commercial fishing operations and ferry/excursion services. Insufficient dredging has reduced and sometimes eliminated access to these harbors causing not only economic loss, but also potential threats to human safety.

2. Communication / Cyber Failure

(2.) Summary

Loss of communication infrastructure may occur anywhere in Kent and Ottawa counties. Communication is essential to the health and safety of residents. More study is necessary to improve its reliability.

(2.) Hazard Description

Communication failure involves the loss of critical public or private communication infrastructure that affects essential services. Communication facilities are located across the area and are subject to damage from digging, fire, traffic accidents, floods, severe weather, and day-to-day events. Communication infrastructure used to mean only the telephone and radio systems. Recent advances in technology have added diverse forms of communication such as cell phones, satellite phones, pagers, microwave and digital signaling systems, computer applications and cellphone apps. These communication systems are subject to failure, especially with the advancement of so-called hacking.

CW 8

(2.) Historically Significant and Related Events

Our technology is accelerating faster than data can be accumulated and analyzed about system reliability. Communication functions are heavily dependent on electrical supply. Severe weather, solar flares, electromagnetic pulses, and excavations can have significant impacts on the reliability of communication systems.

CW 9

(2.) ***Risk/Likelihood***

The likelihood of communication infrastructure failure cannot be readily quantified, but such failure can be expected to occur at various times in the future, including during emergency events. Effective communication systems are essential to the health and safety of everyone in the region.

(2.) ***Existing Prevention Programs***

Existing prevention programs are in place in the form of firewalls, cyber security training and redundant communication systems.

3. Drought

CW 5

(3.) ***Summary***

Kent and Ottawa Counties are situated next to one of the world's largest bodies of fresh water but are still vulnerable to drought. The droughts experienced in Michigan can cause significant economic losses and the increased likelihood of brush and forest fires becomes a concern. Longer term effects of drought are usually felt in the agriculture area and can be mitigated to some degree by crop and conservation methods. Federal assistance programs are available to ease the economic impact on agriculturalists.

(3.) ***Hazard Description***

A drought is a prolonged, abnormally dry period when there is not enough water for users' normal needs. The definition of drought also varies by location. For Michigan, blessed with the Great Lakes, a moderate climate and vast reservoirs of underground water, drought may at first seem like a minimal hazard. Mild droughts are common in Michigan, but severe droughts are less frequent and generally of shorter duration. Nevertheless, periods of abnormal dryness in Michigan can have significant impact on daily living in the areas of (1) higher risk of forest and brush fires, (2) commercial agriculture, (3) gardens, (4) agricultural supply businesses, (5) lake and river levels, (6) Great Lakes shipping, (7) recreational boating and fishing, (8) shallow water wells, (9) vegetation, (10) wildlife and their habitats, (11) hydroelectric power plants, (12) land use, and (13) downstream impacts from watershed drought.

Most of these drought-related impacts are slow in emerging and slow in retreating, except the higher chance of brush and forest fires. They can be classified into four types of drought as experienced in Michigan:

1. Meteorological: A meteorological drought is defined by the extent to which precipitation is below normal, and for how long. Such a drought tends to be for a relatively short period of time.
2. Agricultural: In this type of drought, moisture in the soil is no longer sufficient to meet the needs of the crops growing in the area. The water demand a crop has depends on weather conditions such as temperature and relative humidity, its biological makeup, what stage of growth the crop is in, and the physical/chemical makeup of the soil.
3. Hydrological: Hydrological drought deals with surface and subsurface water supplies such as water tables and stream flow. Extended dry periods cause these supplies to drop below normal. This type of drought usually does not occur at the same time as the others, but instead lags behind. It takes longer periods of time for the lack of moisture to show up in places such as the ground water, reservoir and lake levels. When this happens, hydroelectric power plants and recreational areas can be significantly impacted.

Though climate and weather are the main contributors to hydrological drought, other factors can have an influence: changes in landscaping, land use, and the construction of dams. Such man-made changes may not have a significant local impact, but regions downstream certainly will be impacted during a meteorological drought.

4. Socioeconomic: Socioeconomic drought refers to what occurs when water shortages begin to affect people and their lives. It associates economic good with the elements of meteorological, agricultural, and hydrological drought. It is different in that it is based on supply and demand. The supply of goods based on weather – water, food grains, fish, hydroelectric power, etc. — can normally meet a given demand in Michigan. If water availability decreases or demand increases (e.g. due to population increases and/or higher consumption), a socioeconomic drought may occur.

CW 8

(3.) Historically Significant and Related Events

Some of the early droughts in the area took place in the periods of 1871, 1895-1986, 1901-1902, 1904, 1914-1915, 1925-1926, and 1931. The worst drought to occur lasted 29 months from 1930-1932. The most recent drought occurred within a 10 month time period from 2005-2006.
Michigan's historically most extreme droughts occurred about once per decade, but the frequency appears to be lessening, according to the 2011 Michigan Hazard Mitigation Plan. For many decades, peaking in 1930, state-wide rainfall was much below normal, but that trend has reversed in recent decades.

The summer of 1871 was notable, because the severe droughts were associated with enormous wildfires across the Midwest, including a fire in Holland that destroyed half of the city. 1904 was one of the driest years on record for Ottawa County—only 23.97 inches of rain fell in Grand Haven during the entire year. In the 1930s, winter precipitation temporarily relieved the drought, but subsoil moisture remained abnormally dry. The most severe Palmer Drought Severity Index readings for southwest Michigan are seen during this period. Drought conditions were compounded by the extremely hot summer of 1936, when many deaths were attributed to the heat. That drought eventually ended by 1937. Because of the severity of this drought, 41 counties were recognized by the Federal Drought Relief Administration as needing assistance.

The drought of 1947-1950 was deemed moderate, but the State suffered significant crop damage and thousands of acres of timber in northern Michigan were destroyed by forest fires. Kent and Ottawa Counties were somewhat impacted by the drought of 1952-1956, but to a greater degree by the drought of 1955-1959 when the Grand River basin stream flows were less than normal.

The longest drought since the 1930's occurred in the Lower Peninsula during 1960-1967. Many stream, lake and groundwater levels were at or near record lows. Precipitation during 1962-1963 was the least since 1931. Crops were severely damaged in 1965 and several counties were designated drought disaster areas. A multi-state drought (including Michigan) from 1986-1989 resulted from greater than normal temperatures and uneven moisture distribution. Stream flows were less than normal at gaging stations statewide. The drought affected water use throughout the State.

In 1996, Ottawa County was granted a disaster declaration for drought by the U.S. Secretary of Agriculture, based upon the period from June 1 to September 21, making farmers eligible for low-interest federal loans. From January 1 to September 30, 1998, Ottawa County received relatively little precipitation, and again received a drought disaster declaration from the U.S. Department of Agriculture.

CW 9

(3.) Risk/Likelihood

Droughts tend to follow two periods of recurrence (not cycles)—meteorological and hydrological. As mentioned above, meteorological drought refers to a relatively short-term period of below normal rainfall. Such periods occur from time to time and can last from a few weeks to a few months. During this time, deep soil moisture and water tables are not replenished, possibly leading to or extending a hydrological drought. A hydrological drought has a longer recurrence period, lasting from a few years to decades.

Kent and Ottawa Counties are located in Climate Division number 8, which historically has had

only 44% of its years go by without any month registering as a drought month. Thus, 56% of the years between 1895 and 2010 involved at least one month with a Palmer drought index equal to or less than -2.0. Viewed in another way, 79.7% of all months between 1895 and 2010 were drought-free. That Southwest Michigan climate division has never reached a Palmer index as low as -7.0, according to monthly and annual data from the U.S. Drought Monitor, but has gone as low as -6.0. An exceptional drought is a Palmer number of -4.0 or below, so Kent and Ottawa Counties have experienced very serious drought conditions in the past.

(3.) Existing Prevention Programs

Rainfall and stream flows are constantly monitored, recorded and analyzed by the National Weather Service/ NOAA, the U.S. Geological Survey and the U.S. Department of Agriculture. Each week the USDA, NOAA, the National Drought Mitigation Center and the NCDC update the current drought conditions across the country. The NDMC offers drought preparedness advice for individual states. Drought preparedness plans contain three critical components: (1) a comprehensive early warning system; (2) risk and impact assessment procedures; and (3) mitigation and response strategies. These components complement one another and represent an integrated institutional approach that addresses both short- and long-term management and mitigation issues. At the current time, the State of Michigan does not have a formal drought preparedness plan. The Natural Resources Conservation Service makes available water, land and crop management information to farmers and ranchers to create their own drought plan.

In the event of drought-related (and other) natural disasters, the USDA makes available a number of assistance programs, including direct payments, crop insurance, emergency loans, and other assistance programs to communities. Of particular interest is the availability of technical assistance to local water resource agencies for watershed protection planning.

In Kent County, the local USDA office monitors the extent of weather-related events in the area to determine if a disaster condition exists. In the case of drought-caused crop losses, local acreage yields and crop quality would be assessed using national agricultural statistics. From these data, dollar losses are computed to determine eligibility for Federal relief.

Crop Advisory Team (CAT) Alerts by field agents and specialists identify what information needs to be disseminated to growers and through web page (http://www.ipm.msu.edu/aboutcat.htm) and printed newsletter information to address concerns.

According to Environmental Working Group (www.ewg.org), farm disaster payments to Ottawa and Kent County farms from 1995-2003 were $4,794,574 and $3,558,937 respectively, or a total of on market value minus the first 35%, which is absorbed by the owner. Of the remaining 65%, several factors are applied to calculate the payment. These variables drive the remaining 65% to roughly 50%. Therefore, the actual loss over the time period is approximately $16M.

4. Earthquake

CW 5

(4.) Summary

The earthquake hazard remains low for the entire Greater Grand Rapids area. The United States Geological Survey predicts a 2% probability of an earthquake occurring in the next 50 years of a magnitude capable of a peak acceleration of 4% g (gravity). This might cause damage and possible collapse of buildings constructed before 1940. Earthquake Hazard Probability Map. Source: United States Geological Survey (USGS).

(4.) Hazard Description

The earthquake hazard refers to the consequences of an earthquake that may disrupt the normal activities of residents or cause them loss. Most hazards arise from ground shaking caused by waves that emanate

from the abrupt fault movement during an earthquake. Seismic hazard maps depict the ground shaking that is expected to be exceeded at a selected probability (or chance) over a specific time period. Estimates of this "probabilistic" ground shaking, or hazard, at any given location must account for many factors, including the possible shaking from all likely earthquakes and the types of rocks and soil in the region. The USGS produces earthquake (seismic) hazard maps on a national scale. Hazard maps are also now produced for selected urban areas. At either scale there are maps for different probabilities and time periods; the choice of which to use depends upon the needs of the user. Builders of a dam, for instance, might want to consider longer periods of time and lower likelihoods of shaking than a home builder would.
This is because a dam is built to have a longer life, and damage to it could have a greater impact on the community.

CW 8

(4.) Historically Significant and Related Events

The earliest confirmed record of earthquake tremors felt in Michigan Territory (statehood came in 1837) were from the great series of shocks centered near New Madrid, Missouri in 1811 and 1812. As many as nine tremors from the New Madrid earthquake series were reportedly felt distinctly at Detroit.

A damaging earthquake, apparently centered between Montreal and Quebec in the Saint Lawrence Valley, occurred on October 20, 1870. This shock was felt over an area estimated to be at least a million square miles, including Sault Sainte Marie.

On February 4, 1883, an earthquake (intensity VI) cracked windows and shook buildings in Kalamazoo. This shock was felt in southern Michigan and northern Indiana.

The destructive earthquake that hit Charleston, South Carolina on August 31, 1886, was felt as far north as Milwaukee, Wisconsin and probably in parts of Michigan.

On October 31, 1895, Charleston, Missouri experienced a major earthquake. Considered the severest shock in the central U.S. region since the 1811 - 1812 earthquakes, the 1-million-square-mile felt area included parts of Michigan. A moderate earthquake of intensity V was felt at Menominee on March 13, 1905.

There have been various minor events felt in Michigan over the years. On November 1, 1935, a 6.2 magnitude earthquake occurred in Timiskaming, Quebec. On October 7, 1983 a 5.1 magnitude earthquake occurred in Blue Mountain Lake, NY. On June 10, 1987 a 5.2 magnitude earthquake occurred in Lawrenceville, IL. On November 25, 1988 a 5.9 magnitude earthquake occurred in Saguenay, Quebec. On April 18, 2008 two separate earthquakes (5.4, and 4.8 magnitude) occurred in West Salem, IL.

The statistical prediction of earthquakes is well documented. The probability of an earthquake in the Grand Rapids area is quantified in the table below. Peak ground acceleration described the change in position of a point on affected lands, while spectral acceleration estimates the movement of a built structure in an earthquake-affected area.)

Probabilistic Ground Motion Values (%g) in 50 Years:

	10%	**5%**	**2%**
PGA	1.331399	2.257348	4.067041
0.2 sec SA	3.320904	5.278307	9.083736
0.3 sec SA	2.897979	4.687243	7.916014
1.0 sec SA	1.251185	2.313128	4.155163

(PGA = peak ground acceleration, SA = spectral acceleration)

The earthquake of August 9, 1947, damaged chimneys and cracked plaster in parts of south-central Michigan and affected a total area of about 50,000 square miles, from Muskegon and Saginaw to Illinois, Indiana, and Wisconsin. The cities of Athens, Bronson, Coldwater, Colon, Matteson Lake, Sherwood, and Union City in the south-central part of the State all experienced intensity VI effects. Reports of damage to chimneys and some instances of cracked or fallen plaster, broken windows, and merchandise thrown from store shelves were common over the area.

On June 30, 2015, a 3.3 earthquake 7 miles northeast of Union City, Michigan could be felt in Ottawa County and the Greater Grand Rapids area. Kent and Ottawa County residents were not affected directly nor was any damage reported.
A number of other earthquakes centered outside the State have been felt in Michigan. Noteworthy among these are the following:

February 28, 1925 St. Lawrence River region northwest of Murray Bay (La Malbaie), Quebec, Canada. The affected area was approximately 2 million square miles (intensity V at Grand Rapids, Michigan).

September 4, 1944 St. Lawrence River region between Massena, New York and Cornwall, Ontario, Canada. The affected area was 175,000 square miles across the U.S., including Grand Rapids, Michigan.

November 9, 1968
South-central Illinois; the affected area was approximately 580,000 square miles (including all or portions of 23 states, including southern Michigan).

CW 9

(4.) Risk/Likelihood
The probability of earthquake in any area of the United States has been well studied by the USGS. The probability of a quake in the Kent and Ottawa County area is shown in the table above. Most planners use the 2% value over a 50 year span. The USGS predicts a one-hundred year earthquake causing acceleration of 4% g. For more information on earthquake prediction and interpretation of data, go to http://www.usgs.gov/.

(4.) Existing Prevention Programs
Two federal programs are in place for Michigan communities in the event of a disastrous earthquake. The first is the National Response Framework, which brings federal assistance through FEMA. The NRF outlines roles of 27 federal agencies in disaster response and recovery. The second is Executive Order 12699, the Seismic Safety of Federal and Federally-Assisted or Regulated New Building Construction law, which requires appropriate seismic design and construction of new federal buildings or those receiving federal assistance.

5. Electrical Failure

(5.) Summary
Electrical infrastructure failure may occur anywhere in Kent and Ottawa Counties, due to local events or distant events that affect the stability of the grid.

(5.) Hazard Description
Infrastructure failure in general is the failure of critical public or private utility infrastructure that results in a temporary loss of essential functions and/or services. Such interruptions could last for periods of a few minutes to several days or more. Public and private utility infrastructure provides 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 inter-related systems fails due to disaster or other cause, even for a short period of time, it can have

cold, people 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. All of these situations can lead to disastrous public health and safety consequences if immediate mitigation steps are not taken. Typically, the most vulnerable segments of society, such as the elderly, children, and ill or frail individuals, are those that are 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 even regions can be negatively impacted.
Electrical failure is the loss of critical public or private electrical infrastructure that affects essential services. Electrical infrastructure failure occurs when power cannot be delivered to the end user.

CW 8

(5.) Historically Significant and Related Events

In February of 2003, a break in a major transmission line caused a 60 mile electrical blackout that stretched over parts of six counties, including Kent County. The break had cut electricity to tens of thousands of customers, including hospitals, retirement homes, and schools. The power outage started at the Croton-Hardy Dam in Newaygo County. Undoubtedly the most notable electric infrastructure failure occurred in August, 2003, and stretched from New York City to Lansing. The massive outage affected all or part of eight states, from Michigan to New York, as well as parts of Canada. Michigan was hardest hit, with southeast Michigan residents going nearly two entire days without power. Losses to the region reached an estimated $220
million, according to the Detroit Regional Chamber and the University of Michigan. While Kent and Ottawa Counties were not directly affected by the monster blackout, the potential for cascading infrastructure failure was made exceedingly clear.

Electric power outages in the Greater Grand Rapids area are common. (Please refer to the sections on severe weather for additional past events.) Emergency Management Directors estimate about three incidents per year in which 1000 or more customers lose power for more than 12 hours. Outages of shorter duration and are more frequent. The economic impact of electrical outage is significant in downtown Grand Rapids. The loss of related infrastructures, such as broadband internet, involve costs that cannot be reliably estimated, but will most likely increase over time.

CW 9

(5.) Risk/Likelihood

Little reason exists to expect electric power reliability to change, outside of the current prevention programs. Consumers Energy is currently conducting an assessment of an area of Ottawa County that seems to experience a high level of power failure. Customers in the assessment area call a special phone number to report details on every interuption of service. Patterns will be determined and mitigation measures will be implemented upon the completion of the study.

(5.) Existing Prevention Programs

The Federal Energy Regulatory Commission is working to better promote the continuity of electric service. The Commission has inaugurated Docket No. RM04-2-000, updated its strategic plan, and created a new reliability division to ensure the reliability of the bulk electric system. The Michigan Public Service Commission regulates electric utilities and has instituted administrative measures to reduce the risk of infrastructure failure. Kent and Ottawa Counties are served by two electricity distributors: Consumers Energy and Great Lakes Energy Cooperative. Both utilities are regulated by MPSC and each has prevention and maintenance programs in place to promote the stability of the infrastructure. Consumers Energy also has a program to assist homeowners in maintaining power. Since 9/11 and the huge blackout of 2003, several new initiatives have been introduced. More information is available at the State of Michigan website :
http://www.michigan.gov/mpsc/1,1607,7-159-16370_17791---,00.html.

6. Extreme Temperatures

CW 5

(6.) Summary

Ottawa County and Kent County enjoy a relatively comfortable climate year-round, thanks to the moderating influence of nearby Lake Michigan. However, the entire area does experience significant extremes in temperature. Coupled with high humidity in summer and high winds in winter, the effects of these temperature extremes are exacerbated and place human health and property at increased risk. Temperatures above 100 degrees and lower than -20 degrees have been recorded in the area. Statistical analysis indicates 8 days of 90+ degree days and 4 days of less than 0 degrees will be experienced each year in Kent County; in Ottawa County 7 days of 90+ degrees and 2 days of less than 0 degrees. Public education about these extreme temperature hazards, early notification of impending extremes, and the availability of cooling and warming shelters are all beneficial actions in mitigating the impacts of these hazards upon people.

Prolonged periods of extreme temperatures, whether extreme summer heat or extreme winter cold, can pose severe and often life-threatening problems for residents. Although quite different from each other in terms of conditions and impacts, the two hazards share a commonality in that they both pose particular problems for the most vulnerable segments of society: the elderly, children, impoverished persons, and persons in poor health. Extreme temperatures can also negatively impact livestock, crops, and wildlife.

(6.) Hazard Description

Temperature extremes are the highest and lowest temperatures recorded in a specific area. The effects of these extremes on the human body are extended by humidity at higher temperatures and wind at lower temperatures. These apparent temperatures as felt by the body are extrapolated from heat index charts and wind chill charts.

Extreme heat is characterized by a combination of very high temperatures and high humidity. When these conditions persist over a prolonged period of time, it is known as a heat wave. Several health conditions can be caused by exposure to extreme heat. *Heat cramps* are muscular pains that are caused by an imbalance of fluids in the body because of dehydration from heavy sweating. These cramps usually involve the legs or abdominal muscles. *Heat exhaustion* is often the result of exercise or heavy work in a hot place. Physical exertion causes a person to lose fluids through heavy sweating. Blood flow to the skin increases, causing blood flow to vital organs to decrease, leading to a mild form of shock. Symptoms include dizziness, weakness, and fatigue. Heat exhaustion can usually be treated by drinking fluids and staying in a cool place until the body temperature and fluids return to normal. *Heatstroke* is a life threatening condition that results when a person's temperature control system, which produces sweating to cool the body, stops working. When this happens, the body's temperature can rise so high that brain damage and death may result if the body is not cooled quickly. Heat kills by taxing the human body beyond its abilities. Fatigue sets in (80 to 90 degrees), followed by heat exhaustion (90 to 105 degrees), then sunstroke or heatstroke (106 to 130 degrees). Inner city areas have increased health risks when pollutants become trapped in a stagnant atmosphere. The poor, especially the elderly, are at additional risk by having poor access to air conditioning. Extreme heat compounds diseased hearts and other health problems.

Prolonged extreme heat can also have an economic impact on society, through (1) lost work, (2) increased electricity usage, leading to brown-outs or black-outs, (3) drought conditions, (4) increased stress on farm crops, reservoirs, streams and lakes, (5) increased stress on farm animals, pets, and wildlife, and (6) increased stress on infrastructure, and on commercial and residential buildings.

At the other end of the temperature spectrum, extreme cold temperatures can become hazardous to health and property. Extreme cold is characterized by temperatures well below freezing, often accompanied by

strong winds. Like extreme heat, exposure to extreme cold can create significant health problems. Hundreds of persons die per year across the U.S. as a result of extreme cold-related causes. However, most cold-related deaths are not the direct result of freezing, but rather the result of pre-existing illness and diseases that are exacerbated by the extreme temperatures. These illnesses include stroke, heart disease, and pneumonia.

But there are also some health conditions that are the direct result of exposure to extreme cold. *Frostbite* is the freezing or partial freezing of some part of the body, usually occurring in the extremities such as toes, fingers, ears, or nose. Frostbite rarely results in death, but does damage the tissue that has been frozen, and in extreme cases may require amputation. A loss of feeling and a white or pale appearance in body parts are symptoms of frostbite. *Hypothermia* is a condition brought on when the body's temperature drops significantly due to exposure to cold. Hypothermia becomes serious when the body's internal temperature goes below 95 degrees Fahrenheit. When the body falls below 90 degrees, hypothermia include uncontrollable shivering (when body temperature is above 90 degrees), slowed speech, memory lapses, frequent stumbling, drowsiness, and exhaustion. If left untreated, or treated improperly, hypothermia can lead to death. Unlike frostbite, hypothermia can occur in a person who is exposed to only moderately cold temperatures (even when indoors)—typically over a prolonged period of time. Infants, the elderly, and persons with conditions that do not allow their bodies to heat normally are most susceptible to this form of hypothermia.

Wind chill temperatures reflect the effects of winds and cold, based on the rate of heat loss from exposed skin. Wind chill does not affect inanimate objects such as car radiators or exposed water pipes because they do not cool below the actual air temperature. As extreme cold and winds cool the skin, frostbite can occur as the body tissue begins to freeze. Hypothermia occurs when a person cools to an abnormally low body temperature (below 95 degrees). Those groups who are more at-risk from extremely high temperatures tend to also be at risk from extremely low temperatures.

The economic impact is also similar: (1) lost work, (2) increased use of utilities, (3) increase stress to farm animals, pets, and wildlife, (4) damage to infrastructure, particularly roadways and water systems, and (5) disrupted transportation. Unusually cold temperatures during the growing season, even if not normally defined as "extreme" under other circumstances, can harm or destroy agricultural crops, drastically reducing crop yields and thus causing economic hardship for farmers and farming communities.

Severe, extended below-freezing temperature situations are defined as when the air temperature or wind factor temperature stays below 20 degrees Fahrenheit for 12 hours or more. Forecast predictions for these events average 85% accuracy. The temperature typically dips below 32 degrees for 28 days in January, 25 days in February, and 22 days in March. Four to six periods of extended, below-freezing temperatures for more than 12 hours happen every winter in West Michigan. Given the number of times per year that this event occurs, the regional population is expected to be self-sufficient for up to 48 hours. Severe, extended below-freezing temperatures cause the highest risk when partnered with another hazard such as severe winter weather, transportation accidents, and infrastructure failure.

CW 8

(6.) ***Historically Significant and Related Events***

Kent County is 28 miles inland from Lake Michigan. The effect of Lake Michigan and prevailing westerly winds influence the county's weather to a great extent. This lake effect increases cloudiness and snowfall during the fall and winter, and moderates the temperature during most of the year. Ottawa County lakeshore areas are moderated to a greater extent, especially during summer months when cooler temperatures prevail and fewer thunderstorms develop.

Because the day-to-day weather is controlled by the movement of pressure systems across the

nation, Kent County seldom experiences prolonged periods of hot, humid weather in the summer or extreme cold during the winter. The maximum recorded temperature was 108 degrees in 1936; the minimum temperature was -24 degrees in 1899 (although an unofficial temperature of -33 degrees was reported in 1872). At the times of these extremes, current heat index and wind chill charts were not in use. Undoubtedly, the effect on county residents was significantly greater than the stand-alone temperatures would indicate.

During the period from 1936 through 1975, nearly 20,000 people were killed by the effects of extreme heat in the United States. The heat wave of 1980 killed more than 1,250 people. Over the past 10 years, an average of 237 people died each year from heat in the U.S. The hottest summer in West Michigan in recent years was in 2012, when temperatures exceeded 90 degrees for more than 30 days. Relative humidity was low during this period; desert-like winds blew across the area. Cold weather claims fewer lives than hot weather in Michigan, but it is not unusual for Michigan's low temperatures to hover dangerously near zero, with afternoon temperatures in the single digits. Average winds of 20 to 25 mph result in wind chills of 20 to 25 degrees below zero. Good temperature records for the area go back at least 100 years.

Throughout the 20th Century, the following records for extreme hot and cold temperatures were set in Ottawa County:

105° F on July 4, 1921 (in Holland)
102° F on July 21, 1934 (combined with drought) and July 13, 1947
101° F on July 23, 1934 and June 20, 1953
-24° F on February 3, 1912 (in Holland)
-21° F on January 1, 1964 (the previous evening had been -16°) and December 15, 1917
-18° F on January 11, 1979 (in Holland)
-16° F on February 17, 1969 and January 16, 1972

A cold wave spread across Michigan in early February 1996, with daytime temperatures in the single digits and overnight lows from -15 to -30. The extreme cold shattered rubberized roof membranes on several school buildings. The weather warmed during the following two days, and one school in Grand Rapids was forced to close when rain leaked through the damaged roof for two days before repairs were complete.

From April 6-10, 1997, unseasonably cold temperatures occurred over a 5-day stretch and caused crop damages. This resulted in a U.S. Department of Agriculture disaster declaration for Ottawa County. The next year, from June 1-9, 1998, severe crop damage again occurred from an unseasonable cold spell that dropped evening temperatures below freezing. Another U.S.D.A. disaster declaration was received by Ottawa County. Events milder than extreme cold temperatures can still impact communities and property. In Grand Rapids, frost had been measured between 20 and 40 inches below the surface (March 2003).

On December 27, 2007 the Gerald R. Ford airport lost power for 14 hours, stranding over 200 travelers in the airport while temperatures dropped to 18 degrees F. The Red Cross responded with canteen services, including hot coffee and hot chocolate, snacks, and blankets for over 9 hours while power was restored. Early thaws followed by cold, and early frosts, can also have an economic impact on crops, particularly fruit trees.

(6.) Community Impact

CW 7

Salt and chemicals used to de-ice roadways fail to work when temperatures drop below 15° F, creating dangerous traveling conditions. Homeless populations face an increased risk of frostbite and over exposure which can have potentially lethal effects. Extra strain is placed on the power grid when

temperatures drop as families use traditional and alternative heat sources. Extended power failures create unsafe conditions for families when homes become too cold to reside in. Damage to homes from freezing and bursting water lines increases. Alternative heating methods such as woodstoves and space heaters create an increased risk of residential house fires.

The American Red Cross (ARC) coordinates with other community resources during extreme temperature events. Warming shelters and mass feeding activities may be needed for situations of loss of power or large-scale residential fires. Both chapters of the ARC have the capacity to open and staff warming shelters independent of each other, but extended sheltering may require shared resources. Both chapters are prepared to respond to requests for shelters from government officials and emergency management personnel.

(6.) Risk/Likelihood

By analyzing historical climate data for the Grand Rapids area over the 30-year period from 1981 to 2010, the Michigan State Climatology Program has developed probabilities for extremes in temperature. The statistical data estimate that on average the Grand Rapids area will experience 8 days each summer with at least 90 degree temperatures. Note that there is no consideration of the Heat Index in these data. The same summary also estimates that on average the area will experience 6 days of zero or below-zero temperatures each year. Again, note that there is no consideration of Wind Chill in these data.

CW 9

(6.) Existing Prevention Programs

Historical data and improved forecasting methods have enabled the National Weather Service to better inform the public of impending weather risks. The NWS has stepped up its efforts to more effectively alert the general public and appropriate authorities to the hazards of heat waves accompanied by high humidity. An Excessive Heat Warning should be issued as the maximum heat index (HI) approaches 105 degrees, temperatures of 75 degrees or higher are observed or anticipated, and are expected to persist for at least a 48-hour period. It is important to note that HI values were devised for shady, light wind conditions. Exposure to sunshine can increase HI values by up to 15 degrees. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

The NWS procedures involve: (1) the inclusion of HI values in zone and city forecasts, (2) issuing Special Weather Statements detailing the hazard, those at risk, and guidelines to reduce those risks, (3) assistance to state and local health officials in preparing Civil Emergency Messages. The National Weather Service also issues alerts during periods of extreme cold. A Wind Chill Advisory is issued when the wind chill values fall to a range between -15 degrees and -24 degrees. A Wind Chill Warning is issued when wind chill temperatures fall to -25 degrees and below.

The NWS implemented a new Wind Chill Temperature Index in 2001 which better calculates the effects of cold air on humans. The new index overcomes the old index's inaccuracies.
In Kent and Ottawa Counties, the American Red Cross has an extensive plan in place to provide cooling and warming to citizens during temperature extremes. The ARC has 70 shelter agreements in place, primarily in school facilities, retirement homes and churches in a four-county area including Kent and Ottawa Counties. Detailed information on each location is available to quickly identify shelters most fitted to handle a given emergency. Many volunteers have been trained to staff and manage these facilities. If all shelters were placed in service at one time, hundreds of thousands of persons could be sheltered – with an estimated 60 to 80% of these in Kent County. (Documentation from 2011 reveals that the Ottawa County Red Cross shelters alone have an evacuation capacity of 73,560.)

7. Fire - General

(7.) Summary

Other types of fire may occur in places of opportunity, but generally the risk of other fires, such as scrap tire fires or landfill fires, is low throughout the area.

(7.) Hazard Description

Other fire encompasses burning trash, scrap tires, and other discarded items. Bulk scrap tire storage areas, once ignited, are particularly difficult to extinguish and have the potential for significant environmental impacts. Landfills often contain material which has been improperly disposed of, and some circumstances can result in fires below the surface.

CW 8

(7.) Historically Significant and Related Events

On October 30, 1987, a large fire broke out at a scrap tire disposal site in Kent County, containing over one million tires. It was estimated that the blaze was contained in about a fifth of the ten-acre site by establishing a fire break with bulldozers. Firefighters ultimately concluded that the best course of action was to allow the contained portion of the fire to burn, since applying water would only delay the inevitable end result. Nearby residents were evacuated during the early stages of the fire.

On July 23, 2008, a scrap yard fire, fueled by 1,000 tires, kept fire departments from Spring Lake Township, Coopersville, Fruitport, Ferrysburg, Ottawa County, Marne, and Grand Haven Township busy for several hours and sent thick plumes of black smoke over the area. This fire in Nunica was first reported at around 3:45 p.m. and was caused by sparks from workers who were cutting off an automobile's catalytic converter. The blaze was confined to roughly a 50-by-50-foot area. Because the nearest hydrant was about 2,000 feet away, water had to be trucked in. In all, 70,000 gallons of water were poured onto the fire before it was brought under control after 90 minutes. No structures were damaged by the fire and no injuries occurred. Because of possible oil contamination from melting tires, the Department of Environmental Quality was notified.

CW 9

(7.) Risk/Likelihood

Ottawa County has a total number of stored scrap tires estimated at 100,000 (as of November 2009), and Kent County was not listed by MDEQ as having any tire disposal sites. This compares to about 3.4 million scrap tires at registered sites throughout the entire state. Any fire that might occur would be relatively small. The Counties have also adopted regulations regarding the storage of scrap tires and landfill items. The risk of these types of fires seems low.

(7.) Existing Prevention Programs

The Scrap Tire Regulatory Program is implemented by the Waste and Hazardous Materials Division of the Michigan Department of Environmental Quality, under the authority of Part 169 of the Natural Resources and Environmental Protection Act (451 P.A. 1994), as amended. Policies and regulations established under this law provide the basis for the MDEQ to implement and administer an effective scrap tire management program. The goal of the program is to promote the development of an acceptable scrap tire management system which minimizes environmental, public health, and nuisance concerns, and maximizes the resource recovery of scrap tire materials. To accomplish this, the following were initiated: 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. Also addressed in the legislation were: 1) increased scrap tire regulations - including fire lane widening from 20 to 30 feet; 2) minimum bonding requirements

for all scrap tire storage sites; and 3) authorization of local fire department inspections of storage/disposal sites. To combat problems at current disposal sites, suggestions have been made about establishing a state policy and program for acquiring such sites and suitably disposing of the millions of tires at these locations. Other proposals call for educating local jurisdictions on the hazards associated with scrap tire disposal sites so that enforcement of existing legislation is effective in minimizing future potential scrap tire fires.

8. Fire - Urban and Structural

(8.) Summary

Structural fires may occur in any structure, so it is logical that fire hazard increases as the concentration of structures increases. Structural loss is proportional to population concentration. Within the area covered by this plan, the greatest loss potential is within the City of Grand Rapids.

(8.) Hazard Description

Urban and structure fires typically involve a single structure, such as a house. Due to a high concentration of combustible building materials and other urban components, urban fires have the potential to spread to other structures or exposures. As a fire increases in volume and energy, nearby exposures become preheated and more easily begin to burn. Abnormally large fires may be able to jump from one structure to another across open areas. A fire storm, or conflagration, contains enough heat energy to create high winds as fresh air is drafted into the massive fire. A conflagration is difficult to stop, due to its massive size and rapid spread.

CW 9

(8.) Historically Significant and Related Events

Kent and Ottawa Counties are reflective of historic fire trends in Michigan. As an industrial state with several large metropolitan areas, Michigan is higher than average in fire deaths, injuries and losses. Each decade dozens of fire deaths occur in Kent and Ottawa counties—together averaging about 9 deaths per year and more than 30 injuries. About half of the Kent County total occurs within the City of Grand Rapids. Kent County annual fire losses average more than $10,000,000 and Ottawa County annual lossed losses average more than $2,500,000.

Some recent structural fires in Kent and Ottawa Counties include: On December 17, 2003, a house fire in Grand Rapids killed all seven people inside, ranging in age from two to seven. On January 28, 2008, a massive structural fire in Grand Rapids erupted, resulting in the destruction of over 100 condominium units in two adjacent buildings. Around 200 individuals escaped the building, and although nobody was injured, four persons had to be rescued. In Coopersville, a September 29, 2008, house fire occurred, resulting in four deaths. On May 13, 2009, an overnight house fire in East Grand Rapids left one dead, and two escaped uninjured but the fire may have been prevented had they used the smoke detectors properly.

On March 19, 2010, a fire destroyed a 32 unit apartment complex displacing all 30 residents in Wyoming. On April 14, 2011, two people died in a house fire in Grand Rapids.

CW 8

(8.) Risk/Likelihood

Local fire departments are proactive in attempting to reduce the number, scope and magnitude, and impacts of structural fires in Michigan. State and local fire service efforts in the areas of training, public education, incident tracking, construction plan review, site inspection and fire analysis are all oriented toward, and contribute to, structural fire mitigation and prevention. However, like most programs, the amount of work that can be done is directly related to funding and programmatic priorities.

(8.) Existing Prevention Programs

Several programs exist related to fire safety. They include:

- Michigan Fire Prevention Act
- Michigan Department of State Police, Fire Marshal Division
- Michigan Department of Consumer and Industry Services, Office of Fire Safety
- National Fire Protection Association
- U.S. Fire Administration
- Local Fire Service
- Fire Safety Rules for Michigan Dormitories

It should be noted that the statistics on the following map do not distinguish between structural fires and other types of fires. They merely indicate the level of fire activity in the county, per 1,000 residents, and are presented for comparative purposes only. For example, a fire rate of 5.19 indicates that there were approximately 5 fires per 1,000 residents for the given year. Fire rates fluctuate from year to year, depending on the level of fire activity within the county, and population shifts. Overall death rates in the U.S. were (according to NFIRS at http://www.usfa.dhs.gov/statistics/estimates/states.shtm) 13.2 per million but in Michigan were 15.4 per million. Source: MDLARA: http://www.michigan.gov/lara/0,1607,7-154-28077_42271_42321-34648--,00.html

9. Fire - Wildfire

CW 5

(9.) Summary

Wildfire in Kent and Ottawa Counties tends to occur in open areas of unmaintained grassland and dry cropland. These surface fires are common along roadways due to the nearly continuous presence of ignition sources from passing vehicles and cigarettes.

(9.) Hazard Description

There are three classes of wildfires. A "surface fire" is the most common type and burns along dry field grass or the floor of a forest, moving slowly and killing or damaging trees. A "ground fire" is usually started by lightning and burns on or below the forest floor in the humus layer down to the mineral soil. "Crown fires" spread rapidly by wind and move quickly by jumping along the tops of trees.

CW 8

(9.) Historically Significant and Related Events

Contrary to popular belief, lightning strikes are not the primary cause of wildfires in Michigan. Today, only about 7% of all wildfires in Michigan are caused by lightning strikes; the rest are caused by human activity (although 10% have an unknown cause and 11% are classified only as "miscellaneous"). Outdoor burning is the leading cause of wildfires in Michigan. Most Michigan wildfires occur close to where people live and recreate, which puts both people and property at risk. The immediate danger from wildfires is the destruction of property, timber, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

The State's first recorded catastrophic fire occurred in the fall of 1871, after a prolonged drought over much of the Great Lakes region in the summer of 1871. The drought had left debris from logging and land clearing tinder dry, and as a result numerous fires burned everywhere. These fires continued to smolder until, on October 8th of that year, gale and hurricane force winds pushed a wall of flames across much of the Lower Peninsula. Because this tremendously destructive wildfire occurred at the same time as the great wildfires that struck Peshtigo, Wisconsin (which killed 1,300 people in a single night) and the Great Chicago Fire (which completely wiped out the city of Chicago), the Michigan wildfire received little publicity. However, the 1871 Michigan wildfire killed 200 people and burned 1.2 million acres. When the

winds finally subsided, the fire's swath stretched from Lake Michigan to Lake Huron. Between Saginaw Bay and Lake Huron, an area 40 miles square was completely destroyed, and over 50 people were killed. The worst of the fire was over by October 19, although the fire wasn't completely out for over a month.

According to the Michigan Department of Natural Resources Forest Management Division, the number of wildfires and acres burned (1981-2010) for Kent County was a total of 20 wildfires, 2 wildfires per year, and 125.6 total acres burned. For Ottawa County there were a total of 145 wildfires, 5 wildfires per year, and 469.9 total acres burned.

CW 9

(9.) Risk/Likelihood

The Risk/Likelihood of wildfires in the Greater Grand Rapids area is manageable. With relatively flat terrain and varied plant life, wildfires typical of western states does not occur.
Most wildfires tend to be fueled by dry grass along roadways. Forest fires occur, but typical high fire danger conditions do not exist except for short periods throughout the year.

(9.) Existing Prevention Programs

The Michigan Department of Natural Resources, Forest Management Division, directs and coordinates wildfire prevention, containment and suppression on all state land. The DNR emphasizes prevention and public education since most wildfires are started by humans.
The Michigan Forest Fire Experiment Station has provided information from research on how to prevent and suppress wildfires, including the use of heavy equipment.

The Michigan Department of State Police, Fire Marshal Division and the Michigan Interagency Wildland Fire Protection Association bring fire response organizations together from across the state. The National Fire Incident Reporting System records historical data for statistical purposes.
The Michigan Natural Resources and Environmental Protection Act and the Solid Waste Management Act are two state acts which help mitigate wildfire hazard. The Great Lakes Forest Fire Compact is a cooperative effort between Michigan, Wisconsin, Minnesota, Ontario and Manitoba. They have produced a fire hazard assessment for the region.

10. Flood - Dam Failure

(10.) Hazard Description

Flooding caused by dam failure or improper operation can result in a sudden drop in the water level above the dam and a sudden rise in water level below the dam resulting in flooding. A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream as well as loss of business. Dam failures may occur during flood events (which may cause overtopping of the dam) or as a result of improper operation, accident, lack of maintenance/repair, or deliberate sabotage or vandalism. One form of dam failure involves tree roots disrupting the integrity of an earthen dam, such that water can pass through the dam where the soil has been broken apart by the roots.

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 (MDEQ) to rate each dam as either a *low*, *significant*, or *high* hazard potential, based on downstream hazard potential to developed lands: L for Low, S for Significant, and H for High. The National Inventory of Dams (NID) registers these dam classifications, which are based solely upon the potential downstream impact if the dam were to fail, and does not consider the actual physical strength and condition of the dam. The potential downstream impact is classified by assessing the population concentration and economic activities located downstream.

Dam owners are required to maintain an emergency action plan (EAP) for *significant* and *high* hazard potential dams. Owners are also required to coordinate with local emergency management officials to assure consistency with local emergency operations plans.

Kent County Dams, as listed by the National Inventory of Dams (NID)

Dam Name	River	Jurisdiction	NID Height	NID Storage	Year Built	Hazard	County ID No.
Ada	Thornapple	Ada	32	3000	1926	Low	Kent MI00501
Cascade	Thornapple	Ada/Cascade	41	4300	1926	High	Kent MI00502
Eastbrook Lake Level Control Structure	Whiskey Creek	Grand Rapids	13	136	1965	Low	Kent MI00429
Falconcrest Industrial Park Detention	Plaster Creek	Kentwood	25	9.9	1989	Significant	Kent
Fallasburg	Flat River	Vergennes Township	35	2000	1903	High	Kent MI00506
Flat River Diversion Dam	Flat River	Vergennes Township	35	2000	1903	Low	Kent MI00506
La Barge	Thornapple	Alaska	32	5250	1901	Low	Kent MI00503
Lake Bella Vista Dam	Barkley Creek	Belmont	29	5917	1969	Significant	Kent MI00453
Oakfield Center Dam	Wabasis Creek	Morgan Lake	11	60	1864	Significant	Kent MI00571
Rockford Dam	Rogue River	Rockford	19	247	1888	Significant	Kent MI00572
Secluded Lake Dam	Tributary of Grand River	Grand Rapids	19	50	1967	Significant	Kent MI00792
Westdale Family Dam	Tributary of Honey Creek	Ada	21	53	1974	Low	Kent MI00665

The definitions of dams' three hazard potential classifications, as accepted by the Interagency Committee on Dam Safety, are as follows:

LOW HAZARD POTENTIAL - Dams assigned the low hazard potential classification are those whose failure or improper operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

SIGNIFICANT HAZARD POTENTIAL - Dams assigned the significant hazard potential classification are those dams where failure or improper operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other

concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

HIGH HAZARD POTENTIAL - Dams assigned the high hazard potential classification are those where failure or improper operation will probably cause loss of human life. Ottawa County currently has 7 dams. Their classifications are: Low – 6 dams, Significant - 1 dam (the Berrens Dam in Zeeland Township), High – none. Kent County has 13 dams. Their classifications are: Low – 5 dams, Significant – 6 dams, High – 2 dams. Kent County has the possibility of loss of life, in the event of the worst possible failure of the highest-hazard dams.

Ottawa County Dams, as listed by the National Inventory of Dams (NID):

Dam Name	River	Jurisdiction	NID Height	NID Storage	Year Built	Hazard	County ID No.
Berens Dam	Macatawa River	Zeeland Twp.	38	228	1993	Significant	Ottawa MI01353
Kenowa Lake Level Control Structure	Tributary to Rush Creek	Georgetown Twp.	8	95	1975	Low	Ottawa MI0072742650
Rush Creek Dam Phase 1	N Branch Rush Creek	Georgetown Twp.	14	375	1978	Low	Ottawa MI00704
Rush Creek Dam Phase 2	Deweerd Dam	Jamestown Twp.	19	172	1983	Low	Ottawa MI00812
Steenwyk Dam	Macatawa River	Zeeland Twp.	30	73	1991	Low	Ottawa MI01354
Timmer Dam	Macatawa River	Zeeland Twp.	15	10.1	1988	Low	Ottawa MI02577
Buttermilk Creek Dam	N Branch Rush Creek	Jamestown Twp.	13	240	2000	Low	Ottawa MI04010
Ottogan	Flood plain management tool	Laketown Twp. Allegan County			1989	Significant	Ottawa and Allegan MI2639
Root Dam	Sand Creek River	Tallmadge Twp.				Destroyed by flood May 21, 1989. Never rebuilt.	Still listed

Many privately owned dams are also located in Zeeland Township, where soil types and ravines allow them to be lake, has had various maintenance issues in the past, although some upkeep efforts have since taken place. Although given a *low* hazard potential classification, local officials feel that if this dam were to fail, it could disrupt traffic along Quincy Street, M-21 (Chicago), and the CSX rail line, cause property damage in the vicinity, and possibly even lead to loss of life.

Several other privately-owned earthen dams in Ottawa County also have the potential to fail and cause flood problems—especially those that are earthen embankments across
small ravines and may be susceptible to failure from lack of maintenance or from the effects of nearby tree roots. Of special concern to Emergency Management and Drain Commission officials are privately owned dams that are located upstream from populated areas or major transportation routes, such as M-45, Chicago Drive, I-196, and the CSX rail lines.
Failure of dams located in contiguous counties could have an impact as well. One example is the Ottagon Dam, located just south of the Ottawa-Allegan county line in Laketown Township. Located directly south of Ottagon Street (32nd Street) near Old Orchard Avenue in the City of Holland, this dame was installed to help combat flood problems in the neighborhood nearby. Failure of that dam could potentially flood an area from Ottagon Street north to Lake Macatawa. That area is a residential neighborhood where flooding could cause extensive property damage, so although the dam is physically located in Allegan County, almost all of the damage from any dam failure there would occur in Ottawa County.

CW 8

(10.) Historically Significant and Related Events

Five dam failures are recorded by the Michigan Department of Environmental Quality. Kent County had three dams fail, one of which is no longer operating. Ottawa County had two dam failures. Only the Root Dam incident in Ottawa County is included in the National Inventory of Dams, and the Root Dam failure involved erosion under the spillway and was destroyed in 1989. Damage estimates are not available for these events, but they all appear to be low-level hazards. The Greater Grand Rapids area has not experienced a significant or high hazard dam failure.
In Ottawa County, on May 20, 1996, several inches of rain fell and created concern about the Timmer Dam (located south of Quincy Street between 48th and 56th Avenues). At one point during the precipitation events of May 20-21, water reportedly flowed over the emergency spillway of the dam, to a depth of 15 inches. Although residents living downstream from the dam were put on alert, water levels did drop without any significant damage occurring. Fortunately, no significant dam failure has actually taken place. Please refer to the section on flooding, however, for additional information about related risks.

Dam Failures in Kent and Ottawa Counties:
(Source: MDEQ, which monitors additional dams not included in NID)

Dam Name	County	Year Failed	Comments	Height
Joyce Drive	Kent	1982	OT 7/16-17/82	8
Childsdale Dam	Kent	1986	9/86 OT	20
Bear Creek	Kent		No longer operating	
Ottawa/Kent Plating Lagoon	Ottawa	1984	OT Hazardous waste 1/84	8
Root Dam	Ottawa	1989	Erosion under spillway Never rebuilt	

Locally, Emergency Action Plans for the following dams are in place: In Kent County, the Ada Dam, Cascade Dam, Fallsburg Dam, King Milling Company Dam, Lake Bella Vista Dam, Rockford Dam, Secluded Lake Dam, and Thornapple River Dam; in Ottawa County, the Berens Dam, Buttermilk Dam, Rush Creek Phase 1 Dam, Rush Creek Phase 2 Dam, Steenwyk Dam, Ottogan Dam and Timmer Dam.

These plans are updated on a regular basis and exercises are held in the EOC's to test the plans.

CW 9

(10.) Risk/Likelihood

(10.) Existing Prevention Programs

The Federal Energy Regulatory Agency licenses some dams and requires Emergency Actions Plans and inundation maps. The Michigan Department of Environmental Quality administers Part 315, the Dam Safety Act, which requires Emergency Action Plans for significant and high hazard dams.

11. Flood - Riverine

CW 5

(11.) Summary

Riverine flooding tends to occur more frequently between December through May, due to combination of frozen ground, high snow pack and sudden, heavy rainfall. Several riverine floods have occurred in the Greater Grand Rapids area in the past 100 years, causing significant economic impact. Flood plain maps describe locations prone to flooding, and various events are documented in the text that follows.

Causes of Flooding

Nationally, riverine flooding is the most common form of flooding, and many events in Kent and Ottawa Counties are also caused by high river levels, especially in the areas along the Grand River and in the Macatawa River watershed. In the spring, the overflow of waterways tends to be encouraged by rapid snowmelt. The problem is compounded when the snowmelt is accompanied by heavy rainfall. If the ground beneath the melting snow is still frozen, then its permeability is low and the snowmelt flows downhill instead of into the ground (as it tends to during other times of the year). During the winter and spring months, ice jams can be a primary cause of flood concern, both for communities located near or upstream of the dam (where backlogged waters may accumulate) as well as to downstream communities that may become inundated by flash flood effects when an ice jam finally melts or breaks apart and releases the excess volume of trapped water. In warm weather, rivers typically overflow after extended periods of heavy rain, or when extremely heavy precipitation falls within an unusually short period of time. Log jams
may result in problems similar to ice jams. Sedimentation in rivers and drains may gradually diminish their capacity to carry away water.

Urban flooding has often occurred when storm sewers and drains have overflowed or been inhibited (through blockage or power failures, for example). Greater Grand Rapids has been undergoing sewer upgrades, through the separation of its combined sewers. In the cities of Holland and Zeeland, flooding has often occurred due to overflowing storm sewers and drains. The problems stem from historical design standards, financial limitations, and increased quantities of water flowing into the systems due in part to upstream land developments over time. For years, several neighborhoods in Holland had experienced flood problems with any excessive rain event. In Zeeland, local sanitary sewer lift stations have not always been able to handle the large amount of water that flows from heavy rain events, and water and sewage backups into homes have resulted, through the sewer lines. Power outages have also caused Zeeland lift stations to fail, resulting in similar backups into homes.

Continued floodplain developments would increase the potential for flood damage to homes, businesses, and infrastructure, therefore it is vital, in this age with new knowledge of storm water management techniques, to maintain and improve the quantity and ability of natural land areas to absorb water, and for drainage infrastructure to properly carry and disperse water flows.

(11.) Hazard Description

Riverine flooding in this plan is defined as a flood caused by the inability of a waterway to carry away water faster than the water flows into the waterway. The water level in a riverine flood may

accumulate and stay above flood stage for several days or even longer, and thus need not be a "flash flood" event, although such events are possible from either a dam failure or from log jam or ice jam events.

In January, 2011, the Kent County Drain Commission provided the following list of rivers and streams, and the jurisdictions in which they are located:

NAME	TYPE	TOWNSHIP(S)
Alder Creek Drain	Stream	Nelson
Armstrong Creek	Stream	Cannon
Ball Creek	Stream	Sparta, Tyrone
Barkley Creek	Stream	Cannon, Plainfield
Bear Creek	Stream	Cannon, Plainfield
Beaver Dam Creek	Stream	Oakfield, Courtland
Becker Creek	Stream	Algoma, Courtland
Behan-Foley Drain	Stream	Wyoming
Black Creek	Stream	Nelson, Spencer
Bond Drain	Stream	Bowne
Brandywine Creek	Stream	Walker
Buck Creek	Stream	Byron, Wyoming
Burger Drain	Stream	Cascade
Butternut Creek	Stream	Spencer
Cedar Creek	Stream	Algoma, Nelson, Solon
Clarke & Bunker Drain	Stream	Bowne
Clear Creek	Stream	Spencer
Coldwater River	River	Bowne
Coopers Creek	Stream	Oakfield, Spencer
County Line Drain	Stream	Nelson
Crescent Creek	Stream	Pittsfield
Crinnion Creek	Stream	Courtland, Nelson, Oakfield
Crockery Creek (North Branch)	Stream	Sparta, Tyrone
Cutlerville Drain	Stream	Byron, Gaines
Dorr & Byron Drain	Stream	Byron
Duck Creek	Stream	Bowne
Duke Creek	Stream	Nelson, Solon, Tyrone
Egypt Creek	Stream	Ada
Flat River	River	Lowell, Vergennes
Forest Creek	Stream	Solon
Frost Creek	Stream	Solon
Geers Drain	Stream	Tyrone
Geiger Drain	Stream	Bowne
Grand River	River	Ada, Cannon, Cascade, Grand Rapids, Lowell, Plainfield, Walker, Wyoming
Hickory Creek	Stream	Tyrone
Hillbrand Drain	Stream	Tyrone
Honey Creek	Stream	Ada, Vergennes
Hopkins Lake Drain	Stream	Alpine
Huizenga Drain	Stream	Wyoming
Indian Mill Creek	Stream	Alpine, Walker
Kilgus Branch	Stream	Bowne
Lamberton Creek	Stream	Grand Rapids
Laubach Inter-County Drain	Stream	Alpine
Lee Creek	Stream	Lowell
Little Cedar Creek	Stream	Algoma, Courtland
Little Plaster Creek	Stream	Cascade, Kentwood
Lockwood Drain	Stream	Nelson, Solon
McCords Creek	Stream	Cascade, Lowell
Mill Creek	Stream	Alpine, Plainfield
Miller Drain	Stream	Byron
Nash Creek	Stream	Sparta
Page Creek	Stream	Vergennes

Pine Hill Creek	Stream	Kentwood, Wyoming
Plaster Creek	Stream	Gaines, Kentwood, Wyoming
Post Creek	Stream	Tyrone
Pratt Lake Creek	Stream	Bowne, Lowell
Rogue River	River	Algoma, Plainfield, Sparta, Tyrone
Roys Creek	Stream	Wyoming
Rum Creek	Stream	Algoma, Cannon, Courtland
Rush Creek	Stream	Wyoming
Rush Creek (East Branch)	Stream	Wyoming
Sand Creek (East Fork)	Stream	Alpine, Walker
Sand Lake Drain	Stream	Nelson
Scott Creek	Stream	Plainfield
Seely Creek	Stream	Grattan
Sharps Creek	Stream	Byron, Gaines
Shaw Creek	Stream	Algoma, Courtland
Spring Creek	Stream	Solon, Tyrone
Stegman Creek	Stream	Algoma, Courtland
Stout Creek	Stream	Cannon
Strawberry Creek	Stream	Alpine
Sunny Creek	Stream	Ada, Grand Rapids
Thornapple River	River	Ada, Caledonia, Cascade
Wabasis Creek	Stream	Oakfield
Waddell Creek	Stream	Cannon, Plainfield
Walter Creek	Stream	Tyrone
Walton Drain	Stream	Bowne
White Creek	Stream	Solon
Whitneyville Creek	Stream	Caledonia, Cascade
York Creek	Stream	Alpine, Grand Rapids, Plainfield

In Ottawa County, the Pigeon River and Rush Creek contain floodplain areas, and the Lake Macatawa watershed also has problematic locations along some of its streams. Two of the most problematic flood areas in the county are situated along the Grand River, in Robinson Township, where two neighborhoods are regularly and heavily affected by flooding. Hazard mitigation funds from the Pre-Disaster Mitigation Program were applied for and successfully obtained for the acquisition of houses that were heavily affected by flooding in the past few decades, apparently due to gradual changes in the river (i.e. from sedimentation and other deposit). Ice jams and the accumulation of woody debris have also caused localized flooding—sometimes in areas where it might not otherwise be expected. The southern half of Ottawa County also experiences regular flooding— especially near Holland, Zeeland, and Georgetown Townships.

Ice jams involve the accumulation of snow and ice along a waterway. As the buildup continues, water passes more slowly, and flooding can occur around this area of more limited drainage capacity. Water levels can also rise rapidly when temperatures rise and result in greater runoff of liquids downstream, sometimes adding more water to the area of a still-frozen ice jam. When the ice itself does melt, greater problems often exist for downstream areas. In other cases, log jams can cause similar backups in the waterway areas, with the accumulation of woody debris serving as a barrier to water flow. Flowing floodwaters may carry some of this debris downstream with them and exacerbate the damage to residences and infrastructure when floods occur. Sediments may also accumulate in streambeds over time and cause certain parts of waterways to have less drainage capacity than they previously had.

In other cases, record rainfalls take place and simply exceed the amount of fluids that existing drains and infrastructure are able to handle, resulting in floods outside of areas normally known to be at risk.

(11.) Historically Significant and Related Events

CW 8

Documentation of major floods in Michigan before 1904 is limited. Earlier floods in the Grand

River basin that have been referenced include 1843, 1852, 1861, and 1875. Late winter and spring floods are, by far, the most common in Michigan. For example, more than 90 percent of the annual peak discharge of the Muskegon River at Evart has occurred from December 1 through June 1. Typically, frontal systems produce a light to moderate, but steady and widespread, rainfall on a saturated snow pack. The upper soil layer typically is frozen and impervious to moisture infiltration. Runoff is increased by the melting snow pack and the frozen soils. Flood stages also are commonly increased by backwater from ice jams, as river ice accumulates where it is unable to flow around bends or past obstacles. Summer and fall floods that are caused by intense, localized thunderstorms can be equally or more devastating than those caused by widespread rainfall on snow pack and frozen soils. Two examples of late summer floods are the September storms in 1985 and 1986, which produced substantial runoff and damage. Flooding is frequent in the southern two-thirds of the Lower Peninsula. Flood damage in Michigan is estimated at about $80 million annually. One of the most disastrous and extensive floods in the southern Lower Peninsula was in March 1904. Runoff resulting from rainfall during March 24-27 was compounded by snow pack and frozen soils. The rain was caused by a frontal system that moved landward from Lake Michigan. Much of the snowfall during the winter had compacted and formed an ice layer at the ground surface. Ground frost prevented infiltration of snowmelt. Flooding in March 1904 was most prevalent in the Grand River, Saginaw River, Kalamazoo River, and River Raisin basins. Few gauging stations were in operation in 1904 to document the magnitude of the flood, but, on the basis of available data, peak discharges in the Grand and Saginaw River basins were greater than discharges expected to recur once in 100 years. Overall, in the southern Lower Peninsula, the flood peaks resulting from this flood were the highest associated with spring flooding since record keeping began. As a result of the 1904 flood in Grand Rapids, about 14,000 people were and about 10,000 people became unemployed. The estimated damage was $2 million.

The flood of April 4-11, 1947, was the most damaging at many locations since the flood of 1904. The meteorological conditions that led to flooding began with a snowfall in March 1947. On April 1, an eastward-moving frontal system caused thunderstorms in the extreme southern Lower Peninsula. On April 2, rainfall was increased by the slow movement of the frontal system and by an abundance of warm, moist air from the Gulf of Mexico. A second frontal system that had originated in the Southwestern United States reached Michigan on April 4. Thunderstorms were moderate to intense during April 4-6. As with the flood of 1904, melting snow in some areas combined with rainfall runoff to increase stream flow. Frozen soil may have limited moisture infiltration in some areas. The areas affected by the April 1947 flood included the Grand River. Many streams within an area bounded by Kalamazoo, Flint, Mt. Clemens, and Detroit had peak discharges with recurrence intervals of greater than 25 years.

During April 18-24, 1975, a major flood affected the southern Lower Peninsula. Rainfall during April 18-19, 1975, was intense; rainfall totals ranged from 3 to 5 inches. Antecedent moisture was increased by a snowfall of as much as 13 inches over most of the area 2 weeks before the rainstorm. Soils had become saturated, and temperatures had increased sufficiently to cause streams to have relatively large discharges before the flood-producing rain fell. Flood peaks occurred between April 19 and 22, 1975, in the Grand River basin. Total private and public damages in the region amounted to about $58 million. A Presidential Disaster Declaration was granted for Kent, Ottawa, and 19 other counties.

During the last week of August and first week of September 1975, intense thunderstorms and severe winds pounded the west central Lower Michigan region. Intense rainfall accompanying these storms caused widespread flooding, resulting in nearly $3 million in public and private damage. A Presidential Major Disaster Declaration was granted for the 16 affected counties, including Ottawa County.

During a two day period from May 10 to 11, 1981, over five inches of rain fell and led to flooded and washed-out roads throughout the southern portion of Ottawa County. In the City of Holland and Holland Township, flooded roads included: 24th Street between Waverly and Country Club Roads, Pine Avenue in front of the power plant, Van Bragt Park near River Avenue, US-31 at New Holland, Quincy, and Riley Streets. Some sections of Quincy Street and Greenly Street were under 6 inches to 1 foot of water. The Paw Paw bridge over the Macatawa River was also damaged by high water. In the City of Zeeland and Zeeland Township, Paw Paw Drive was flooded between Chicago Drive and 104th Avenue, and 96th Avenue at Quincy Street was under two feet of water. Zeeland Public and Christian schools were closed, and $2,000 to $3,000 of damage was done to Zeeland High School. A Zeeland sewer lift station, unable to handle the large quantity of water, flooded and caused numerous basements in the area to be flooded. Water covered streets and entered homes in the vicinity of 104th Avenue and Alice Street along the Noordeloos Creek. Elsewhere in the county, the Macatawa River flooded Chicago Drive from Zeeland to Hudsonville, and Rush Creek flooded Chicago Drive at Port Sheldon Road, in Georgetown Township.

On July 17 and 18, 1982, an 11-inch deluge left most of Ottawa County's major thoroughfares impassable around Holland, because of flooding. At one point, northbound US-31 was the only major roadway out of town, and even that was closed south of 32nd Street. Several streets in the area were still closed on July 19, due to damage and high water. The storm also caused property damage all around Holland. Basements were flooded in all the homes along 24th Street between Lincoln and Fairbanks, causing three gas leaks. Heavy rain caused a roof to cave in at the Montgomery Ward department store. Sewer backups occurred when power was knocked out at the lift station on 8th Street, near Chicago Drive. Flood waters crumbled the intersection of Chicago Drive and 8th Street. Lightning and wind associated with the storm caused power losses all over the area. One report estimated that 20 percent of the Holland area population was without power for an extended period of time. Several Holland BPW substations were knocked out, as well as primary and secondary power lines. Consumers Power representatives estimated that 21,000 of their customers were left without power.

A February 1986 Governor's declaration for shoreline flooding was received by Ottawa County, and this disaster resulted in the creation of three temporary assistance programs—the Shoreline Community Protection Program, the Emergency Moving Program, and the Emergency Flood Protection Program.

A September 10-15, 1986 flood was caused by rainfall from a low-pressure system that developed over the central Great Plains. Northeastward movement of the system produced a warm front that extended across the central part of the Lower Peninsula. The precipitation was caused by warm, moist air south of the front that collided with cold air from the north. The absence of upper atmospheric winds caused the storm to remain relatively stationary over the State for several days. In the areas of greatest rainfall, quantities ranged from about 8 to 13 inches. More than 10 inches of rain fell in 2 days within a 3,500 square mile area.

The flood of September 10-15, 1986, resulted in unprecedented damage. Across the affected area the flooding caused 6 deaths, injured 89, contributed to the failure of 14 dams, threatened 19 additional dams, and caused basement flooding or structural damage to about 30,000 homes. Four primary road bridges and hundreds of secondary road bridges and culverts failed, making 3,600 miles of roadway impassable. Total damage to homes, businesses, public structures, and harvest-ready agricultural crops was $500 million. A 30-county area of the State was declared a Federal disaster area, including Kent and Ottawa Counties. Crop damage was severe. Of Michigan's 12 million acres of cultivated land, about 1.5 million acres were affected. In addition to the extensive crop losses, more than 1,200 farm-related structures were flooded.

In Ottawa County on May 29, 1989, several residences were flooded along the Rose Drain at M-21 (Rich Street) in the City of Zeeland, when five inches of rain fell within 24 hours.
Two heavy rain events occurred exactly one year apart, on October 17 of 1992 and 1993, bringing 3 to 4 inches of rain within a 24-hour period to Ottawa County. This caused water to flow over a significant stretch of Kenowa Avenue in the vicinity of 44th Street in Georgetown Township. In the southeastern quarter of the county, homes were flooded and cars had stalled in the middle of flooded roadways. Residents had difficulty accessing their homes in the Brook Meadow Apartments.

Beginning on February 24, 1994, flooding occurred due to an ice jam on the Grand River in Robinson Township, Ottawa County, and continued until the ice jam broke free on March 5th. During that 10-day period, floodwaters damaged 45 homes and three businesses and caused the evacuation of 125 people from their homes until the waters receded. Sections of three county roads and a county park also sustained damage. The County formally requested a Governor's Disaster Declaration, but unfortunately there was little that could be done in the way of state assistance to help in the response and recovery to that particular event. However, the Governor did request, and receive, an SBA Disaster Declaration which made available low-interest disaster loans to those homes and business owners that suffered uninsured losses in the flood.

On July 5, 1994, a slow-moving storm system dropped 2 to 4 inches of rain across northern Ottawa and Kent Counties during the early morning hours. This heavy rain resulted in moderate but widespread flooding in low spots and underpasses. The most affected waterway was the Crockery Creek in Chester Township, which crested at 2 feet above bank full. Although no significant damage was reported, since most flooding occurred in less populated rural areas, the rains did require the dumping of more than 4.2 million gallons of untreated but diluted sewage into the Grand River at Grand Rapids.

In the winter of 1996, an ice jam on the Grand River caused flooding that forced several families from their homes in Robinson Township.

Within a 24 hour period on May 18, 1996, 3.5 to 5.5 inches of rain fell in Ottawa County, with the heaviest rainfall seen in the townships of Zeeland, Jamestown, and Georgetown. Flooding was observed at the intersection of 44th Street and Kenowa Avenue in Georgetown Township. Water flowed into the spillway at Timmer Dam, in Zeeland Township. Then, on May 20-21, 1996, rains of 3.5 to 4.5 inches led to extensive flooding in the city of Holland and in surrounding rural areas. Early in the afternoon, US-31 was closed between Lincoln and 32nd Street, where a half-mile portion of the highway was covered with water under the railroad overpass near 40th Street. Later in the evening, US-31 at Washington Avenue was also closed. The peak of flooding occurred between 8 an 9 p.m. on May 20. A partial washout of the 32nd Street bridge took place, where it crosses the Tulip Intercounty Drain. In the City of Zeeland, Noordeloos Creek overflowed its banks and flooded streets and yards near 104th Avenue and Alice Street. Chicago Drive, from the east of the Zeeland city limits to Hudsonville, was also under water for a period of time. In addition to the widespread residential property damage to homes with flooded basements, a vehicle had slid from a flooded road along Adams Street near 80th Avenue in Zeeland Township, into a tributary of the Black River. The driver was able to escape from the vehicle but was swept under the bridge by the current and forced to cling to a tree until rescuers arrived. The National Climatic Data Center reported $100,000 in property damage from this flood event.

Between May 1 and June 16, 1997, the U.S. Department of Agriculture granted a disaster declaration to Ottawa County. This made area farmers eligible for low-interest federal disaster loans, after heavy rains had caused flooding in the county.

On June 20-21, 1997 a series of intense thunderstorms passed through West Michigan, spawning heavy rainfall that flooded many areas in Ottawa County, among others. Ottawa County officials reported June 27, 1997, a Governor's Disaster Declaration was granted to Ottawa County to provide supplemental state assistance for the public damage. The SBA provided low interest disaster loans to those homes and business owners that suffered uninsured damage from the flooding or wind.

After rain and warm temperatures had caused existing snow to melt on March 18-19, 1998, flooding eventually occurred along the Grand River in Kent and Ottawa Counties, between March 22 and 25. In Robinson Township, the river crested at its flood stage of 13.3 feet, and stayed at that level for all three days. Fortunately, no property damage was reported, since only minor flooding had occurred.

In May 2004, a stationary front over Iowa, Wisconsin, and Michigan brought severe thunderstorms and heavy rains causing wide-spread flooding over Southern Lower Michigan. Much of the rainfall occurred in saturated areas that had already experienced well-above average precipitation for the month of May. Backyards were submerged under several feet of water. Total rainfall over the Grand River basin from May 20th through June 3rd varied from four to as much as seven inches. It was the biggest and longest duration flooding event in the past twenty years across southwestern and south central Lower Michigan. It was the third wettest May on record in Grand Rapids. A Presidential Disaster Declaration was granted for 23 counties in Michigan including both Kent and Ottawa County.

In January 2005, Robinson Township in Ottawa County endured heavy flooding of the Grand River caused by run-off and a miles-long ice jam. The river peaked at 18.3 feet, five feet above flood stage. The area remained flooded for several days, as a prolonged cold spell slowed the flood water's retreat. The flooding, which occurred about 20 miles west of Grand Rapids, affected homes in two Robinson Township neighborhoods. At least one road was covered by three feet of water. The river usually runs about 10 feet in the area during that time of the year, but during the morning of the flood the water level had risen to 17.6 feet, which is 4.3 feet above flood stage. A state of emergency was declared in the township. About 50 homes and businesses were damaged or destroyed and their residents were evacuated for a period of months, in many cases. The City of Grand Rapids placed bridges on 24-hour watch against the rising ice threat. Governor Granholm hoped the state would seek a federal disaster declaration.

Beginning on June 6, 2008, severe weather impacted twelve counties (including Ottawa County) and resulted in a federal disaster declaration. The National Weather Service reported two flash floods that exceeded the "100-year" threshold, confirmed three EF1 tornadoes, and also noted severe thunderstorms with winds that exceeded 100 mph. Rainfall totals were estimated between 7 and 12 inches, exceeding the "100-year" rainfall values of 3.5 inches in less than 6 hours. Flash flooding washed out roads, flooded crops, and caused moderate flooding of rivers and streams. A large severe thunderstorm squall line affected southwest Michigan on June 8, with winds of 75 to 100 mph.

In December 2008, about $36 million in flood damages occurred in Ottawa County due to an ice jam. The ice was so thick that many meetings were held to strategize how to break up the ice. A Coast Guard Cutter was dispatched to travel upriver as far as the U.S. 31 bridge in Grand Haven. This event resulted in county emergency declarations.
In June 2009, about $3.4 million in flood damages occurred to some 2,000 homes in Ottawa County. The county declared a local state of emergency.

On May 31, 2010, a flash flood occurred in Kent County near the city of Rockford. The flash flood caused multiple roads to be washed out, ripped out culverts, and flooded several homes. One home had over 8 feet of standing water in its basement. The water in the basement was from overland flow that broke out a basement window and filled the recently finished basement. Minor flooding also occurred along the Rogue River near Rockford.

Heavy rainfall on April 17-18, 2013 caused the Grand River to rise to a record peak of 21.85 feet in downtown Grand Rapids, breaking a record set in 1985. Flooding caused more than $1 million in damage in Grand Rapids and $10 million in Kent County. April 2013 was one of the wettest months on record across West Michigan, with many areas reporting more than 10 inches of rain, according to the National Weather Service. A presidential disaster declaration was issued for several jurisdictions in West Michigan, including Kent and Ottawa Counties. In Ottawa County flooding occurred in several areas of the county; tributaries, drains and the Grand River rose to near record levels causing nearly $3 million in damage.

Kent County and Ottawa County have structures located in areas that are prone to flooding. Recurring flooding typically occurs along the Grand River in the areas of Robinson Township in Ottawa County, and in Plainfield Township in Kent County. Several streets along the river had been built in floodplain areas. The most heavily affected areas are Abrigador Trail, (Kent) Limberlost Lane and Van Lopik Avenue, (Ottawa) and some areas along North Cedar, 120th Avenue, and 118th Avenue (Ottawa).

CW 8

(11). Plainfield Township, Kent County

An ice jam in 1997 caused the Grand River to crest at 15 feet (at the Comstock Park gauge), which was 3 feet above the flood stage. Thirteen homes along Abrigador Trail (which itself was underwater) were flooded, and portions of other streets had flood problems as well—primarily with yard flooding. Two years later, the Grand River (at Comstock Park) again crested above the flood stage, although this time the water peaked at a less severe stage of 13.2 feet.

In 2000, very heavy rains covered Plainfield Township, and the Grand River crested at 14.5 feet on May 24 (at the Comstock Park gauge), again placing Abrigador Trail under water, along with Konkle Drive.

The next year again saw new flooding, from February 9 to 11, 2001, as heavy rains combined with melting snow. Many reports were received of standing (undrained) water in low-lying and poorly drained areas, and the Grand River peaked on February 13.

In March of 2004, the Grand River at Comstock Park again crested above the flood stage—this time at a level of 13.3 feet (1.3 feet above the flood stage) and low-lying areas were flooded nearby. More flooding followed in May-June of the same year, with the river cresting at 16.5 feet (the fourth highest crest there at that time), and approximately 150 houses were damaged or impacted as well as several area businesses. For example, the fairways on the Grand Island Golf Course were under water until the latter half of June. The American Red Cross and Salvation Army assistance organizations were each mobilized to provide services for flood victims, and State and Federal disaster declarations also took place to make government assistance available. More than 110 Kent County victims requested FEMA disaster assistance and received over $87,000 in aid. The river gauge on the Grand River's Comstock Park location monitors water levels and provide a good indicator of the risks to residents who live on Willow Drive, Abrigador Trail, and (to a lesser extent) Konkle Drive, Riverbank Drive, and Coit Avenue. At a water level of 12.0 feet (flood stage), minor flooding begins in the low-lying areas along the river banks, and flooding occurs on Abrigador Drive and Willow Drive.

On January 31, 2008, an ice jam formed on the Grand River downstream of Comstock Park, resulting in backwater flooding that reached a crest 3.85 feet above flood stage on February 3rd. The river froze in place and remained above flood stage for almost 10 days. The flooding impacted multiple homes along Abrigador Trail, Konkle Drive, and Willow Drive. Several residents had to be rescued by boat.

On December 24th, 2008, an ice jam had formed on the Grand River downstream of Comstock Park and resulted in backwater flooding that reached a crest 3.19 feet above the flood stage on January 1st, 2009. The river remained above flood stage for 12 days. The flood impacted multiple homes along Abrigador Trail and Willow Drive. A record warm temperature of 60 degrees in Grand Rapids on December 27th, along with over an inch of rain, resulted in widespread flooding in Kent County. During this event, the rain and significant snowmelt resulted in the closure of 26 roads in Kent County, due to flooding.

The historical trends show that the flood stage in this location tends to be exceeded about 8 times per decade. Konkle Drive also begins to flood at this stage. A survey was performed by township engineers, for their 2007 flood mitigation plan, including Abrigador Trail (47 structures), Konkle Drive (14 structures), and Willow Drive (17 structures). First-floor elevations were measured for these structures, and although specific information will be kept confidential in this public planning document (it may be

obtainable as needed from the Plainfield Charter Township Planning Department), the following generalized information about the flood risks in this area are presented in the following table.

Percentage of Structures Flooded in Events of Various Frequencies

	"5-year" events (20% annual frequency)	"10-year" (10% annual frequency)	"25-year" (4% annual frequency)	"50-year" (2% annual frequency)	"100-year" (1% annual frequency)
Abrigador Trail	21%	42%	90%	98%	100%
Konkle Drive	13%	53%	73%	93%	100%
Willow Drive	0%	0%	53%	94%	100%

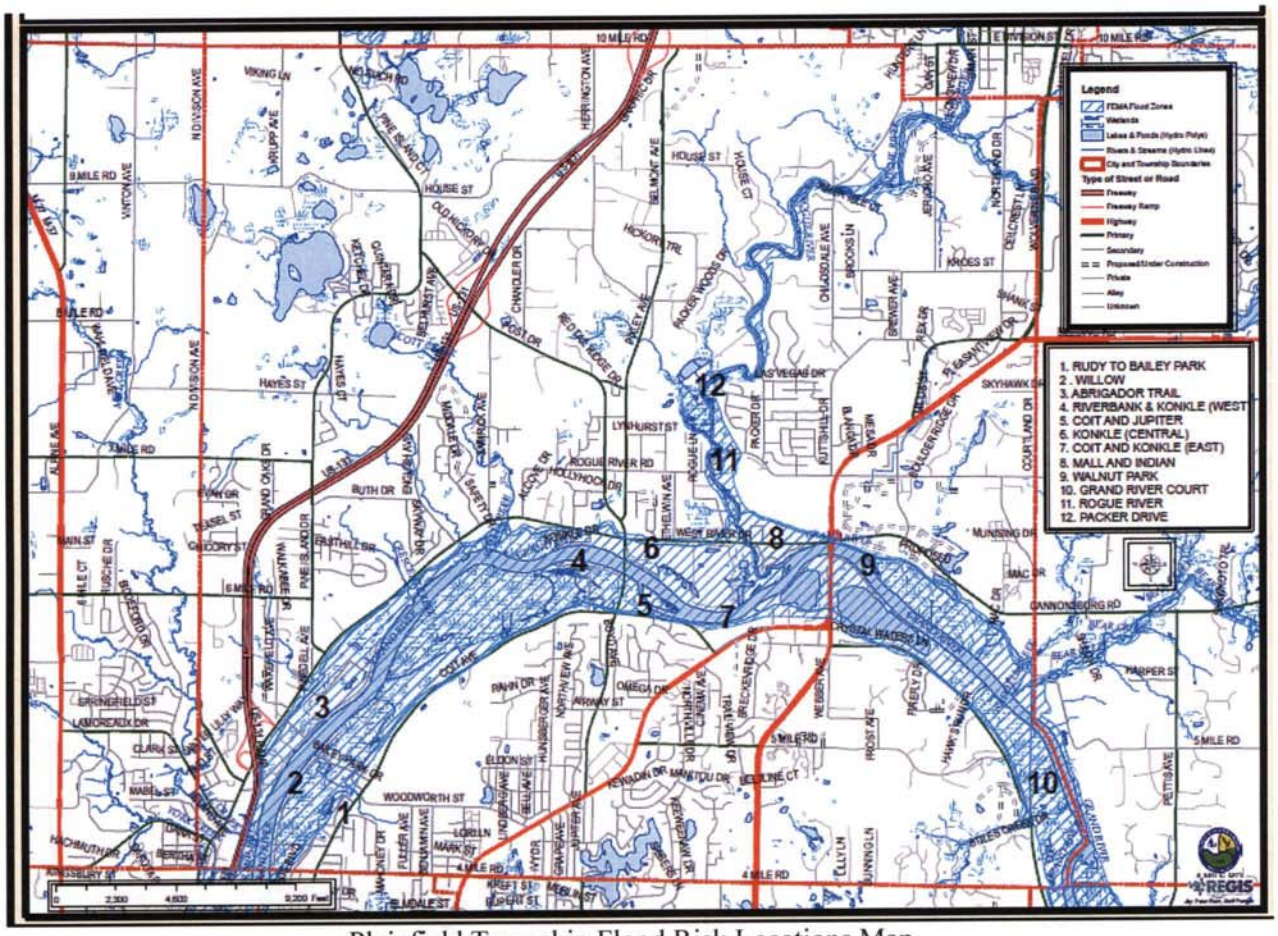
Various other areas of flooding have also been identified on Riverbank Drive, Coit Avenue, and elsewhere in the township. About once per year, basements, yards, and sometimes the first floors of these identified at-risk structures are flooded in these areas. During years with harsher weather, some basements have been completely filled with flood water. A golf course has also suffered repeated damage to its land, including complete destruction by the force of floodwaters.
Plainfield Township has a storm water ordinance that requires developers to mitigate the effects of new development upon wetland areas, but might also be adjusted to encompass the effects upon retention and detention basins, as well. The "Lower Grand River Watershed 319 Project" came out of a section 319 grant from the Michigan Department of Environmental Quality, for watershed planning, and covers a 10-county area. More detailed information from the watershed section 319 study can be found online, at http://www.gvsu.edu/wri/isc/lower-grand-river-319-project-208.htm.

More than a century ago, the Grand River's condition had started deteriorating from the impact of numerous mills and factories along its banks, and the effects of dams and logs in its waters. Fortunately, many of these trends were halted and some of their impacts reversed, as pollution controls and ecological considerations became more heavily emphasized over time. Plainfield Charter Township strongly emphasizes the importance of flood insurance—and not just for properties that have a history of flooding. It's flood plan states that the average premium for an NFIP policy is "usually less expensive than interest on federal disaster loans", and that such insurance would have to be purchased anyway if a property owner receives federal disaster assistance after a flood. Official Flood Insurance Rate Maps (FIRMs) do not identify all possible sources of flooding, and insurance is therefore not meant to be limited only to properties that were identified as overlapping with the officially designated flood zones.

Structures in Plainfield Township's flood hazard zone were assessed according to various criteria that were used to prioritize them according to the urgency of flood mitigation actions. Criteria (not listed here in any particular order of emphasis) included the current condition of the structures, the extent of connection with public utilities, the presence of wells and septic systems, the frequency of flooding, and the difficulty of accessing the property.

In addition to the prominent areas marked for the densely populated areas of Grand Rapids, Walker, Grandville, Kentwood, and Wyoming, it must be noted that flooding is reported almost every year in some areas of Plainfield Township. The especially high risk areas of Plainfield Township are located along the Grand River. Homes had been built in an area that was then identified officially as a floodplain by the NFIP, and in other locations there have been roads blocked by flood waters—particularly in the spring and early fall. Some of the major floods in Plainfield Township have occurred in 1986, 1997, 1999, 2000, 2001, 2004, and 2010. Recent significant flood events in Grand Rapids occurred in 1995, 1996, 1997, 2004, 2009 and 2013.

CW 6



Plainfield Township Flood Risk Locations Map

Kent County	- - - Properties with structures (structure type listed below) - - -					No structures
Properties in floodplain:	Residential	Industrial	Commercial	Agricultural	Tax-exempt	Vacant
Ada Township	363	3	43	1	29	84
Algoma Twp.	173			17	2	25
Byron Twp.	2		2			2
Caledonia Twp.	427	1	2	5	7	126
Cannon Twp.	552		9		2	70
Cascade Twp.	599		19		49	108
East Gd. Rapids	132		4		7	27
G.Rapids Twp.	1					2
Grand Rapids	8234	211	992		290	436
Grandville	678	155	189		21	77
Kentwood	570	5	46		9	52
Plainfield Twp.	659	29	84	15	10	383
Rockford	3				1	1
Sparta Twp.	153	1	31	1	16	35
Tyrone Twp.	2					
Walker	8	40	1		15	42
Wyoming	514	57	127		99	112
TOTAL:	13,070	502	1549	39	557	1582

CW 8

(11). Robinson Township - Ottawa County

The other focus area that requires emphasis in this plan is the flood-prone portions of Robinson Township in Ottawa County, located down river from Kent County. From Robinson Township the Grand River continues to the City of Grand Haven and out to Lake Michigan. The mouth of the river is in Ottawa County.

Robinson Township had entire residential areas affected by flooding for lengthy periods in 2005, which finally resulted in a flurry of flood mitigation activities. Here is a summary of the multiple events that led to the critical flood conditions of 2004-5.

As mentioned earlier, flooding occurred in Robinson Township in 1994 and in 1996 due to ice jams on the Grand River.

May 18-20, 2000: Flash flooding occurred during the morning hours of the 18th across Ottawa and Kent Counties as a result of as much as 5 inches of rain between 9 p.m. EST on the 17th and 2 a.m. EST on the 18th. The heaviest band of rain fell in a band from Grand Haven east to Rockford. In Ottawa County, roads were washed out, numerous homes were flooded and area schools were closed. The Grand River crested at 14.8 feet on May 24, placing Van Lopik Ave. underwater again.

Feb 9-12, 2001: Extensive flooding began on the 9th as a result of the combination of heavy rain and melting snow. There were many reports of standing water in low lying areas and poor drainage areas. The event transitioned into a river flood event across the area. 10 forecast points on 8 different rivers went above flood stage. However, no lives were lost, and only minor property damage occurred. The Grand River crested at 13.8 feet in Robinson Township on February 15.

Feb 24-28, 2001: Minor flooding began during the evening hours of the 24th and continued through the rest of February. The event was primarily a river flood event, and an urban and small stream flood advisory was issued at 9:45 p.m. on the 24th. Several area rivers crested slightly above flood stage, but there were no fatalities, and no significant property damage was reported.

May 15, 2001: Thunderstorms developed during the morning hours of the 15th, producing several reports of large hail and high winds. It was also a record rainfall event for the Grand Rapids area, and 4 to 5 inches of rain fell in less than 6 hours across much of southwestern and south central lower Michigan. Flash flooding and flooding took place across Ottawa and 13 other counties. There were numerous reports received of flooded roads, basements, and flooding of small creeks and streams. Fortunately, however, the flash flooding and flooding did not cause any fatalities. On May 17, the Grand River crested at 13.8 feet in Robinson Township, again flooding low-lying areas.

Jul 23, 2001: Flash flooding occurred during the early afternoon hours of the 23rd across mainly northwestern Allegan county and southwestern Ottawa county. Numerous roads were reported to be flooded along the Allegan and Ottawa county lines by area law enforcement. Several reports of flooding were received from the city of Holland (Ottawa County). A report of 5.51 inches of rain was received from a trained spotter in Holland Township (Ottawa County) at 12:58 p.m. EDT, who also reported several impassable flooded roads.

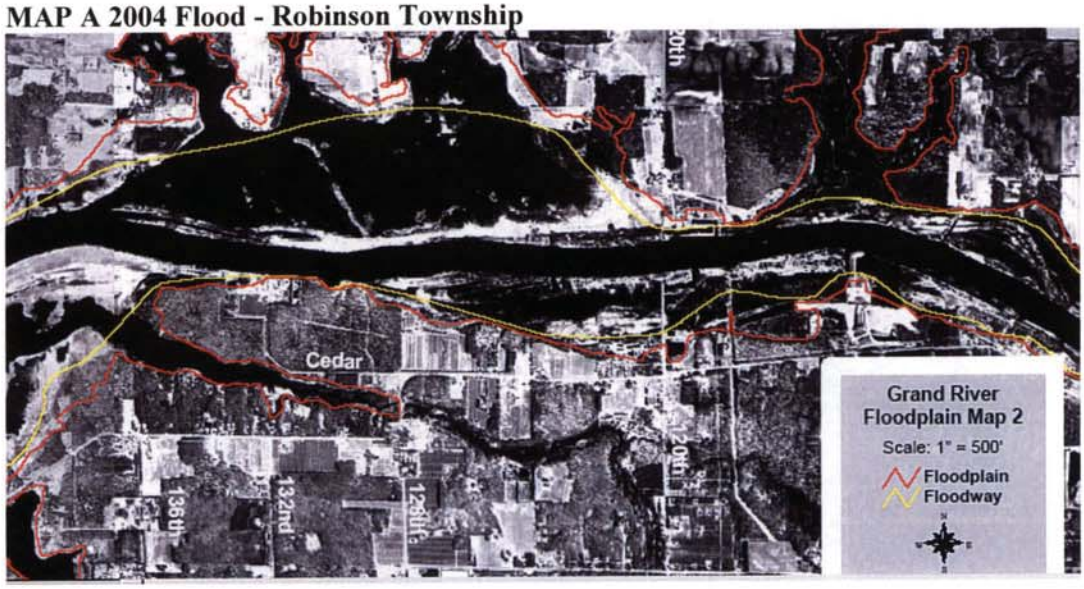
On March 9, 2004 the Grand River at Robinson crested at 13.4 feet, again flooding low-lying areas nearby.

May 20-June 1st 2004: Heavy rain and thunderstorms plagued all of Southern Michigan with 5" to 6" totals during May 20-24. The great influx of water caused river levels to swell quickly, resulting in widespread flooding along many area rivers. The Grand River at Robinson Township crested at 16.2 feet

at 4 p.m. on May 28, well above the flood stage (13.3 feet). It was the 3rd highest historical crest at that time. By May 27th, it was reported that 48 homes in Robinson Township were affected by flood waters, and some had as much as 3 feet of water in them. Flood damages were estimated at $2.5 million in Robinson Township based on county damage assessments. Seven homes in the Van Lopik Ave. and Limberlost Lane experienced major flood damage. Governor Granholm issued a disaster declaration for 24 counties in Michigan, including Ottawa. President George Bush issued a Presidential Disaster Declaration for 19 of the 24 counties, including Ottawa. The following aerial photographs show the areas and homes affected by flooding in this event. First is a floodplain map produced by the Michigan Department of Environmental Quality (MAP A), followed by greater detail of the floodplain map (MAP B) showing that Van Lopik Ave. and Limberlost Lane homes are located in the floodway.

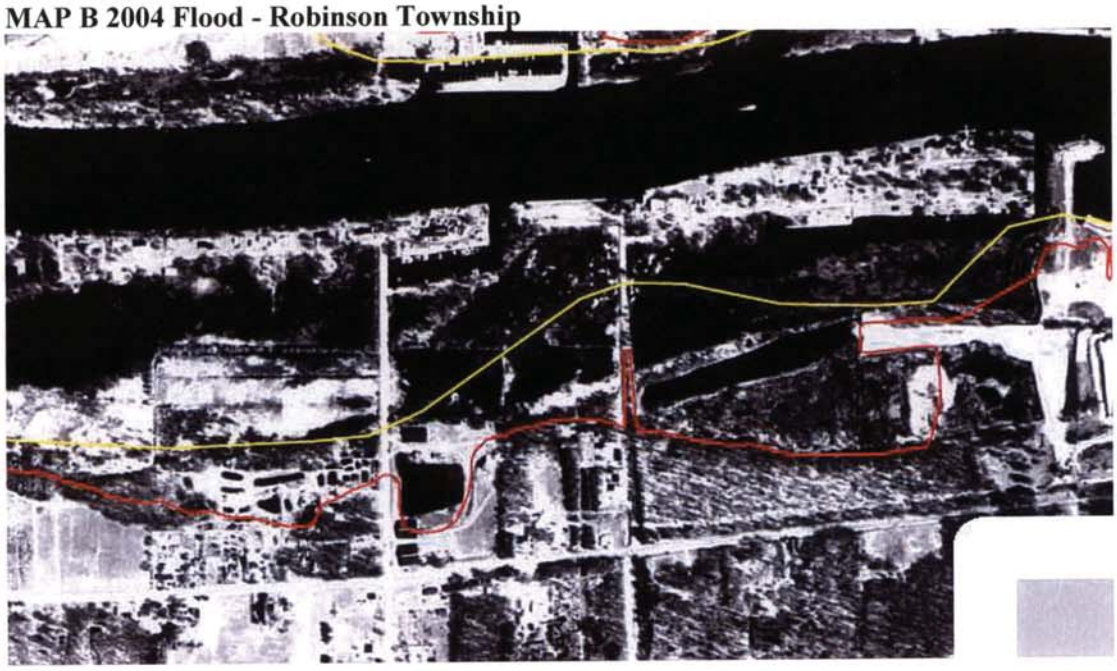
MAP A 2004 Flood - Robinson Township

CW 6



MAP B 2004 Flood - Robinson Township

CW 6

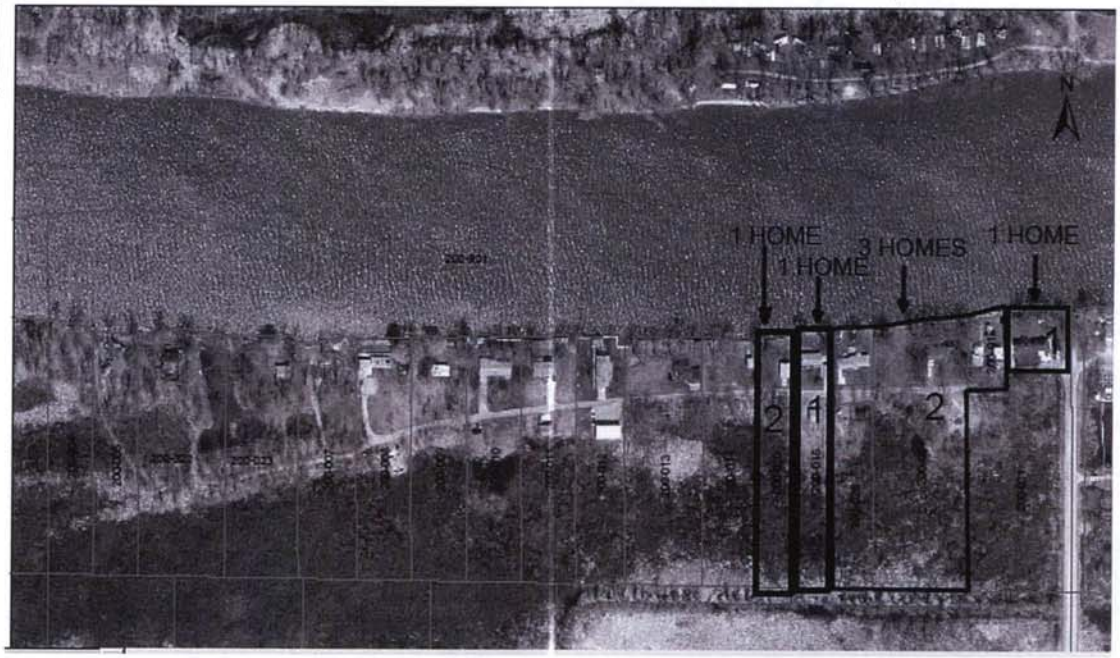


MAP C and MAP D give detail about the number and location of houses damaged in the 2004 flood.

MAP C

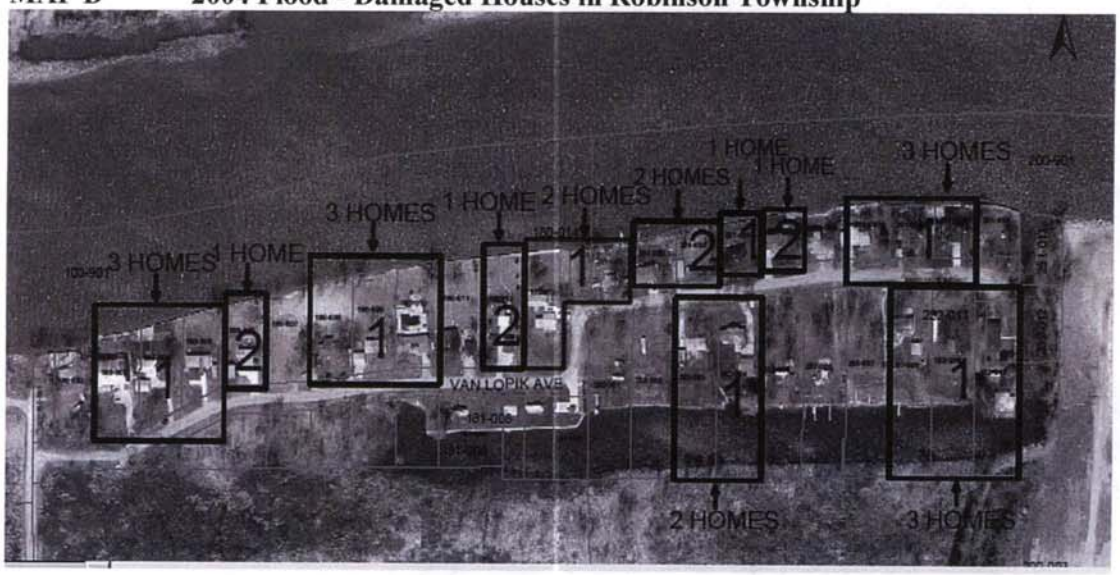
CW 6

LIMBERLOST LANE PRIVATE FLOOD DAMAGE, 2004



MAP D **2004 Flood - Damaged Houses in Robinson Township**

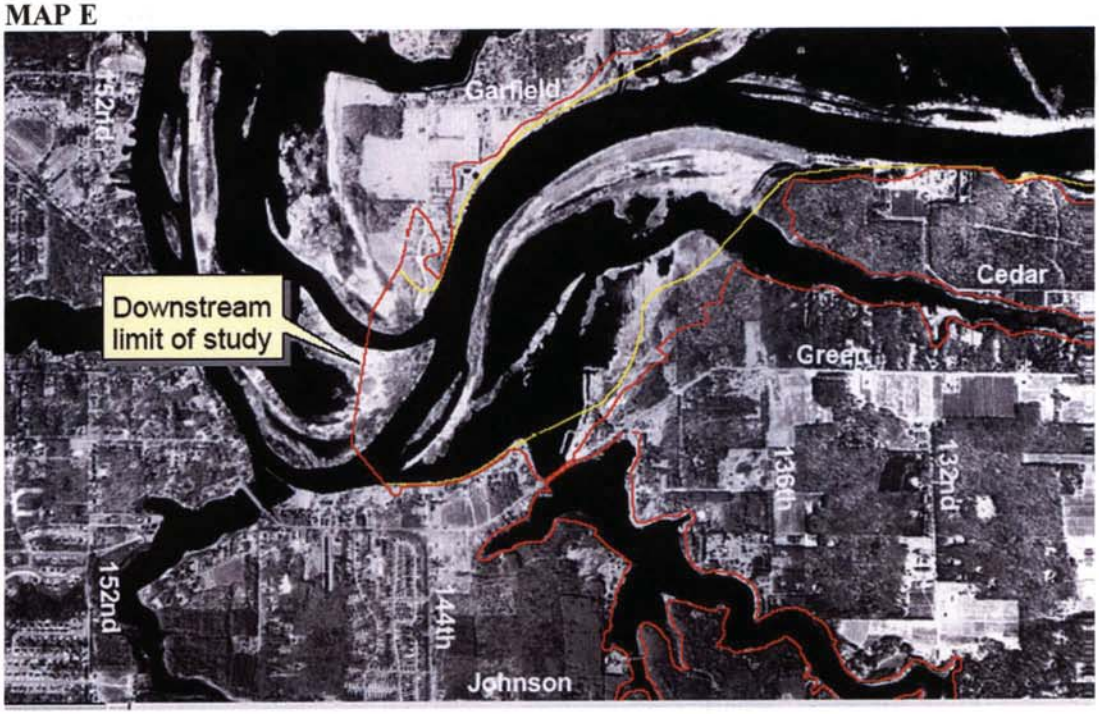
CW 6



January 17-March 2005: Again the Van Lopik Ave and Limberlost Lane in the north-central part of the township are severely impacted by flooding that resulted from an ice-jam on the Grand River at the bend in the river portrayed on MAP E.

CW 6

MAP E



The event began on January 17, 2005 when the Grand River rapidly went over its flood stage of 13.3 feet. (It would eventually reach record levels of 18.3 feet by January 21) On the morning of January 18, the first rescue of residents was initiated, and by 4 pm that day, with water levels at 16.9 feet, utilities were shut off to the two flooded streets and homes on Van Lopik Ave. and Limberlost Lane. This was done for safety reasons. Rescue activities continued into the early evening of the 18th as the neighborhood was evacuated. Extensive media coverage of the event was broadcast and distributed. An official damage assessment was completed on January 20 (finding 32 homes affected before the river crested) and numerous meetings occurred during subsequent weeks. According to National Weather Service data, a total of 30 homes on Van Lopik Ave., and 20 more homes on Limberlost Lane are affected by flooding as a result of cresting flood waters.

By January 29, notifications of suspended occupancy were posted on homes in the area. Representatives of the Small Business Administration arrived, inspected the area, and agreed to make loans available under an SBA disaster declaration. With local wells and septic systems unusable and contaminated with floodwaters, gas and electric services shut off by utility companies for a projected 2 months, homes flooded and surrounded by water, and possible damage to frozen water pipes, residents had to evacuate the area for several weeks. The American Red Cross became involved in this event, providing shelter for about 7 families at a church located in nearby Grand Haven. (Most affected families found temporary lodging with friends, relatives, or in motels.).

Following the flood event in 2005 Robinson Township, with the assistance of Ottawa County, applied for and received two Pre-Hazard Mitigation grants totaling 6 million dollars for the acquisition and demolition of flood prone properties on Van Lopik Ave and Limberlost Lane. Details are listed in the community subsection under Robinson Township.

CW 10

(11.) ***Community Impact***

A river gauge exists on the Grand River and is used to monitor the levels of waters there, which has a direct bearing on the safety and comfort of residents who live on Van Lopik Ave. and Limberlost Lane. A live camera feed has been installed to allow for remote monitoring. The gauge is located just east of 120th Avenue in the center of where the Grand River flows along the northern part of the township. At this point, the flood stage is pinpointed at a 13.3 foot water level. At that level, minor flooding begins in low-lying areas along the river banks. This level has been reached or exceeded more than fifteen times since 1994.

Top 15 historic crests (since 1994) at Robinson Township Gauge Point on the Grand River (see MAP F).

1	18.30 ft.	1/21/2005
2	18.00 ft.	2/25/1994
3	17.00 ft.	4/19/2013
4	16.20 ft.	5/28/2004
5	15.60 ft.	3/28/1997
6	15.10 ft.	2/8/2013
7	14.80 ft.	5/24/2000
8	14.50 ft.	1/27/1997
9	14.20 ft.	1/16/2016
10	14.00 ft.	1/19/2017
11	13.80 ft.	2/15/2001
12	13.80 ft.	5/17/2001
13	13.50 ft.	4/28/1999
14	13.40 ft.	3/9/2004
15	13.30 ft.	3/24/1998

Map F

Gauge information is from the National Weather Service station based in Grand Rapids and Ottawa County Emergency Management. As the river gauge data shows, flood events in this area occur regularly and have the potential to worsen over time.

At 13.6 feet, the eastern edge of Van Lopik Ave. and the western edge of Limberlost Lane begin to flood. At 17.0 feet 15 homes become flooded all along Van Lopik Ave.

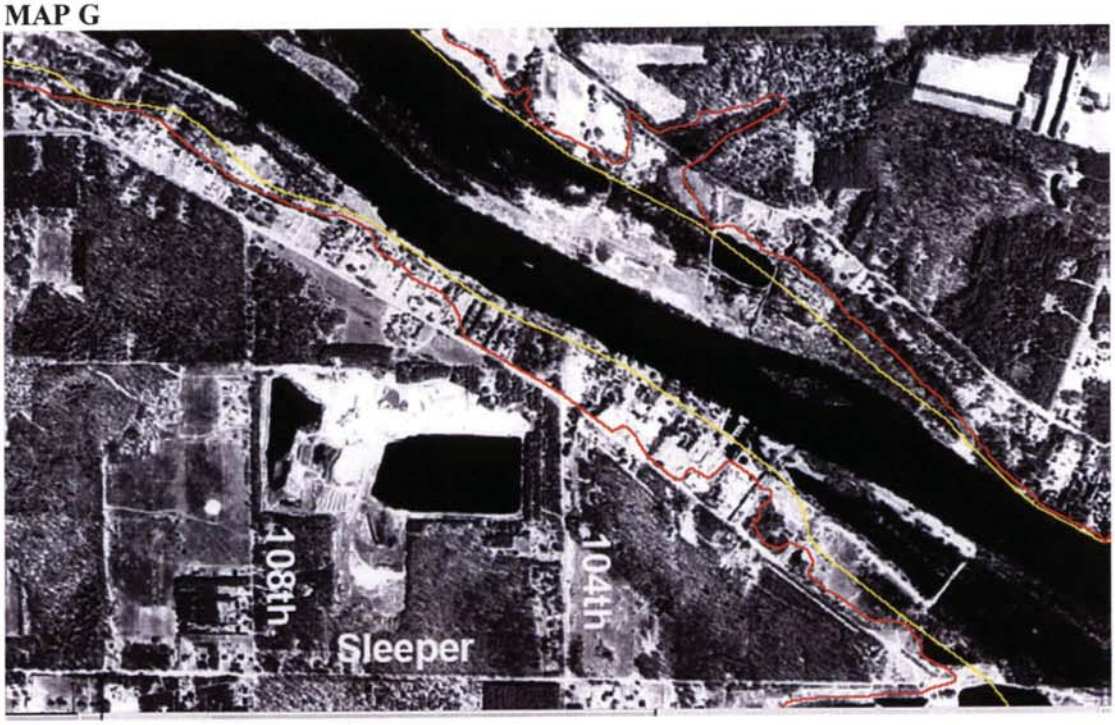
A record flood level was reached in 2005, as waters crested at 18.3 feet and resulted in major flooding of 30 homes on Van Lopik Ave., and flooding of 20 homes along Limberlost Lane. Van Lopik Ave. was estimated to be under 4 to 5 feet of water, with water levels up to "seat-cushion level" inside several homes.

Most other houses in the area have no basements which is probably the wisest strategy for such developments, although information about water levels *is* available during the permit process. A special concern observed by response personnel is the problem of how to effect rescue efforts in situations where flooding has become severe enough to cause swift waters to sweep through residential areas. Special equipment would be needed for such rescue activities, especially in icy weather, when flood activities to continue to worsen over time. Local responders may be forced to rely on U.S. Coast Guard assistance to arrive from Grand Haven, and such delays could endanger the lives of residents.

In addition to Van Lopik and Limberlost streets, some additional areas of flood problems were identified in Robinson Township (see MAP G). In the northeast section along North Cedar Drive, from the area around 108th Avenue and a mile east of there, there are from 4 to 6 homes in this area that have suffered flood damage. About once per year, basement flooding occurs, with more than two feet of water accumulating in these homes. Sandbags, and even an illegal berm, have been employed by residents to try to protect their homes there. During years with more inclement weather and drainage conditions, these basements have become completely full of water. Such conditions have occurred at least five times in just over a decade – in 1994, 1997, 1998, 2004, 2005 and 2013.

MAP G

CW 6

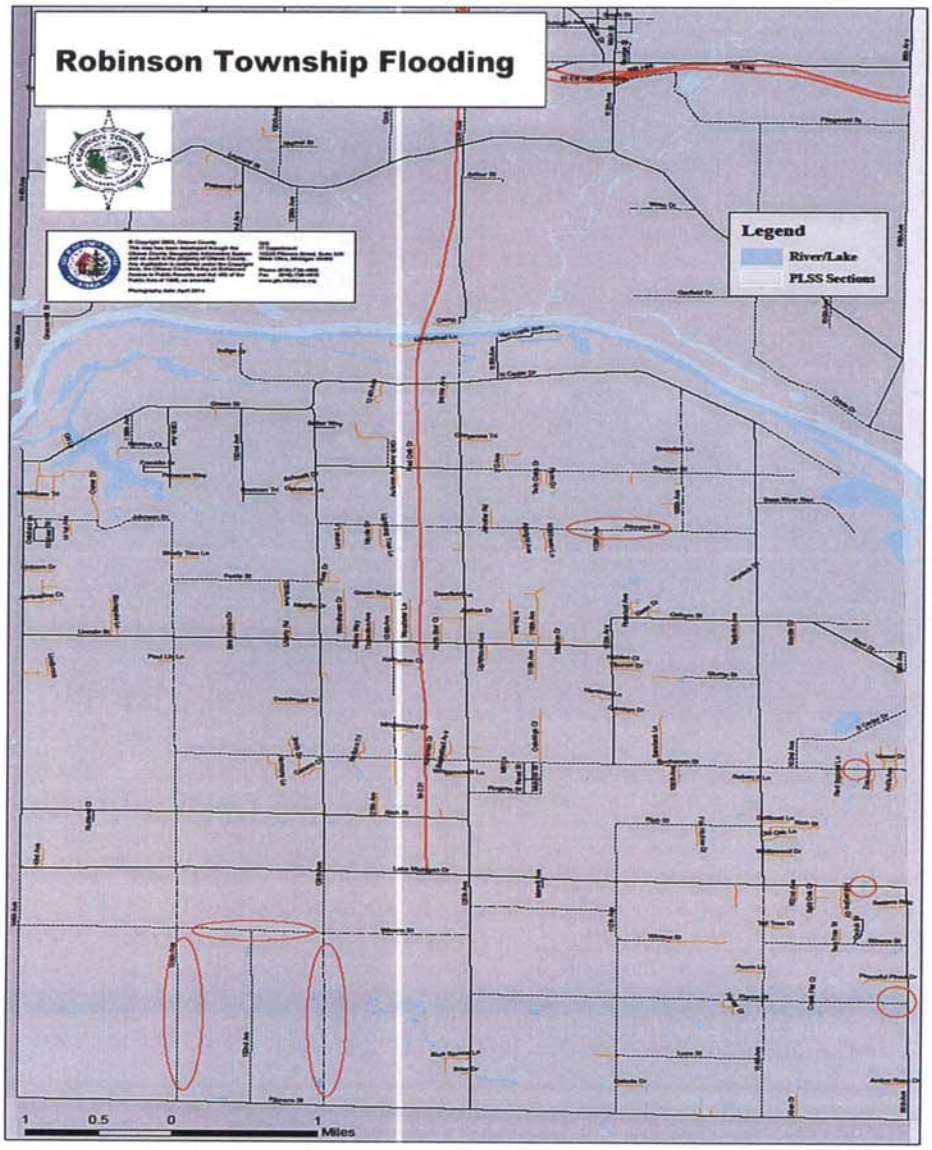


A private marina in this area of the township has also suffered repeated damage to its docks, including complete destruction caused by the forces of floodwaters and ice jams. Flood damages occur here approximately every other year. At the county park in this same area, flood problems are also experienced. Numerous private docks suffer damages from floodwaters and ice effects (occurring four times in the last decade.) It has been suggested that the replacement of permanent docks with floating docks would allay these damages. These docks are present throughout the Grand River and Bayou areas of the township.

Robinson Township was heavily impacted by the flooding during April 2013 flooding. The Grand River crested at 17.0 feet resulting in the evacuation of homes for several days. Also the area with the most significant flooding was the Southwest corner of Lincoln Street and 136th Ave with 5 homes that were surrounded by water. One home in that area is especially vulnerable to flooding. It has a sump pump but occasionally the pump requires maintenance or fails during a power outage, resulting in about two feet of basement flooding if failure occurs, especially during the spring months. The problems in this section of the Township may stem from a drain that flows nearby, but also can be considered to more broadly represent concerns that development in areas with a high water table should be aware that sump pumps do not offer foolproof protection against seepage and flooding. During the April 2013 event there was so much water that the foundation of the one home was compromised. Many other homes within the Township also experienced water in their basements.

Besides the flooding related to rivers and ice jams, as described at the beginning of this hazard analysis section, Robinson Township experiences other flood problems that affect numerous sections of its roadways. Although a lower priority than the riverine flooding that directly affects the homes and lives of residents, this type of flooding is nevertheless quite significant in the township as it impedes the use of roads that may be needed for timely emergency access, or day-to-day access to people's homes and other destinations. Several locations have been pinpointed as being particularly vulnerable to road closures and potentially damaging washouts, as described below and indicated on MAP K (circled locations of high-priority problem road areas).

MAP K



Along Johnson Street between 112th Avenue and just past 108th Avenue there is a low area in the road. Water collects in this area and covers the road, to depths of several inches. This is a gravel road and so this kind of wash-out causes damages and trapped vehicles. This sort of event typically occurs every spring. Sometimes the road must be officially closed when this happens, but even during times when it

isn't actually flooded over, its surface gets too muddy to allow many vehicles to safely get through. This is a common occurrence throughout the year.

Another area suffering from similar flood impacts is a "horseshoe" section of three roads in the southwest area of the township. On the west of the "horseshoe" is 136th Avenue, on the northern end in Winans Street, and on the east side is 132nd Avenue. All are gravel roads. Flooding affects the area and comes south to within a quarter mile of Fillmore Street. Fillmore itself is not affected, as it has been blacktopped and raised above flood level.

Additional areas of flooding and road failure have been identified in the southeastern sections of the township, near the Bass Creek. At M-45 (Lake Michigan Avenue), no flooding has been observed, but accumulations of water at the Bass Creek bridge make local officials suspect that some mitigation activity will eventually need to be done to prevent waters there from backing up over the road. One solution might be a re-engineering or replacement of the bridge to allow more water to pass underneath and avoid backups. Additionally, where the Bass Creek crosses over Buchanan Street, Pierce/96th Avenue, and Winans are located flooding and road damage has been regularly observed.

(11.) Risk/Likelihood

CW 9

Identified floodplain areas, by definition, have at least a 1% chance per year of flooding. Within these floodplain areas are locations that, as already identified and described, experience damaging floods with a much greater probability. The history of damaging events speaks for itself, with floods taking place in these most vulnerable locations approximately every year or two, on average.

Since 2005, several hazard mitigation activities have been used to mitigate the impacts of flooding in Robinson Township. These activities continue into the present and can be found in the Community Subsection of this plan under Robinson Township.

(11.) Existing Prevention Programs

Michigan Flood Hazard Regulatory Authorities address flood mitigation. The Land Division Act, PA 288 or 1967, as amended, governs the subdivision of land in Michigan. The Act requires review at the local, county and state level to ensure that the land being subdivided is suitable for development. This includes reviews by the Drain Commissioner and the DEQ. Several other parts of Act 451 are used to mitigate flooding: the Floodplain Regulatory Authority, Part 31; Soil Erosion and Sedimentation Control, Part 91; Inland Lakes and Streams, Part 301; Wetlands Protection, Part 303; and Natural Rivers Program, Part 305. Other programs affecting flood mitigation include the Flood Mitigation Assistance Program, Repetitive Flood Claims Program, Severe Repetitive Loss Program, Flood Management and Mitigation Education, Road Infrastructure Flood Mitigation Committee, State and Federally-Assisted Relocation of Flood-prone Properties, and other State and Federally-Assisted Flood Hazard Mitigation Projects (e.g. Pre- Disaster Mitigation Program, Hazard Mitigation Grant Program).

12. Flood - Shoreline Flooding and Erosion

(12.) Summary

Shoreline erosion is a natural process which is affected by human activities on the west edge of Ottawa County, affecting the townships of Spring Lake, Grand Haven, Port Sheldon, and Park, as well as the Cities of Grand Haven and Ferrysburg. All of these townships, and the majority of the Lake Michigan shoreline in Ottawa County has been designated as a high risk erosion area. The rate of erosion is slowing as Lake Michigan shoreline protection is added. Fallen lake levels have caused shallow depths in marinas and river mouths. The impact on shipping, marinas and watercraft has been significant.

(12.) ***Hazard Description***

Erosion is defined as the wearing away of land by the action of natural forces. On the Lake Michigan coast in Ottawa County, the forces of erosion are embodied in waves, currents, and wind. Surface and ground water flow, and freeze-thaw cycles, may also play a role. Not all of these forces may be present at any particular location. Though erosion is a natural process, it can be influenced, both adversely and beneficially, by human activity. Flooding, as it applies to the shoreline, is defined as excess water resulting in a high water level at the shoreline and marinas. Water levels which are too high or too low are both considered in this section.

CW 8

(12.) ***Historically Significant and Related Events***

The Lake Michigan water level fluctuates. During the last decade, Lake Michigan reached its lowest level since 1964, but has gradually been trending back up to historically average levels. These low lake levels were also seen during the 1920s and 1930s, but were not present during the long period from 1860 to 1920. The 1970s, 1980s, and 1990s all had peak water levels that were well above the historical averages, but the decade of the 2000s saw lake levels that were all consistently below average. Before 1920, Lake Michigan's water level was consistently on the high side of the overall average from 1860 to 2010. According to the US Army Corps of Engineers, the loss incurred by recreational boating has three components:

• "Loss specific to marinas: It is possible to demonstrate a financial loss to marinas in the five study counties of between $2 to $4 million. These are estimates but are based in part on fairly exact recordkeeping of marina owners and on observable numbers of marina slips.

• Loss of trip-related spending in the community due to a loss of available marina slips. There was no loss estimated in 2000 because the loss of slips due to low water equaled the excess capacity of marinas. If water levels were to drop an additional 12", this loss would be about $825,000 in Allegan and Ottawa Counties and the loss would be about $1.15 million for a drop of 18". There would be no such loss in Wisconsin.

• General loss to a potential boating related economy. We gathered information on the level of boating activity in 2000, including average boating days, use of trailer launched boats, boat launch ramp depth capacity, charter fishing and boat sales. However, it was difficult to develop a stage damage curve for future financial impact. This was because of the difficulty of gaining an accurate response from boaters on their likely change in boating activity due to a situation they have never encountered. Therefore, we've estimated the potential boating-related spending that low waters could affect. How much low water affects spending is open to further speculation. We believe that the boating-related economy of the five counties could be in range of about $29 million to as high as nearly $43 million."

A shoreline flooding event occurred when record high lake levels in 1985-1986 culminated in a Governor's disaster declaration for 17 shoreline counties, including Ottawa County, on February 21st, 1986. The USACE implemented its Advance Measures Program, and the State of Michigan implemented three unique shoreline flooding and erosion mitigation programs aimed at reducing future flood impacts on shoreline communities and homeowners.

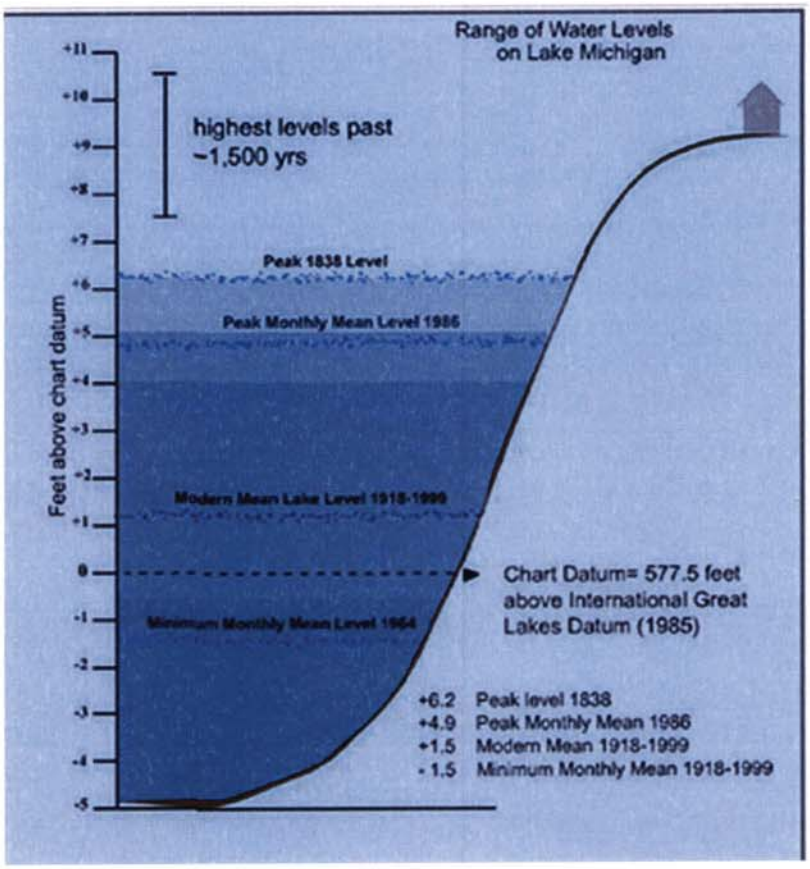
CW 9

(12.) ***Risk/Likelihood***

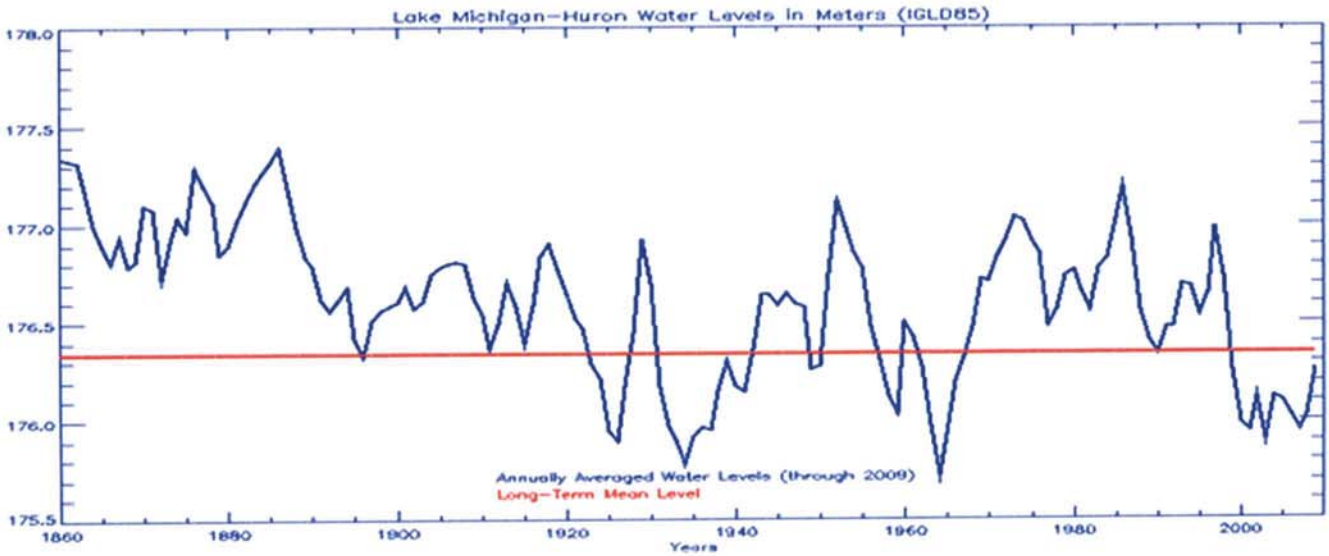
The fluctuating rise and fall of Lake Michigan is inevitable. Predicting the rate of rise and cycle of the lake has been difficult. The graph image on the preceding page shows a rise and fall of nearly 2 meters (about 6 feet) every 20 years or so over an 80 year period. Over thousands of years, the Great Lakes level has fallen. In the next century, we can expect the level to fluctuate in its historical pattern, but the accuracy of such predictions is limited.

(12.) ***Existing Prevention Programs***

The current shoreline classification database includes an inventory of shore protection type, level of performance and spatial coverage and changes for the period from 1989 to 1999. Percentage values are expressed as a percentage of the entire 41km length of Ottawa County shoreline.



The range of water levels in Lakes Michigan and Huron in the graphic above are given in feet relative to Chart Datum, or Low Water Datum (LWD) of 577.8 feet, International Great Lakes Datum, 1985 (IGLD 1985). This LWD is 176.0 meters above IGLD 1985.



Quick Analysis of a single decade's effects (based upon the 1990s to 2000s period):
• 0.5 km of new shore protection added in 10 years (i.e., loss of 591m of "unprotected shoreline").
• Addition of 640 m of new revetments in 10 years, a 1.2% increase.
• Loss of over 1 km of groins.
• An increase in Beach Nourishment.

Terminology

Revetment	A facing of wood, stone, or any other material, to sustain an embankment when it receives a slope steeper than the natural slope; also, a retaining wall.
Seawall/Bulkhead	An embankment to prevent erosion of a shoreline.
Groin	A small jetty extending from a shore to protect a beach against erosion or to trap shifting sands.
Jetty	A wharf or pier extending from the shore.

Ten year comparison of shoreline protection in Ottawa County.

Shore Protection Type	1989 Shoreline Length (M)	% Ottawa County Shoreline	1999 Shoreline Length (M)	% Ottawa County Shoreline	Change (M)	Change (%)
1A1 - Revetments >45 Year Lifespan	300	0.73	800	1.95	500	1.22
1A2 - Revetments 5-45 Year Lifespan	375	0.91	515	1.26	140	0.34
Seawalls/Bulkheads 5-45 Year Lifespan	1527	3.72	2270	5.54	743	1.81
Seawalls/Bulkheads 0-5 Year Lifespan	1415	3.45	915	2.23	-500	-1.22
2A2 - Groins 5-45 Year Lifespan	6585	16.06	6335	15.45	-250	-0.61
2A3 - Groins 0-5 Year Lifespan	1375	3.35	425	1.04	-950	-2.32
2A4 - Groins 0 Year Lifespan (Disrepair)	140	0.34	140	0.34	0	0
2B1 - Jetties	744	1.81	744	1.81	0	0
3A2 – Beach Nourishment	1100	2.68	1600	3.9	500	1.22
Materials, 0 Year Lifespan (Disrepair)	10	0.02	0	0	-10	-0.02
7 - Unprotected	30152	73.54	29561	72.1	-591	-1.44

Other existing prevention programs are the Michigan Shoreline Flood and Erosion Hazard Regulatory Authority, the National Flood Insurance Program, the USACE Advance Measures Program, and the Lake Michigan Potential Damages Study, along with community education programs.

13. Flood - Urban

(13.) Summary

Urban flooding is a hazard in metropolitan areas of Greater Grand Rapids. Long term commitment to the prevention of combined sewer overflows (CSOs) has and will continue to reduce this hazard.

(13.) Hazard Description

Urban flooding occurs in developed areas when existing drainage systems cannot carry water away from low-lying areas of impervious pavement and development. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff two to six times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while basements and viaducts can become death traps as they fill with water.

Several factors contribute to flooding. Two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play important roles. Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms.

Floods can be slow or fast-rising, but usually develop over a period of hours or days. The National Flood Insurance Program has estimated that almost 25% of all flood insurance claims come from properties that are *not* located in "special flood hazard areas" (i.e. identified floodplain areas). Many of these damaged properties have suffered from waters that were inadequately drained, or from infrastructure problems or failures that allowed the accumulation or back-up of waters into basements or other low-lying areas.

(13.) Historically Significant and Related Events

CW 8

According to *The Holland Sentinel* newspaper of January 1, 2000, the heaviest rainfall event in the City of Holland (Ottawa County) took place on July 17 and 18, 1982. On those dates, 11.0 inches of rainfall was recorded. The second-highest rainfall measurements occurred on May 20-21, 1996, with 7.7 inches of rainfall. Ranked 3rd through 5th were events on June 16, 1972 (4.71 inches), June 7, 1967 (4.16 inches), and June 21, 1997 (4.1 inches). The news article covered the worst rainfall events of the entire 20th Century.

Urban flooding, as the term implies, is concentrated in urban areas, so it is not surprising that most urban flooding has occurred in the metropolitan Grand Rapids area. What were once common urban flooding incidents have been reduced in frequency and severity by the adoption of a new waste water philosophy separating storm water run-off from the sanitary sewer system. Much effort and money has been committed to a long term plan to reduce combined sewer overflow incidents.

(13.) Risk/Likelihood

CW 9

The risk of urban flooding exists, and is difficult to pinpoint due to its diffuse and systemic origins, but is generally decreasing due to the effects of combined sewer overflow projects and use of green spaces.

(13.) Existing Prevention Programs

Michigan Flood Hazard Regulatory Authorities mitigate flooding. The Land Division Act of 1967 as amended governs the subdivision of land in Michigan. The Act requires review at the local, county and state level to ensure that the land being subdivided is suitable for development. This includes review by

the Drain Commissioner and the DEQ. Several other parts of Act 451 are used to mitigate flooding: the Floodplain Regulatory Authority, Part 31; Soil Erosion and Sedimentation Control, Part 91; Inland Lakes and Streams, Part 301; Wetlands Protection, Part 303; and Natural Rivers Program, Part 305. Other programs that relate to flood mitigation include: Flood Mitigation Assistance Program, Flood Management and Mitigation Education, Road Infrastructure Flood Mitigation Committee, State and Federally-Assisted
Relocation of Flood-prone Properties, and other State and Federally-Assisted Flood Hazard Mitigation Projects, such as the Hazard Mitigation Grant Program or the Pre-Disaster Mitigation Program. The City of Grand Rapids has expended significant funding on a floodwall project designed to decrease urban flooding.

(13.) Additional Flood Analysis

Flooding occurs on an annual basis and can occur at any time of the year. The flooding in the county ranges from widespread river flooding, to area "urban" flooding and flash flooding. The flooding can be caused from rainfall, snowmelt, ice jams or any combination of the three. Late winter and spring floods are, by far, the most common in the area. Typically, frontal systems produce a light to moderate, but steady and widespread, rainfall on a saturated snow pack. The upper soil layer typically is frozen and impervious to moisture infiltration. Runoff is increased by the melting snow pack and the frozen soils. Flood stages also are commonly increased by backwater from ice jams, as river ice accumulates where it is unable to flow around bends or past obstacles.

Spring and summer thunderstorms sometimes produce intense rainfall, damaging winds, and hail. Flooding is possible from these storms, with urbanized areas more prone to flash flooding. Summer and fall floods that are caused by intense, localized thunderstorms can be as significant as those caused by widespread rainfall on snow pack and frozen soils. The Grand River Basin is the largest river basin in the State and the largest river in the area. Almost all of Kent County, and a large portion of Ottawa County, drains into the Grand River Basin. The entire Grand River Basin covers an area of 5,572 square miles of relatively level to hilly land. The main stem of the Grand River rises near the State's southern boundary at an elevation of 1,040 feet above sea level, flows northward for about 70 miles and then westward for another 190 miles until it flows to Lake Michigan at an elevation of 580 feet above sea level. Tributary rivers are the Portage, the Red Cedar, the Looking Glass, the Maple, the Flat, the Thornapple, and the Rogue. The basin is underlain by glacial deposits except for a few small areas in the headwaters of the Grand River and a short stretch along the river at Grand Ledge where sedimentary rocks are exposed. Only 15 percent of the basin is wooded, mostly along the water-course and in hilly lands; the rest of the basin consists of farmland and urbanized areas. The largest urbanized areas in the Grand River Basin are: Grand Rapids, Lansing, Jackson, and Jackson County to the City of Ionia (90 miles upstream of its mouth and just east of Kent County), the slope is 2.4 feet per mile. From Ionia to its mouth at Lake Michigan, the slope is 0.6 feet per mile. Average discharge by water year of the Grand River at Grand Rapids during the past 50 years has ranged between 1,500 cubic feet per second to 6,300 cubic feet per second. The record flood on the Grand River was in 1904, with discharges of 54,000 cubic feet per second at Grand Rapids. The major uses of surface water in the basin are for recreation purposes and power generation. The area generally has a series of freeze-thaw cycles throughout the winter months, which keeps total snow depth fairly low, but makes this area subject to frequent flooding due to snowmelt, rainfall on frozen ground, or rain on snow cover. There normally is snow cover throughout the winter months, with spring runoff then usually occurring from March through April.

When cold weather (usually from late December through March) is followed by a thawing period, numerous local ice jams and extensive ice bridges may form. In general, the effect of ice jams will be the ponding of water above the ice jam. To cause serious ice jams, rapid inflow to rivers and streams must occur. This is generally caused by significant rain and snow melt. Water will initially flow on top of a completely frozen river without dislodging the ice cover. As the depth of liquid water increases the

buoyancy force of the ice causes it to rise to the surface of the liquid water. Once the ice breaks up, it moves downstream and often forms ice jams.
These ice conditions are potentially dangerous to life and property, both upstream in the backwater area from flooding, and downstream, when sudden releases of river water are made as the ice breaks up or moves. As long as the flow arriving above the ice jam is increasing, the ice jam flood threat will increase. Colder temperatures will strengthen the ice jam and cause more upstream flooding, while warmer temperatures will weaken the ice jam and may cause a sudden release of the impounded water. The normal situation involves fluctuations in the river levels of a few feet as the ice jam breaks up, moves downstream, re-forms, and breaks up again. Most rivers and streams in Kent County have wide floodplains that allow water to flow around most ice jams. This prevents extremely large volumes of water from backing up. Ice jams in Michigan generally do not result in flash flooding. However, at times, rapid fluctuations in water levels can result if the ice jam breaks up suddenly.

Dam failures represent a particular problem for public notification and warning, as they may occur for a variety of reasons, and over varying time intervals. A dam may simply erode and empty slowly, or under catastrophic conditions, a dam may fail during a heavy rainfall event or earthquake. The latter of these presents a dangerous flash flood situation. In the Kent-Ottawa area, multiple dam breaks took place on September 10th and 11th, 1986. Over those two days, between 8 and 17 inches of rain fell over central Lower Michigan. In addition to widespread flooding, 11 dams failed and 19 others were threatened, resulting in the evacuation of 1500 people downstream of these dams. During this event, in Kent County, the Childsdale Dam failed on the Rogue River. Several significant to high hazard dams exist in the area.

Several large and small waterways have been identified by the National Flood Insurance Program for study, including the Grand River, Thornapple River, Rogue River, Plaster Creek, Buck Creek, Mill Creek, and Indian Mill Creek. The larger rivers have defined flood stages. The National Weather Service defines flood stage as the water elevation level that begins to cause impacts upon safety and/or property.

There are several small streams and creeks in the Grand Rapids Metropolitan area that tend to flood any time one to two inches of rainfall occur within several hours over the urban drainage basins. The most significant of these small streams and creeks are the following:

Plaster Creek	Plaster creek tends to crest in about 18 - 24 hours. No flood stage is established.
Buck Creek	Buck creek tends to crest in about 18 - 24 hours. No flood stage is established.
Mill Creek	Mill creek along West River Drive in Comstock Park tends to crest in about 6 - 12 hours. No flood stage is established.
Indian Mill Creek	Indian Mill creek near Alpine Ave. in the city of Walker tends to crest in about 6 – 12 hours. Alpine Ave. is a major growth corridor and urbanization is increasing the flood threat. No flood stage is established.

There are not as many stream gauges being used in Ottawa County. The USGS water-watch web site at http://waterwatch.usgs.gov/new/?m=real&r=mi&w=map lists current information only for the Macatawa River at State Road near Zeeland. Peak water levels at that gauging location were listed as:

1	16.45 ft.	6/20/2009
2	13.50 ft.	6/8/2008
3	12.57 ft.	10/30/2009

The Grand River at Lowell takes approximately five days to crest. Tributaries such as the Flat River do not contribute significantly to the crest at Lowell. The crest at Lowell is primarily a result of what is coming down the river from Ionia. Flood stage for the Grand River at Lowell is 15 feet.

Lowell Top 20 Historical Crests

1	19.00 ft.	3/22/1948
2	18.50 ft.	4/8/1947
3	17.80 ft.	3/19/1942
4	17.38 ft.	4/2/1960
5	17.26 ft.	3/7/1976
6	17.17 ft.	5/26/2004
7	16.85 ft.	10/3/1986
8	16.80 ft.	3/18/1943
9	16.40 ft.	3/19/1982
10	16.40 ft.	4/6/1950
11	16.12 ft.	5/12/1956
12	16.10 ft.	2/15/1938
13	15.90 ft.	10/4/1981
14	15.80 ft.	2/24/1997
15	15.75 ft.	12/30/2008
16	15.50 ft.	3/9/1946
17	15.10 ft.	4/8/1985
18	15.02 ft.	4/30/2009
19	14.86 ft.	5/21/2000
20	14.00 ft.	4/25/1999

The Thornapple River at Caledonia can have a double Crest due to contributions from local tributaries and the main stem that flows through the LaBarge Dam, located just upstream. The first crest occurs in about twelve hours from the local area. The second crest occurs in about four days. Flood stage for the Thornapple River at Caledonia is ten feet.

Thornapple River Top 20 Crests

1	14.40 ft.	4/7/1947
2	11.43 ft.	2/27/1985
3	11.21 ft.	5/26/2004
4	10.96 ft.	4/22/1975
5	10.79 ft.	5/10/1956
6	10.60 ft.	2/22/1997
7	10.60 ft.	4/2/1960
8	10.33 ft.	12/28/2008
9	9.87 ft.	3/15/1986
10	9.86 ft.	3/9/1979
11	9.79 ft.	5/19/2000
12	9.59 ft.	10/5/1986
13	9.58 ft.	4/23/1993
14	9.47 ft.	6/11/2008
15	9.44 ft.	12/1/1990
16	9.37 ft.	2/15/2001
17	9.25 ft.	3/8/1976
18	9.15 ft.	1/16/2005
19	9.10 ft.	1/5/1993
20	8.96 ft.	4/13/1952

The Grand River at Ada crests in about 5 days. Crest is mostly from the water coming down the Grand River from Lowell, however, the Thornapple River can contribute 2 to 3 feet to the crest. Flood stage for the Grand River at Ada is 20 feet.

Grand River at Ada Top 20 Crests

1	21.60 ft.	2/28/1986
2	21.56 ft.	5/26/2004
3	21.55 ft.	2/28/1985
4	20.75 ft.	3/8/1976
5	20.72 ft.	2/24/1997
6	20.65 ft.	10/10/1986
7	20.65 ft.	3/18/1982
8	20.05 ft.	12/31/2008
9	20.00 ft.	10/4/1981
10	19.45 ft.	4/23/1975
11	19.22 ft.	4/4/1985
12	18.95 ft.	3/8/1974
13	18.84 ft.	5/21/2000
14	18.72 ft.	1/5/1973
15	18.26 ft.	2/13/2001
16	18.23 ft.	5/1/2011 (provisional)
17	18.21 ft.	3/17/1990
18	18.20 ft.	2/14/2001
19	18.00 ft.	6/22/1996
20	17.80 ft.	1/16/2005

The Rogue River at Rockford crests in approximately one day. Flood stage for the Rogue River at Rockford is eight feet.

The Grand River at Comstock Park crests in about 5 days. A sharp rise may occur in the first 24 hours due to the contribution of its' tributaries and urban areas. The next 2 days will show a slow rise or a leveling off trend until water from upstream makes its way down to Comstock Park. The crest here is mostly a result of water coming down from Ada. The Rogue River is not a major contributor to the crest at Comstock Park. The flood stage for the Grand River at Comstock Park is 12 feet.

Grand River Comstock Park Crests

1	17.75 ft.	3/22/1948
2	17.45 ft.	4/9/1947
3	16.70 ft.	3/1/1985
4	16.60 ft.	5/27/2004
5	16.15 ft.	3/3/1960
6	16.0 ft.	10/4/1986
7	15.90 ft.	3/8/1976
8	15.40 ft.	3/1/1971
9	15.33 ft.	4/7/1950
10	15.19 ft.	1/1/2009
11	15.00 ft.	2/25/1997
12	15.00 ft.	3/5/1986
13	14.85 ft.	2/4/2008
14	14.73 ft.	3/8/1974
15	14.70 ft.	5/1/2009
16	14.50 ft.	5/21/2000
17	14.50 ft.	4/9/1985
18	14.28 ft.	4/23/1975
19	14.00 ft.	6/5/1989
20	13.84 ft.	1/5/1973

Rogue River Top 20 Crests

1	11.35 ft.	9/13/1986
2	9.29 ft.	3/6/1976
3	8.84 ft.	12/29/2008
4	8.76 ft.	3/14/2006
5	8.62 ft.	10/2/1981
6	8.62 ft.	5/19/2000
7	8.61 ft.	6/1/1989
8	8.60 ft.	5/17/1974
9	8.59 ft.	3/31/1960
10	8.50 ft.	6/21/1996
11	8.43 ft.	5/31/2010
12	8.40 ft.	9/1/1975
13	8.34 ft.	2/21/1994
14	8.32 ft.	2/23/1997
15	8.30 ft.	6/25/1994
16	8.27 ft.	3/15/2007
17	8.23 ft.	3/6/2004
18	8.08 ft.	2/13/2009
19	8.06 ft.	4/13/1965
20	8.00 ft.	3/17/1982

The Grand River at Grand Rapids crests in about 5.5 days. A sharp rise may occur in the first 24 hours due to local tributaries and urban areas. The next 2 days will show a slow rise or a leveling off trend until water from upstream makes its way down to Grand Rapids. The crest here is mostly a result of water coming down from Ada. The Rogue River is not a major contributor to the crest at Grand Rapids. The flood stage at Grand Rapids is 18 feet.

Grand River at Grand Rapids Crests

1	22.49 ft.	3/28/1904
2	21.36 ft.	3/23/1948
3	20.66 ft.	1/24/1907
4	20.56 ft.	4/9/1947
5	20.26 ft.	6/9/1905
6	19.64 ft.	3/1/1985
7	19.54 ft.	5/27/2004
8	19.29 ft.	3/8/1976
9	19.25 ft.	4/3/1960
10	19.25 ft.	10/4/1986
11	19.06 ft.	3/20/1942
12	18.83 ft.	3/19/1982
13	18.56 ft.	3/20/1919
14	18.56 ft.	3/18/1918
15	17.96 ft.	3/30/1916
16	17.96 ft.	4/7/1912
17	17.87 ft.	2/25/1997
18	17.84 ft.	12/31/2008
19	17.70 ft.	5/13/1956
20	17.42 ft.	5/22/2000

Repetitive Loss Properties in Kent and Ottawa Counties

CW 12

According to the official information available through the NFIP as of Fall, 2016, Kent County had 54 properties which had been identified as suffering from repetitive flood losses, and Ottawa County had 21 such properties. Although the specific information for each property is confidential in order to protect personal details of insurance claims, the following is a slightly more specific overview of the number and types of properties at higher-risk within various local jurisdictions within the two counties. Within Kent County, 6 properties on the list are classified as "mitigated," so they will not be included in the following descriptions.

In Kent County, Plainfield Township has the largest number of properties on the repetitive loss list—a total of 19 properties, all of which are classified as single-family residential units in type. The City of Grand Rapids has 11 listed properties, 7 of which are single-family residential and the other 4 of which were classified as non-residential "other" uses. Ada Township has 5 single-family residential properties, the City of Wyoming has 4 listed properties of the same type, the City of Grandville and Algoma Township each have three, and the City of East Grand Rapids and the Village of Sparta have one listed property each. Finally, the City of Lowell has one listed property which is of "other residential" type. Although in general the damages within these communities parallel the number of at-risk properties they contain, it should be noted that the Grand Rapids properties of non-residential type have exceeded $1 million in documented flood damages, which is over 10 times what comparable residential structures have reported. So this exceptional circumstance may provide a reason for specifically selected flood mitigation actions within Grand Rapids to be given especially high priority.

In Ottawa County, 7 repetitive loss properties are located in Robinson Township, all of which are single-family residential in type. Holland Township and Park Township each have four listed properties, and all of those in Park Township are classified as "other" non-residential, plus one of the properties in Holland Township. The other three Holland Township properties are single-family residential housing units. Georgetown Township has two single-family residential properties on the repetitive-loss list, and the remaining four units in Ottawa County (also single-family residential) are located in Spring Lake Township, Tallmadge Township, Wright Township, and the City of Zeeland."

14. Hazardous Material Release

(14.) Summary

The potential release of hazardous materials exists wherever that material may be located. A higher potential for release coincides with storage sites at fixed facilities and along transportation routes, such as major roadways and rail lines.

(14.) Hazard Description

Hazardous materials are chemical substances which, if released or misused, can pose a threat to people, property, or the environment. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in manufacturing plants. Hazardous materials are contained and used at fixed sites and are shipped by all modes of transportation, including transmission pipelines.

CW 8

(14.) Historically Significant and Related Events

Coopersville (Ottawa County)—A gasoline tanker truck rolled over on I-96 near Coopersville, resulting in a spill of 9,000 gallons of gasoline. The gasoline then caught fire, forcing the closure of I-96 for several hours until the fire could be suppressed and the site cleaned up and restored. (February 1, 1983) Holland Twp.(Ottawa County)—A freight train derailed, causing a spill of hydrogen fluoride. The accident prompted the evacuation of 1,500 persons. (November 12, 1979)

Kent County has seen several releases of anhydrous ammonia from refrigeration units and agricultural equipment.
Grand Rapids Township—Paint cans in the road on East Beltline between Michigan and Fulton. Estimated 25 to 55 gallons of xylene spilled. TriCom Haz Mat Team and DNR responded. (March 7, 1992)

City of Lowell—King Milling Company experienced an accidental release of chlorine at the plant. (March 24, 1995)

Sparta—Anhydrous ammonia refrigerant leak from a facility the produces apple juice. This release closed portions of M-37 for 24 hours. (July 26, 2001)

City of Lowell—A fire and explosion destroyed several connected buildings at a Lowell factory. The fire affected a quantity of 10% solution of sulfuric acid that was between 5 and 10 thousand gallons. There was a concern on the effect on groundwater, and the Lowell municipal water supply. A half dozen area fire departments, from as far away as East Grand Rapids and Belding, helped Lowell firefighters battle

City of Grand Rapids—A natural gas explosion occurring at 3:30 pm resulted in the collapse of a two story building. Seven persons were injured, and five neighboring businesses suffered damage. A fire burned well into the night due to an inability to shut off the natural gas until 9:30pm because the fire wouldn't allow access. Three quarters of the city's firefighters were involved in the effort, with neighboring departments covering calls in the city. A gas leak was also detected under the road. (February 26, 2008)

City of Grand Haven—A small leak from a faulty plug in a one ton sulfur dioxide tank delivered to a Grand Haven wastewater treatment plant forced authorities to evacuate about 75 homes for three hours. The plug had a faulty thread, allowing the liquid substance to escape and immediately turn to gas. (September 25, 2008)

Olive Township—The haz mat team was activated when an accident between a tractor trailer truckand a cargo van required the clean-up of motor fuel on a road and diesel fuel in a ditch. (April 7, 2010)

City of Kentwood—A natural gas leak caused a 4 unit apartment to explode, resulting in 4 injuries. The gas leak occurred in a vacant apartment in the complex. The scene resembled that of a tornado, with debris scattered nearby, shards of broken window glass littered on the ground, lumber lodged into a neighbor's garage, and siding propelled through a neighbor's window. (May 16, 2010)

Grand Haven DPS—Marine incidents caused the haz mat team to be activated on two separate occasions, to clean up gas/oil in water. (July 1, 2010 and August 27, 2010)

City of Grand Rapids—An explosion occurred to a home as a result of natural gas when a man turned on the light switch upon returning to the home. (July 3, 2010)

Grand Haven Township—A small diesel spill and truck fire (in a roadway) required haz mat team activation. (December 5, 2010)

Wright/Tallmadge Townships—A semi-tractor-trailer jackknife incident caused a diesel tank to rupture and spill about 60 gallons, requiring haz mat team response. (January 3, 2011)

City of Grand Rapids—A house exploded as a result of a natural gas leak causing one fatality and leaving another person critically injured. (January 10, 2011)

Holland—A truck broke a hydraulic line, and the resulting spill of about 60 gallons required haz mat team activation. (March 9, 2011)

Holland—The city had a large LPG container leaking, with no way to offload the contents. The situation resolved without requiring a major response. (June 20, 2011)

Jamestown Township—A fire involving a trailer that was carrying dichlorobutene required the haz mat team to be activated. (June 21, 2011)

Holland Township—The haz mat team was activated to deal with a tanker leak that involved the release of ammonia fumes. (July 8, 2011)

CW 9

(14.) Risk/Likelihood

Haviland Products Company, the area's largest chemical products company, serves the industrial market with specialty blending, packaging, and distribution of a wide variety of chemical products, including industrial cleaners, specialty products for anodizing aluminum, electroplating and basic chemicals for making pharmaceuticals, food, furniture, automobiles, and most other manufactured products. Haviland is a responsible corporate community member with its own certified HAZWOPER response team and has never caused an off-site chemical injury.

(14.) Existing Prevention Programs

Several prevention programs are in place at all levels of government. These include:

- Federal Hazardous Material Transportation Regulations
- Hazardous Materials Transportation Uniform Safety Act
- Transportation Community Awareness and Emergency Response
- Hazardous Material Response Training
- Federal/State Hazardous Material Response Resources
- U.S. EPA Chemical Emergency Preparedness and Prevention Office
- National Transportation Safety Board
- Michigan Chemical Council
- Chemical Awareness Week

Kent County communities have plans for all EHS (Extremely Hazardous Substance) sites. They are listed below (as of 2016), by community and its number of EHS facilities:

Ada	3	Dutton	2	Lowell	8
Alpine	10	Grand Rapids City	51	Plainfield	4
Bowne	2	Grand Rapids Twp.	1	Rockford	4
Byron	7	Gratten	7	Sand Lake	1
Caledonia	4	Grandville	7	Sparta	9
Cascade	15	Kent City	3	Walker	17
Cedar Springs	2	Kentwood	31	Wyoming	46
Cutlerville	1				

The Ottawa County EHS communities are listed below, with each's number of facilities. All of these EHS sites have off-site spill response plans:

Allendale	4	Hudsonville	7
Blendon	1	Jamestown	3
Chester	9	Olive	1
Coopersville	5	Park	7
Georgetown	8	Spring Lake Twp.	7
Grand Haven City	18	Wright/Tallmadge	5
Grand Haven Twp.	8	Zeeland City	15
Holland City	23	Zeeland Twp.	6
Holland Twp.	31		

Both counties have strong Local Emergency Planning Committees (LEPCs) with active planning for the extremely hazardous substance (EHS) sites. Kent County has 235 Extremely Hazardous Substance (EHS) sites. These sites include fixed facilities and farms. Ottawa County has 158 Extremely Hazardous Substance (EHS) sites. The Pesticide Applicator Certification and Training programs include education about SARA Title III and how to properly handle, store and apply hazardous chemicals. Also included is information about what to do in the case of a spill, where to get help to clean up a spill, and what personal protective equipment is needed to protect the person handling the chemicals.

Both Kent and Ottawa County LEPCs are very active and help to reduce the likelihood of hazardous material incidents. Hazardous materials are an integral part of our economy and way of life. Risk of a hazardous material release exists at fixed sites, but remains manageable. Transportation incidents may occur anywhere as a primary or secondary aspect of an accident. The Greater Grand Rapids area appears to be at less risk than average, based on national statistics.

15. Intentional Acts

(15.) Summary

Intentional human acts, such as terrorism, crime, civil disturbances and others, pose various degrees of threat to the entire area. Terrorism risk is higher in the metropolitan Grand Rapids, and around some critical infrastructure.

(15.) Hazard Description

Intentional acts include events such as civil disturbances, criminal acts, and terrorism. A civil disturbance is defined as a public demonstration or gathering (such as a sports event), or an uprising in a prison or other institution, that results in some disruption of essential community functions, or in rioting,

looting, arson, or other unlawful behavior. Large-scale civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events: (1) labor disputes where there is a high degree of animosity between the two dissenting parties; (2) high profile/controversial judicial proceedings; (3) the implementation of controversial laws or other governmental actions; (4) resource shortages caused by a catastrophic event; (5) disagreements between special interest groups over a particular issue or cause; or (6) a perceived unjust death or injury to a person held in high esteem by a particular segment of
society.

Areas subject to civil disturbances may encompass large portions of a community. The types of facilities that may be subject to or adversely impacted by civil disturbances may include government buildings, military bases, nuclear power plants, universities, businesses, and critical service facilities such as police and fire stations.

Prison uprisings are normally the result of perceived injustice by inmates regarding facility rules, operating procedures and living conditions, or insurrections started by rival groups or gangs within the facility. Civil disturbances (including prison uprisings) often require the involvement of multiple community agencies when responding to and recovering from the incident.

CW 8

(15.) Historically Significant and Related Events

As a heavily populated, nationally-prominent industrial state, Michigan has had its share of significant civil disturbances, including labor disputes, anti-war and civil rights protest demonstrations, and rioting. The Michigan prison system has also seen two major periods of prison uprising, however, according to the State of Michigan's hazard analysis, no significant civil disturbance has occurred in Kent or Ottawa County.

CW 9

(15.) Risk/Likelihood

Throughout our nation's history, violent protests, disturbances and riots have always existed. Although destructive civil disturbances are rare, the potential is always there for an incident to occur. This is even more true today, when television, radio, and the Internet provide the ability to instantly broadcast information (factual or not), in real time, to millions of people around the country. That coverage may help to "spread" discontent to other, uninvolved or unaffected areas, exacerbating an already difficult situation.

In fact, media coverage of unfolding events outside prison walls has, in the past, spurred uprisings within prisons. Real-time media coverage of unfolding events is a fact of modern life that is inescapable. As a result, law enforcement officials must be skilled in monitoring all forms of media coverage to anticipate public and perpetrator actions and the possibilities for event progression.

(15.) Existing Prevention Programs

In most civil disturbances, local law enforcement resources, augmented where necessary by the Michigan State Police, are sufficient to manage and end the incident. If, however, local resources are not adequate, the Michigan National Guard can be mobilized to assist in maintaining peace and restoring order. A Governor's emergency mobilization order is necessary to activate the Michigan National Guard. In the wake of the riot that occurred at Michigan State University in 1999, a new state law (51 P.A. 2000) aimed at curbing rioting on or near (within 2,500 feet of) Michigan's public colleges and universities took effect on June 1, 2000.

16. Landslide

CW 5

(16.) ***Summary***
While landslides may occur in the bluff area of the shoreline of Ottawa County, the relatively flat terrain and groundcover of the area as well as other factors combine to form a low hazard from landslides.

(16.) ***Hazard Description***
The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:
• Erosion by rivers or waves create over-steepened slopes
• Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
• Earthquakes create stresses that make weak slopes fail
• Excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures
• Sub-surface erosion causing sink holes. Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries, causing flooding along its path.

CW 8

(16.) ***Historically Significant and Related Events***
Landslides occur often along the shoreline and are caused by erosion of the bluff. The US Geological Survey rates the shoreline of Ottawa County as "High susceptibility/low incidence" of landslides.

A landslide occurred in Belknap Park within the City of Grand Rapids in 2004. The hill slid over Monroe Avenue (Business Route 131), blocking it until it could be cleared by heavy equipment. Any further subsidence on this hill will endanger homes.

CW 9

(16.) ***Risk/Likelihood***
No model could be found to predict the likelihood of landslides along the Lake Michigan bluff shoreline. Historically, the hazard does exist (1914, 1971 and the 1995 Sleeping Bear Dune landslide), so it could potentially happen again.

(16.) ***Existing Prevention Programs***
Landslides are typically tied to shoreline erosion on the shoreline of Lake Michigan in western Ottawa County. Existing prevention programs are the same as in the section on shoreline erosion. There is no existing program in place for the subsidence in Grand Rapids' Belknap Park.

17. Nuclear Power Plant Accident

(17.) ***Summary***
Kent and Ottawa Counties do not have a nuclear power plant within their boundaries, but portions of both counties lie within the 50-mile Ingestion Pathway Zone (IPZ) planning area for the Palisades plan (in Van Buren County).

(17.) ***Hazard Description***
Nuclear power plant accident is 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 offsite population. 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. 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 Ingestion Pathway Zone (IPZ) that exists to prevent the introduction of radioactive contamination into the food chain.

CW 8

(17.) Historically Significant and Related Events

Nuclear power plants are highly regulated. As a result, accidents are rare, but still have the potential to be spectacular. Chernobyl and Three Mile Island are two of the most well known incidents. Palisades, like all nuclear plants in the US, has a historical record on file with the NRC. Escalated enforcement actions issued to Palisades are shown below.

CW 9

(17.) Risk/Likelihood

Current NRC regulations are based largely on deterministic analyses developed without the benefit developed in the early stages of reactor technology development and thus, were based on limited experience, testing programs, and expert judgment in conjunction with conservative design margins and the principle of defense-in-depth to protect public health and safety. The deterministic approach asks two questions: "What can go wrong?" and "What are the consequences?" This approach assumes that adverse conditions can occur and requires plant designs to include safety systems capable of preventing or minimizing accident consequences.

Although the deterministic approach has been successful in protecting public health and safety, Probabilistic Risk Analysis (PRA) considers these questions in a more comprehensive manner by examining a broader spectrum of initiating events and their frequency, and asks, "How likely is it that something will go wrong?" PRA then analyzes the consequences of the scenarios and ranks the consequences by their frequency, giving a measure of risk (see the NRC's Strategic Plan [specifically Nuclear Reactor Safety Performance Goal Bullets 3 and 4 in Vol. 2, Part 2] and Final Policy Statement on Probabilistic Risk Assessment [Vols. 1 and 2]).

(17.) Existing Prevention Programs

Following the accident at Three Mile Island in 1979, the Nuclear Regulatory Commission (NRC) reexamined the role of emergency planning to protect the public in the vicinity of nuclear power plants. The Commission issued regulations requiring that before a plant could be licensed to operate, the NRC must have "reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency."

The regulations set forth 16 emergency planning standards and define the responsibilities of the licensee, and of State and local organizations involved in emergency response. Escalated Enforcement Actions Issued to Reactor Licensees by the NRC (Palisades - Docket No. 050-00255)

NRC Action Number(s) Action Type (Severity) & Civil Penalty (if any) Date Issued Description

EA-01-223 NOV (White) 10/26/2001 On October 26, 2001, a Notice of Violation was issued for a violation associated with a White SDP finding involving smoke detectors in the cable spreading room. The violation cited the licensee's failure to properly locate and install the smoke detectors in accordance with requirements including the applicable National Fire Protection Association code.

EA-01-088 NOVCP (SL III) $55,000 06/27/2001 On June 27, 2001, a Notice of Violation and Proposed Imposition of Civil Penalty in the amount of $55,000 was issued for a Severity Level III violation. The action was based on the licensee's failure to provide complete and accurate information in letters to the NRC requesting enforcement discretion and an exigent Technical Specification change.

EA-98-433 NOV (SL III) 12/11/1998 Violation occurred when the HPSI system was made inoperable for approximately 90 minutes during a surveillance test.

EA-97-567 & EA-97-569 NOVCP (SL III) $55,000 04/02/1998 Work control - operations.

EA-96-131 NOVCP (SL III) $50,000 08/13/1996 Appendix R violations.
Emergency planning has been adopted, as an added safeguard, to the NRC's "defense-in-depth" safety philosophy. Briefly stated, this philosophy (1) requires high quality in the design, construction and operation of nuclear plants to reduce the likelihood of malfunctions; (2) recognizes that equipment can fail and operators can make errors, therefore requiring safety systems to reduce the chances that malfunctions will lead to accidents that release fission products from the fuel; and (3) recognizes that, in spite of these precautions, serious fuel damage accidents may happen, therefore requiring containment structures and other safety features to prevent the release of fission products offsite. The added feature of emergency planning to the defense-in-depth philosophy provides that, even in the unlikely event of a release of radioactive materials to the environment, there is reasonable assurance that actions can be taken to protect the population around nuclear power plants.

For planning purposes, the Commission has defined a plume exposure pathway emergency planning zone (EPZ) consisting of an area about 10 miles in radius and an ingestion pathway EPZ about 50 miles in radius around each nuclear power plant. EPZ size and configuration may vary in relation to local emergency response needs and capabilities as affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries.

Detailed information about emergency planning and preparedness is contained in Appendix E of 10 CFR Part 50 and in NUREG-0654 (FEMA-REP-1), a joint publication of the NRC and the Federal Emergency Management Agency (FEMA) entitled "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants."

In the U.S., 104 commercial nuclear power reactors were licensed to operate at 65 sites in 31 states. For each, there are onsite and offsite emergency plans to assure that adequate protective measures are taken to protect the public in the event of a radiological emergency. Federal oversight of emergency planning for licensed nuclear power plants is shared by the NRC and FEMA through a memorandum of understanding. The memorandum responds to the President's decision of December 7, 1979, that FEMA take the lead in offsite planning and response, that NRC assist FEMA in carrying out this role, and that NRC continue its statutory responsibility over the radiological health and safety of the public. Each plant owner is required to exercise its emergency plan with offsite authorities at least once every two years to ensure that State and local officials remain proficient in implementing the plan.

18. Public Health Emergency

(18.) Summary

Public Health is committed to preventing and protecting the health and safety of our community, through the following preventative/response measures:

- surveillance;

- food safety;
- mass vaccination or antibiotic/antiviral medication distribution;
- drinking water safety (Type II);
- quarantine/isolation authority;
- communicable disease containment and surveillance;
- epidemiology;
- animal control and disease surveillance;
- and public education.

(18.) Hazard Description

A public health emergency is an occurrence or imminent threat to the health of residents caused by an environmental, bio-terrorist or epidemic/pandemic disease impact that could potentially overwhelm routine community capabilities.

Public health emergencies occur in many forms, including but not limited to:

- disease epidemics/pandemics;
- incidents of food and water contamination;
- extended periods without adequate public water and/or sewer services;
- harmful exposure to chemical, radiological or biological agents;
- and large-scale infestations of disease vectors, such as insects or rodents.

Public health interfaces with emergencies whether they are the primary responders (disease outbreak, food contamination) or secondary responders to other disasters or emergencies (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.

(18.) Historically Significant and Related Events

CW 8

In 2016 the Kent County Health Department (KCHD) responded to two vapor intrusions within the City of Grand Rapids. The first of which involved tetrachloroethylene (PERC), which may have health effects such as a higher risk of bladder cancer, non-Hodgkin's lymphoma, or multiple myeloma. These vapors are a result of PERC in the groundwater evaporating through the soil from pollution from a former dry cleaning business. Based on these health risks KCHD issued an order under the authority of the Public Health Code (Act 368 of 1978) to prohibit occupancy at the affected properties until the concentration of PERC fell below the maximum allowable indoor air concentration. This order displaced twenty eight people from two non-profit organizations and two apartments. Each of these people had samples drawn at KCHD to determine their level of PERC and monitor health effects. Additionally, the residents of one apartment did not have alternative housing. KCHD assigned a social worker to assist with housing and other needs in collaboration with various community partners to ensure that they had housing available to them through the duration of the event.

Additionally, KCHD was notified of a trichloroethylene (TCE) vapor intrusion in a heavy commercial area formerly occupied by a solvent reclamation facility. Based on air monitoring of several commercial properties in the area only one was required to vacate their property as levels were up to 200 times the allowable level. The business was able to return to the property after it was demonstrated that the vapors were effectively mitigated.

In March of 2014 the Ottawa County Department of Public Health (OCDPH) responded to a foodborne illness complaint submitted through a surveillance survey. The consumer expressed concerns about becoming ill from food eaten at a restaurant in Holland, MI. Additional complaints of illness, naming the same restaurant, came in later that day. The OCDPH responded by activating the response team,

implementing Incident Command, and launching an investigation. Analysis revealed that 294 cases of illness were reported from food eaten over the course of 4 days up until the restaurant voluntarily closed upon OCDPH recommendation. Education was provided to the facility on personal hygiene, safe food handling, employee illness requirements, and how norovirus spreads. All observed violations from the investigation were corrected and the entire facility was cleaned and sanitized. Laboratory testing confirmed norovirus as the cause of illness.

The West Africa Ebola outbreak starting in March of 2014 was the largest outbreak of Ebola in history with 28,652 cases and 11,325 deaths. Ebola is a virus that is transmitted through contact with blood or bodily fluids of a person infected with Ebola exhibiting symptoms including fever, vomiting, diarrhea, and hemorrhaging. This outbreak presented a unique challenge for public health as Ebola had not been seen in the United States and the outbreak was geographically distant in areas with poor health infrastructure to stop the outbreak, but could be brought to the US through normal day to day travel. Locally, health departments collaborated with a variety of preparedness partners, ranging from emergency management, hospitals, and EMS, to ensure a coordinated response if Ebola arrived in Michigan. This included monitoring anyone who had travelled from an affected country for twenty-one days; usually via a phone call twice daily to record the temperature of the traveler. Kent County monitored forty-eight travelers over the course of the outbreak, the second highest in the state. Ottawa County monitored seven. Protocols were established to transport travelers with confirmed fevers to a pre-identified treatment hospital. If traveler became a patient, public health was responsible for contact tracing and monitoring and working with companies to ensure that their place of residence was sanitized. Although Michigan did not have any cases of Ebola the plans, procedures and relationships established though this outbreak will be beneficial for response to other serious contagious diseases that may arise.

The emergence of a novel influenza virus in 2009 had a significant impact, H1N1 Influenza pandemic. The 2009-2010 influenza season in Kent and Ottawa counties was unlike any seen in recent history. During 2009-2010, influenza season peaked during the last week of October, with very little influenza activity occurred after the month of November, by April (normally the end of the influenza season), the Kent County Health Department (KCHD) received 516 reports of laboratory confirmed cases of influenza (compared to 261 reports received over the same period during the 2008-2009 influenza season) and Ottawa County Department of Public Health (OCDPH) received 213 reports of laboratory confirmed cases of influenza (compared to 71 reports received over the same period during the 2008-2009 influenza season).

The health departments launched an extensive public information and education campaign, worked with emergency response partners and the healthcare community to reduce/prevent the spread of pandemic influenza, distributed antiviral medications to healthcare providers and pharmacies within Kent and Ottawa counties, and launched a mass-vaccination campaign in late October 2009 (when vaccine became available). These combined efforts helped reduce the impact of 2009 H1N1 Influenza.

In November of 2008, Hope College suffered from a viral outbreak that caused the Ottawa County Health Department to close the campus. According to a news article in the Grand Rapids Press (November 10, 2008), more than 400 students and staff at the college had developed "norovirus-like symptoms." Officially, 180 cases were reported to the health department, but it was assumed that not all of those who had become ill had reported officially or sought medical treatment. A GRP article from November 12 stated that classes resumed later in the week, and that the acute outbreak at the college had not become more widespread. Hope College had sent emails to its students about precautionary steps to try to avoid viral contagion.

CW 9

(18.) ***Risk/Likelihood***

Emerging infectious diseases and outbreaks are directly related to human activity. The major causes of infectious disease emergence and outbreaks in the United States include (1) animal and food contact; (2) changes in human behavior; (3) immigration; (4) overuse and misuse of antibiotics; (5) travel, (6) and human interface with the environment.

In addition, public health events should be viewed as ongoing events which must be managed to protect public the health and safety of our communities. This all-hazards plan will help to promote mitigation efforts in a manner that does not adversely affect public health initiatives.

(18.) ***Existing Prevention Programs***

Public Health works primarily to prevent the spread of disease through surveillance and case investigations. This may range from food safety and vaccinations, to planning and implementing a point of dispensing for life saving medications. Additionally, public health monitors environmental hazards and threats.

Public health emergency preparedness planning initiatives involve strong partnerships at the local, regional, state and federal levels, within the healthcare sector and with other emergency response partners. Coordinated emergency response plans reduce economic and infrastructure impacts within communities during emergencies.

19. Sanitary Sewer Failure

(19.) ***Summary***

Loss of sanitary sewer infrastructure can lead to significant environmental, health, and safety risks, and even to a public health crisis by allowing the unchecked growth of pathogens. Flooding of structures and low-lying areas may occur as a result of interrupted lines or loss of lift stations. The system may also be overwhelmed by extreme precipitation events.

(19.) ***Hazard Description***

Sanitary sewer failure is the loss of critical public or private sanitary sewer system infrastructure that affects essential services.

CW 8

(19.) ***Historically Significant and Related Events***

When an obstruction blocks the flow of waste water within a pipe, the wastewater may back up and overflow through a manhole, cleanout, or drain. This overflowing wastewater may make its way into the environment, a house or a business. Sanitary sewer system infrastructure is complex, costly to replace and vital to the community's health. The overflow of waste water from a sanitary sewer system is classified as a sanitary sewer overflow (SSO). SSOs can lead to significant environmental, health, and safety risks. SSO prevention is important in ensuring the safe and unimpeded transport of raw wastewater from each source to wastewater treatment plants.

Before the City of Wyoming reconstructed its streets and drainage system, there were apparently many instances of localized flooding during periods of heavy rain. That is now rarely, if ever, the case, although Wyoming does still experience occasional seasonal flooding in the Ideal Park area in the Buck Creek floodplain. Please refer to the sections on flooding for more information about previous sewer failure events.

CW 9

(19.) ***Risk/Likelihood***

The sanitary sewer system is not fail-safe, however, the risk of failure continues to decrease as

progress is made on the long term combined sewer overflow project. Modern engineering, materials, construction, and planning and zoning have made the sanitary sewer system more reliable. The potential for the loss of power at lift stations remains an obvious weak point, but operators are aware of this and have taken measures to promote back-up power to keep the system intact.

(19.) Existing Prevention Programs

Sanitary sewer systems across the area vary from single residential septic tank systems to crosslinked municipal systems. Existing prevention measures include generators (to operate plants and lift stations), interconnections between municipal systems, and existing comprehensive contingency plans.
Both county health departments work to provide guidelines, testing, and education for rural septic systems. The Well Head Protection program is in place to protect individual wells and aquifer quality. Some authorities have obtained specialized remote video devices that allow the interior inspection of sewer lines. Combined sewer separation projects have occurred across the area as part of a long term plan. For example, the City of Grand Rapids has spent over $200 million on combined sewer separation projects. This has, and will continue to have, a significant impact on health, safety and environmental quality. The Market Avenue Retention Basin, with a 30 million gallon capacity, was placed into service in 1992.

20. **Severe Winter Weather** (Snow, Ice and Blizzard)

CW 5

(20.) Summary

West Michigan is in the crosshairs of one of the biggest snow machines in the country – Lake Michigan. Significant snowfalls and strong winds become an ever-present danger to all residents of Kent and Ottawa Counties. Deep, drifting snows frequently affect the entire area and disrupt normal life. Snow plowing, snow removal, vehicle damage from snow and ice-caused accidents, and damage from ice storms have a significant economic impact on the counties.

(20.) Hazard Description

Winter in Michigan brings a number of hazards in various forms: precipitation, wind, and cold temperatures. Nature is adept at mixing these ingredients in various proportions to bring risk in some form to every resident of the State. West Michigan is especially vulnerable to heavy snows and blizzard conditions due to Lake Michigan. There, west to east air flows find a ready source of moisture to generate vast amounts of snow. Coupled with arctic-chilled air, unimpeded while crossing the lake, lake-enhanced and lake-effect snows can quickly create blizzard conditions, close roadways with shoulder-high drifts, and bring normal life to a standstill. Precipitation comes in a variety of forms, each with its own particular hazards:
Snow flurries: Light snow falling for short durations. No accumulation or light dusting is all that is expected. Roadways can become slick even with small amounts of snow. Automobile accidents frequently occur early in the snow season when drivers haven't become acclimated to driving on snowy roadways.
Snow showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
Snow squalls: Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls can rapidly affect visibility and threaten driving conditions.
Blowing snow: Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind. Again, driving conditions can rapidly deteriorate in blowing snow.
Blizzards: 35 mph or greater winds with snow and blowing snow reducing visibility to below ¼ mile and lasting for 3 hours or more.

Other types of precipitation can bring additional hazards to Michigan's wintery mix. These events can happen any time conditions are right, but mostly occur in late fall/early winter and late winter/early spring.

Sleet: Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists and pedestrians.
Freezing rain: Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.
Ice storm: Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

Everyone is potentially at risk during winter storms. The actual threat depends on a persons' specific situation. Recent observations indicate the following:

Deaths related to ice and snow:
• About 70% occur in automobiles.
• About 25% are people caught out in the storm.

Deaths related to exposure to cold:
• 50% are people over 60 years old.
• Over 75% are males.
• About 20% occur in the home.

Additional snow and ice related risks include:
• Heart attack while shoveling snow
• Falling on icy walkways
• Frostbite
• Accident damage to vehicles • broken trees limbs, power lines, telephone lines
• Disrupted utilities
• Flooding from the melting of snow and ice
• Roof damage from ice build-up and snow loads
• Increased stress to livestock and wildlife

CW 8

(20.) Historically Significant and Related Events

Lake-effect snow is generally accompanied by strong winds which can drop large amounts of snow inland. Lake-enhanced snow can also be heavy, but tends to fall closer to Lake Michigan. This is reflected in the average seasonal snowfalls for Holland and Grand Rapids (less than 30 miles apart) from 1950 to 1980. During that time, Holland averaged 96.9 inches of snow; Grand Rapids 78.2. During this same period, Holland's greatest seasonal snowfall of 160 inches in 1969/1970; Grand Rapids' was 144 inches in 1951/1952. January is the area's prime month for snowfall.

In early March, 1976, an ice storm struck the Lower Peninsula, accompanied by high winds and tornadoes, and affected a 29 county area, resulting in a Presidential Major Disaster declaration for that area (including the Grand Rapids region). This storm was one of the worst to ever hit the State of Michigan, causing over $56 million in damage, and widespread power outages.
In late January, 1977, a snowstorm affected vast portions of the Michigan's Lower Peninsula.

Winds of blizzard proportions resulted in the extensive drifting of snow, blocking many roads. Many residents were isolated in rural residences or stranded in public shelters. The storm resulted in a Presidential Emergency declaration for 15 counties, including the Grand Rapids region.

On January 26-27, 1978, a severe snow storm struck the Midwest, and Michigan was at the Center of the storm. Dubbed a "white hurricane" by some meteorologists, the storm measured 2,000 miles by 800 miles and produced winds with the strength of a small hurricane and tremendous amounts of snow. The Grand Rapids area was a victim of this massive storm as well. In Michigan, up to 34 inches of snow fell in some areas, and winds of 50-70 miles per hour piled snow into huge drifts. At the height of the storm, it was estimated that over 50,000 miles of roadway were blocked, 104,000 vehicles were abandoned on the highways, 15,000 people were being cared for in mass shelters, and over 390,000 homes were without electrical power statewide. Two days after the storm 90% of the state's road system was still blocked with snow, and the storm resulted in a Presidential Emergency Declaration for the entire state to provide assistance with snow clearance and removal operations.

The National Climatic Data Center (NCDC) keeps records on snow and ice events. From 1993 to mid-2011, they reported 119 events in Ottawa County and 96 events in Kent County. The events include lake effect snows, heavy snows, winter storms, ice storms and freezing rain. Note how despite Kent County's larger land area, the lake effect caused a historical record of many more events in Ottawa County. These snow/ice events caused a total of about $12.225 million in property damage (but since this data source often lists these events as regional or statewide, not all of that damage was necessarily within Kent and Ottawa Counties alone).

On February 25, 1994, an intense snow burst caused around eight inches of snow to fall across most of the Grand Rapids metro area. Snowfall rates of one to two inches an hour, for a period to two to three hours, were common and resulted in blizzard conditions. Winds of 15 to 25 mph with frequent gusts to 35 mph combined with temperatures around 20F and resulted in wind chill values of 10 to 20 degrees below zero. Considerable blowing and drifting of the falling snow resulted in near-zero visibility and numerous multi-vehicle accidents on Interstate 96 and U.S. Highway 131. As a result, sections of these highways were closed for hours during the storm. In the Grand Rapids area, numerous injuries were reported, including two fatalities. Scores of people were stranded as the storm hit during the middle of the day. The Kent County International Airport was closed for an hour during the height of the storm, for plowing.

On December 28, 1995, some freezing rain and sleet created slippery roads in Ottawa and Kent County followed by heavy snowfall that blanketed the entire area during the afternoon and evening. The community of Lowell experienced a total power outage lasting for six hours, due to icing on a main line.

On March 2, 1996, lake effect snow squalls dropped a total of 5 to 9 inches of snow in Ottawa and Kent County, while strong winds reduced visibilities to near-zero.
From November 9 to 12, 1996, lake effect snow accumulated to depths of 12 to 20 inches near the Lake Michigan shoreline in Ottawa County. Highway crews were able to keep interstates and primary roads open but, overnight on the 10th and 11th, most secondary roads were impassable. School closings were the norm and numerous businesses shut down for at least some shifts.

On December 20, 1996, heavy snow rapidly became lake enhanced and dumped storm totals up to 20 inches into central Ottawa County. Schools were closed for up to two days in some areas. Some secondary roads were blocked until road crews could get control of the situation.

During a three day period from January 10 to 12, 1997, heavy snow was reported in Ottawa and Kent County for snowfall totals of at least 12 inches in all areas. In neighboring Allegan County, the snow was measured at 28 inches on Friday evening and 40 inches by Saturday afternoon. Schools were used as emergency shelters for stranded motorists throughout the affected area. Secondary roads across all of the area were blocked from Friday night into Saturday and interstates were also closed for a few hours from late Friday into Saturday. Accidents occurred at the rate of 50 to 100 per day for each county, from the 10th through the 12th.

An early season snowstorm crossed the Grand Rapids area on October 26, 1997, dumping 2 to 8 inches of heavy, wet snow. Because of the significant amount of foliage still left on trees, the added weight of the heavy snow caused many trees and tree branches to break, resulting in numerous power outages and reports of property damage from downed trees. At the height of the storm, over 195,000 electrical customers were left without power in the Grand Rapids area alone. Because of the widespread power outages (some of which lasted 36-72 hours), shelters were established in several Kent and Ottawa County communities to care for senior citizens and others vulnerable to the cold. The storm forced the closure of many schools and businesses throughout the impacted area.

In the early morning hours of January 2, 1999, a severe winter storm moved across the Grand Rapids area. The storm grew in intensity and size, producing record or near-record snowfall that affected much of the southern Lower Peninsula by the late evening hours of January 3rd. High winds and frigid temperatures created blizzard conditions that lasted until late in the day on January 4th in some areas. Subsequent storms over the next several days dumped an additional foot of snow in many areas of the state, including the Grand Rapids region, resulting in snowfall of historic proportions in several Michigan communities. Combined, these winter storms produced the worst winter conditions to hit Michigan since the statewide blizzard of January 1978. A Presidential Emergency Declaration was granted for 31 Michigan communities that received record or near-record snowfall, including Kent and Ottawa Counties, thus making available Federal snow removal assistance under the Federal Emergency Management Agency's (FEMA) Public Assistance Grant Program.

On November 20, 2000, the first snow storm of the season for the Grand Rapids area was a combination event, featuring snow with the storm itself, followed by lake effect snow as much colder air moved in behind the system. It was an Alberta clipper that moved into lower Michigan. As westerly colder air continued to move in, a dominant lake effect snow band was set up from Muskegon to Grand Rapids during the evening hours. This band produced a record 24 hour snowfall of 11.5 inches at the National Weather Service Office in Grand Rapids, breaking the old record of 10.4 inches. Lake effect snow continued through the night and during the morning hours of the 21st, where 1 to 2 feet of snow fell across parts of Ottawa County. Neighboring Allegan County received 24 inches. In the early morning hours of December 11, 2000, a severe winter storm moved through the state, inflicting its heaviest effects on the southern Lower Peninsula, once again including the Grand Rapids area, before moving out of the state on the morning of December 12th. The storm produced record or near record 24-hour snowfall levels in many areas of the Lower Peninsula, paralyzing the entire region. High winds and frigid temperatures created blizzard conditions that lasted until late in the day on December 13th in some areas. Another series of winter storms the following week dumped an additional foot or more snow across southern Lower Michigan, increasing many areas to two feet or more. The tremendous snow depths caused a host of public health and safety concerns across the region. The snow fell at such a steady rate in many areas that public works crews worked at maximum capacity for two weeks just to keep pace. The weight of the accumulated snow caused numerous collapsed roofs on homes and businesses, as well as house fires when water from melting snow and ice seeped into electric meter boxes. The winter storms of December 2000 produced the worst winter conditions to hit Michigan since the statewide blizzards that occurred in January 1978 and January 1999, and also resulted in a Presidential declaration for Ottawa.

From December 23-27, 2001, Grandville (in Kent County) received 26 inches of snow. Up to 15 inches of snow fell in Grandville in less than 24 hours and around 24 to 26 inches of snow fell total in aband from Grandville southwest to neighboring Allegan County. Even more lake-effect snow redeveloped on the 28th and continued through the 29th, producing additional snowfall of 8 to 22 inches across the area. 12 to 18 inches of snowfall was common across the City of Grand Rapids area. There was also a narrow strip of around a foot of snow that fell about 25 miles
inland from Ottawa County. These were the final days of moderate to heavy lake effect snow which had persisted through the week. Storm total snowfalls broke all previous records for snowfall in one week in several locations across southwest Michigan. Grandville ended up with 70.2 inches of snow for the week, which was the greatest reported snowfall total across the area. The National Weather Service Forecast Office in Grand Rapids (Kent County) had a storm total snowfall of 50.6 inches for the week. Generally speaking, the heaviest snow accumulations for the week occurred along the US-131 corridor from Grand Rapids down through neighboring Allegan County, where two to four feet of snow fell.

From January 29-30, 2002, severe winter weather battered much of the lower Peninsula (including the Grand Rapids area) for two days during the end of January 2002, bringing a foot or more of snow, mixed with sleet and ice. Schools were closed, roads were flooded, several vehicle accidents were reported, and many residents were left without power.

On March 2, 2002, a winter storm produced heavy snow across most of southwestern and south central lower Michigan, dumping anywhere from 12 to 18 inches of snow to the north and west of the track of the low pressure system. Snow developed well out ahead of the low pressure area during the early morning hours of the 2nd and continued through the day. Once the low pressure area passed by to the east, lake-enhanced snowfall began. Approximately 16 inches of snow fell across Ottawa and western Kent counties.

On January 22, 2003, heavy lake-effect snow developed across the lakeshore county of Ottawa. Since winds were primarily out of the north, the heaviest snow was confined to the immediate lake shore areas. 12 to 16 inches of snow fell from just south of Grand Haven to the west side of the city of Holland.

On February 12, 2003, an Alberta clipper moved through and produced heavy snow across western lower Michigan. The heaviest snowfall report was received from Walker (Ottawa county), where 14 inches of snow fell. A large swath of anywhere from 6 to 10 inches of snow fell across other parts of Ottawa County as well as Kent County. There were also localized reports of a foot or more of snow received in the two counties.

From April 3-5, 2003, a major ice storm affected much of southern lower Michigan, including the Grand Rapids area, causing hundreds of thousands of people to lose power. The weight of the ice brought down thousands of trees and limbs and hundreds of power lines. Many people across the area lost power for several days and some who lived in outlying areas were without power for a week. The ice storm resulted in several million dollars worth of damage across the area. It was one of the biggest ice storms to affect lower Michigan in the last 50 years.
The The National Weather Service reported: "January 2004 demonstrated what winter can do in Michigan. The state plunged into the cold Arctic air as temperatures fell well below the average. Numerous snow storms moved through the state leaving most locations with one of the snowiest January on record. By the end of the month, the cold and snow gave much of Lower Michigan its deepest snowpack in about 10 years." On January 27, 2004, six to ten inches of snowfall occurred across much of Lower Michigan, including the Grand Rapids area. Up to 14 inches of snow accumulated northeast of Grand Rapids alone. Several accidents were reported during the day.

On November 24, 2004, a potent winter storm brought heavy snow and wind across south-central lower Michigan on November the 24th on the day before Thanksgiving. Precipitation began as rain along the I-94 corridor but then changed to snow by around noon. Snow become moderate to heavy during the early to mid-afternoon hours, when snowfall rates of two to three inches an hour were reported at times. Moderate to heavy snow continued into the early evening hours before gradually diminishing overnight. The snowfall at Grand Rapids was the third heaviest 24-hour snowfall on record (9.7 inches of snow was recorded between noon and midnight). Eight to eleven inches of snow were reported in a band in Kent County. East Grand Rapids reported the heaviest total snowfall (eleven inches). Ten inches of snow was reported in Wyoming.

From January 21-22, 2005, a potent Alberta clipper system, in combination with a strong upper air system, produced heavy snow across central and southern lower Michigan. It resulted in the fifth heaviest 24-hour snowfall on record in Grand Rapids, where 12.3" of snow fell in a 24 hour period.

On February 16, 2006, a major ice storm developed across much of central lower Michigan producing around a quarter to a half-inch of ice accumulation between Route 10 and I-96. Thousands of homes lost power north of Grand Rapids and many areas did not have power for three to five days. There were numerous reports of downed trees and power lines all across that area.

On February 3, 2007, the combination of lake effect snow and snow already on the ground, as well as very strong winds, resulted in blizzard conditions across western lower Michigan on February 3rd. The maximum snowfall total for a 12 hour period was eight inches, and the maximum snowfall for a 24 hour period was 12 inches. The highest snowfall total for the entire event was 17 inches in Grandville. The Gerald R. Ford International Airport in Grand Rapids reported visibility at or under a quarter of a mile on February 3rd and numerous other observation sites across far western lower Michigan also reported blizzard conditions. The majority of locations within two counties of the Lake Michigan shoreline reported
sustained winds of 20 to 30 mph with gusts to around 40 mph during the late morning and afternoon hours of the third. The blizzard conditions resulted in numerous road closures, power outages and numerous car accidents.

On February 10, 2008, a blizzard event involved a combination of extreme cold, frequent gusts up to 40 mph, whiteout conditions, heavy snow, and blowing snow. There was a 50-car pile up on I-196 in Ottawa County, causing 20 persons to receive treatment for minor injuries. Snow drifts of 3 to 5 feet deep were common in rural areas. Property damage was estimated at $250,000 in Ottawa County.

On December 21, 2008, in Kent and Ottawa Counties, six to twelve inches of snow fell, accompanied by wind gusts up to 45 mph. This resulted in two to three foot snow drifts across portions of the area, which in conjunction with the blizzard to near-blizzard conditions produced dangerous travel conditions. At the height of the storm, several stretches of highway were shut down due to multiple vehicle accidents.

From December 3 to 4, 2009, over a foot of snow was reported across portions of Ottawa County, where 15 inches fell in Marne and 14 inches fell in Coopersville. Several inches of slushy snow accumulated on roads from Muskegon to Grand Rapids. Thunder snow was also reported, with some lightning seen in Ottawa County. The next week, four to eight inches of snow, in conjunction with wind gusts to 40 mph, created near-blizzard conditions at times, resulting in very hazardous travel conditions with near-whiteout conditions at times. Around a foot of lake-effect snow fell across the Grand Rapids area. Numerous accidents were reported, due to the slippery roads and reduced visibility from the blowing snow.

From February 9-10, 2010, six to ten inches of snow fell across Ottawa County. The storm coincided with Michigan's winter 'Count Day' used to determine base funding for local public school systems. Many school systems closed due to the snowstorm. Several significant accidents occurred on the also a multiple vehicle pileup on I-196.

In February 2011 a major winter storm brought 10 to 15 inches of snow and blizzard conditions to much of southwest lower Michigan the during the late evening of Tuesday, February 1st into the morning hours of Wednesday, February 2nd. Wind gusts in excess of 40 mph combined with heavy snow to produce whiteout conditions and snowdrifts of 3 to 5 feet. Thunder accompanied the snow in some areas with snowfall rates exceeding two inches per hour. Many businesses, schools, and some government offices were closed on Wednesday. Most main roads were plowed by midday Wednesday but some side streets were not cleared until Thursday. The storm is considered a 1 in 10 year event for southwest Michigan.

On December 22 and 23, 2013 both Kent and Ottawa counties were eligible for Section 19 funds for an ice storm that occurred. Ottawa County submitted and received funds for debris removal resulting from the storm.

CW 9

(20.) Risk/Likelihood

Based on the NCDC snow and ice event reports, Kent County can expect, on average, five significant snow storms each winter. Ottawa County can expect seven. Most of these events would be in the category of heavy snow and would be accompanied by strong winds. Depending on conditions – wind speed and current snowpack being of primary concern – dangerous travel conditions would exist. School closures would be likely, disrupted travel plans, and possible business and plant closings could occur during some of these storms. This would also be typical for a West Michigan winter.

(20.) Existing Prevention Programs

City and county road crews are the area's first line of defense against snow and ice storms. Plowing snow, sanding and salting roadways occupy a great deal of time and budgets during the winter season. Kent County budgeted $3.4 million for 2004 snow removal and Ottawa County budgeted $3 million. The actual amount can easily exceed 150% of the budgeted amount. Their response relies heavily on NWS and local weather forecasts and alerts of storm conditions.

Severe Weather Awareness

The American Red Cross in Grand Rapids and in Zeeland has emergency shelters available throughout both counties in the event of weather-related needs, including severe winter weather. Improved electrical infrastructure reliability will mitigate the effects of severe winter weather. Numerous winter storms have coated electrical lines and trees with ice, bringing them to the ground and interrupting service. Improved urban forestry and tree maintenance can reduce the effects of ice load on trees and power lines.

The NWS Doppler Radar is as useful in tracking severe winter storms as it is in tracking thunderstorms and tornadoes. As the agency's forecast models become even more accurate, advance warning times will continue to increase. Currently, the NWS issues a variety of watches, warnings and advisories:

Blizzard Warning

A Blizzard Warning means that the following conditions are occurring or expected within 24 hours: (1) snow and/or blowing snow reducing visibility to 1/4 mile or less for 3 hours or longer, and (2) sustained winds of 35 mph or greater or frequent gusts to 35 mph or greater. There is no temperature requirement that must be met to achieve blizzard conditions.

Wind Chill Advisory
A wind chill advisory is issued when wind chills of -15F to -24F are expected for three hours

Wind Chill Warning
A wind chill warning is issued when wind chills of -25F or lower are expected for three hous

Winter Storm Watch
A winter storm watch is issued when there is the potential for significant and hazardous winter weather within 12-36 hours or more. It does not mean that significant and hazardous winter weather will occur; it only means it is possible. Significant and hazardous winter weather is defined as (1) eight inches or more of snow (and/or sleet), or (2) glaze accumulation (freezing rain) of 1/4 inch or more, or (3) enough ice accumulation to cause damage to trees or power lines, or (4) a life-threatening or damaging combination of snow and/or ice accumulation with wind.

Winter Storm Warning
A winter storm warning is issued when significant and hazardous winter weather is occurring or imminent. Significant and hazardous winter weather is defined as (1) eight inches or more of snow (and/or sleet), or (2) glaze accumulation (freezing rain) of 1/4 inch or more, or (3) enough ice accumulation to cause damage to trees or power lines, or (4) a life-threatening or damaging combination of snow and/or ice accumulation with wind.

Winter Weather Advisory
A winter weather advisory is issued when snow, sleet, freezing rain, or a combination of precipitation types is expected to cause a significant inconvenience but not serious enough to warrant a warning. Ongoing efforts to keep the public informed and aware of winter hazards include the Winter Hazards Awareness Week in Michigan:
"The Michigan Committee for Severe Weather Awareness has created a safety information campaign to encourage residents to prepare for the hazards of Michigan winter weather. The National Weather Service, in conjunction with the Michigan Committee for Severe Weather Awareness, will issue daily information statements this week offering winter weather safety tips and definitions of winter weather terms. All news media are strongly encouraged to pass this information along to their audiences at every opportunity. Additional information on Winter Hazards Awareness Week is available from the Michigan Committee for Severe Weather Awareness.

21. Severe Weather - Thunderstorm (Hail, Lightning and Wind)

CW 5

(21.) Summary
Thunderstorms, including lightning, heavy rain, hail, strong winds, and the potential to spawn devastating tornadoes, are probably the most frequently recurring natural hazards in all of Kent and Ottawa Counties. Even moderate thunderstorms may disrupt and inconvenience modern life. But because of the regularity of severe thunderstorm weather in Western Michigan, it is incumbent on those charged with public safety to continually improve monitoring, analysis, and warnings about threatening weather. Educational efforts need to continue to inform the public about what to do before, during, and after severe weather.

(21.) Hazard Description
A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air, such as a warm and cold front, a sea breeze, or a mountain. Severe thunderstorms can bring heavy rains, strong winds (over 57 mph), hail (over 1"), lightning, and tornadoes. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the more severe impacts occur when a single

thunderstorm affects one location for an extended time. On average, the United States gets 100,000 thunderstorms each year. Approximately 1,000 tornadoes develop from these storms. Thunderstorms can bring heavy rains (which can cause flash flooding), strong winds, hail, lightning, and tornadoes. Lightning is a major threat during a thunderstorm. In the United States, between 50 and 70 Americans are hit and killed each year by lightning.
Straight-line winds sometimes exceed 100 mph. These winds are responsible for most thunderstorm damage. Large hail results in nearly $1 billion in damage to property and crops annually across the United States.

Prevailing winds are from the southwest at 10 mph. Other than tornadic winds, the highest wind recorded in the county since 1950 was in November 1998, at 100 mph. Also in the category of straight-line winds is the derecho (day-RAY-cho). A derecho is a widespread severe wind event resulting from persistent and violent outflow from an MCS (Mesoscale Convective System). A severe wind is one with wind speeds of 58 mph or higher at the surface. These winds can reach 100 mph and last for up to 30 minutes. People most at risk from derecho winds are those involved in outdoor activities. Campers, hikers, and people driving in cars are at risk from falling trees.

To summarize, the hazards resulting from these weather events related to thunderstorms include flash flooding (heavy rains), electrocution (lightning and downed power lines), personal injury from falling trees and debris (winds), power disruption (winds), and property and crop damage (hail).

CW 8

(21.) ***Historically Significant and Related Events***

Thunderstorms occur frequently in West Michigan from early spring through late summer. From 1950 to mid-2011, NCDC recorded 201 thunderstorm wind events in Kent County and 137 in Ottawa County, 120 hail events over ¾" in Kent County and 82 in Ottawa County, and 13 lightning events in Kent County, plus 7 in Ottawa. (Tornadoes will be covered separately, in the next section of this plan.)
Grand
1998. The Southern Great Lakes Derecho of 1991 caused 125 million 1991 U.S. dollars in damage, killed one person, injured 12 and cut off electrical power to 853,000 customers. Traveling at 60 mph, the derecho produced wind gusts to 84 mph in Grand Rapids. About 50 barns were damaged or destroyed, and many area fruit growers lost more than half their orchards.

In the last two weeks of April, 1975, a series of intense thunderstorms struck southern lower Michigan, spawning several tornadoes and causing widespread flooding over a 21 county area (including the Grand Rapids region). Total public and private damage was nearly $58 million. A Presidential Major Disaster declaration was granted for the 21 affected counties.
From July 15 to 20, 1980, southern lower Michigan experienced widespread thunderstorm windrelated damages which were so severe that a Presidential Major Disaster Declaration was granted for 10 counties (including the Grand Rapids region). More than 300,000 electrical customers were left without power—some for several days. During the recovery process, almost $6.8 million in public and private assistance was made available to affected local jurisdictions and to residents in the affected areas. Four million dollars in low-interest disaster loans were made available through the Small Business Administration.

On April 14, 1994, lightning struck a television antenna and caused an attic fire at a Holland residence. There were no injuries, but the damages were estimated at $5,000. On June 13, 1994, lightning hit a tree next to a home in Park Township, destroyed electrical equipment and appliances in the home, and caused minor injuries to a child who was burned by the braces she was using. The estimated cost of damages was $50,000 in that incident. Later that summer, on

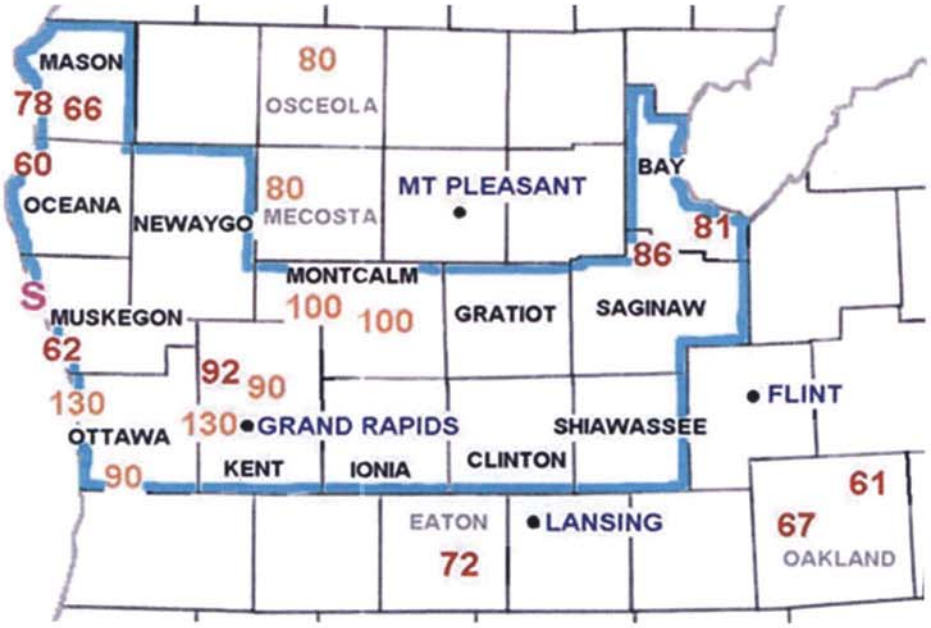
July 5, 1994, two homes in Allendale were struck by lightning, causing an estimated $50,000 in damages. During the following summer, on July 4, 1995, lightning struck a home in Holland and ignited an attic fire that also caused smoke damage to other parts of the house. Damages were estimated at $15,000.

On April 12, 1996, hailstones of 0.75" diameter were reported by a weather spotter. The hailstones covered the ground near Adams Street and 80th Avenue, in Zeeland Township. The next year's storm Jenison, Zeeland, and Grand Haven, causing significant crop damages. From

June 20 to 24, 1997, a hail storm
again caused crop damage and resulted in a U.S.D.A. disaster declaration, with Ottawa County farmers thus becoming eligible for low-interest federal loans. Finally, on September 19, 1997, a strong storm deposited hail with diameters of 0.75" and even as much as 1.25" near Grand Haven, Hudsonville, and Jenison.

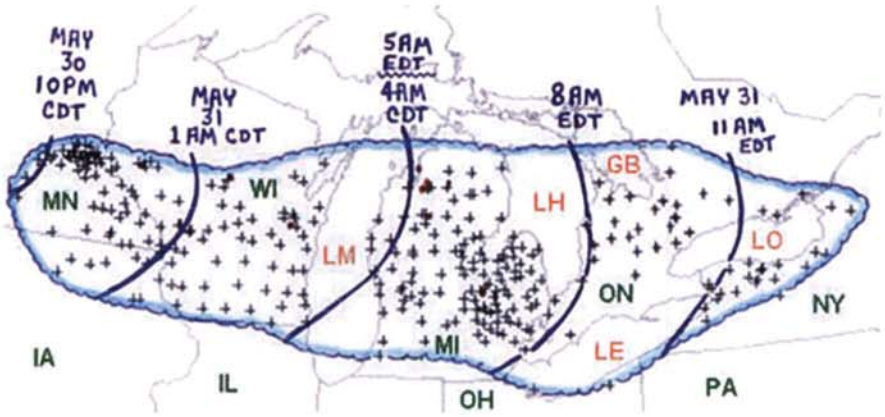
On April 21, 1998, lightning struck the roof of a house in Nunica and caused a fire that produced $45,000 in structural damage, and a further $15,000 in damage to the house's contents. On May 6, 1998, a man was critically injured by lightning at Spring Grove Park (in Jamestown Township). He was an Ottawa County park employee. On the same day, reports of 1" diameter hail came in from Ferrysburg, and a house's window was shattered by this hail. On July 21, 1998, a three-bedroom house in Georgetown Township was mostly destroyed by a fire that started when the home was struck by lightning.

A derecho in May 1998 crossed the lower part of Michigan at 70 mph, toppling trees and power lines, killing 4, injuring 146 and producing $172 million in damage. About 860,000 customers in Michigan lost power, a new historical record; some were out of power for up to 10 days. Kent and Ottawa Counties plus eleven other counties were declared a Federal Disaster Area. Damage surveys in Spring Lake and Walker suggested that winds there had reached speeds of 120 to 130 mph, equivalent to an EF-2 tornado. It took up to ten days to restore power in Walker. Areas north and northwest of Grand Rapids (the Rockford area) received winds over 90 mph in the range of an EF-1 tornado.



The preceding map shows the area in Lower Michigan affected by the worst damage from the May 30-31, 1998 derecho. Red numbers are maximum measured wind gusts in mph. Orange numbers are estimated maximum gusts in mph based on a damage survey by Grand Rapids NWS Forecast Office meteorologists.

Thirteen Michigan counties (noted in black lettering and within light blue border) were declared a Federal Disaster Area by the Federal Emergency Management Agency (FEMA). The purple "S" represents where a "seiche" took place on the eastern shore of Lake Michigan.



Area affected by the May 30-31, 1998 derecho event (outlined in blue). Curved purple lines represent the approximate locations of the "gust front" at three hourly intervals. "+" symbols indicate the locations of wind damage or wind gusts above severe limits (measured or estimated at 58 mph or greater). Red dots and paths indicate tornado events. A governor's Disaster declaration was given in early June.

On May 17, 1999, a strong storm raced through Western and Central lower Michigan, bringing with it severe winds, heavy rain, and large hail. Wind gusts of 60-70 miles per hour downed numerous trees and power lines, with peak wind gusts of 115 miles per hour recorded near Wyoming, MI in Kent County. On July 28, 1999, numerous reports of large hail accompanied thunderstorms in Allendale, Grand Haven, and Port Sheldon. Maximum hail sizes ranged from 0.75" to as much as 2.00" The storms produced winds of 60 to 70 miles per hour, which downed trees, limbs, and power lines, causing minor damage to homes. Total property damages were estimated at $50,000.

On May 8, 2000, lightning from a severe thunderstorm caused at least four fires in Ottawa County. The most severe damage occurred when lightning struck an electrical transformer at a house next to a sawmill in Grand Haven Township. Although the house was saved, the sawmill burned to the ground. Damage was estimated at $500,000.

The quality and detail of readily available records is much better for more recent years. Rather than describing each event out of dozens, it may suffice to state that the majority of damaging events were caused by thunderstorm winds, which typically cause damages on the order of tens of thousands of dollars per event in Kent and Ottawa Counties, several times per year. On June 12, 2001, from Cutlerville to East Grand Rapids, strong winds gusted and large hail was reported. An estimated $100,000 in property damage was caused, as several street signs and trees were blown down in Port Sheldon. In addition, various power lines were down, especially in the City of Allegan. Not counting tornadoes, this was the largest of the damaging thunderstorm events between 2000 and 2008, when it was approximately matched in scale by the event of June 6, 2008 when the governor agreed to a state of emergency declaration for Ottawa County assessing nearly 6M in damage. About $100,000 in damage were caused as winds caused the collapse of a building that was under construction in the area of Cascade Township.

On August 9, 2009, severe thunderstorms developed across Ottawa and Kent Counties ahead of a cold front, resulting in hundreds of trees being blown down by 60 to 80 mph winds and taking down numerous utility poles and wires. Fruitport took the brunt of the storm, with wind gusts of 70 to 80 mph over a period of about 10 minutes. Tens of homes were heavily damaged by tree fall. Significant damage

to apple orchards occurred west of Sparta. The storm complex also produced an EF-0 tornado that left a path about 35 miles long and up to 9 miles wide. Damages were estimated at $500,000.

Strong winds of 75 mph on June 21, 2010 caused $200,000 property damage in Eastmanville in Ottawa County and $50,000 in crop damage. The storm continued through Ottawa County, spawning a EF0 tornado and causing a further $50,000 property damage and $10,000 in crop damage. Including the damage from the tornado the total damage for this wind event was $450K and $70K in property and crop damage, respectively.

On July 18, 2010, a NWS storm survey team concluded that a series of wet microbursts across southwestern Kent county had produced wind gusts ranging from 60 up to 80 mph, which brought down several trees and power lines in the Wyoming and Cutlerville areas and also flipped over and destroyed 8 wood and metal sheds at a store near Cutlerville. Also, a tornado damaged a home and broke or uprooted several trees just northeast of Wayland. A roof was lifted off of a garage in Wyoming, and a shed was destroyed and some structural damage occurred to one home by wind gusts estimated up to 80 mph. Damages were estimated at $150,000.

On September 21, 2010, various fire departments in Kent County reported that about a dozen house fires were ignited, in an area from Ada south to Caledonia, by lightning strikes produced by severe storms during the late afternoon. Damages were estimated at $500,000.

Straightline winds on July 11, 2011 caused an estimated $1, 232,983 in damage to the City of Holland in Ottawa County. A Gubernatorial Declaration was requested but not granted.

On November 17, 2013 heavy rain and high winds caused many down power lines, trees, and branches between 2PM and 2AM on November 18th. Nearly 10% of Ottawa County was without power, some lasting 3 days.

CW 9

(21.) Risk/Likelihood

Ottawa County averages about 36 thunderstorm days per year, Kent County as well. Many of these storms are not severe and do not cause significant damages, but it is expected that over the course of any given year, at least one severe thunderstorm will cause damage, causalities, or power failures. Some of these damaging storms do not otherwise meet the technical criteria to be classified as "severe," but are still capable of causing harm.

NOAA has analyzed numerous data of severe weather events and generated probabilities of a given event occurring within 25 miles of any point in the U.S. Their analysis shows that both counties have a peak daily probability of 0.3% of experiencing thunderstorm winds (>58 mph) in midsummer. The peak probability of receiving hail (>3/4") is 1.2%, also in midsummer. These numbers were generated from data collected from 1980 to 1999.

(21.) Existing Prevention Programs

Public education on the hazards of thunderstorms (Severe Weather Awareness Week) and early awareness of the conditions for and the existence of thunderstorms are the best line of defense against personal injury. The National Weather Service watches and warnings of severe weather continue to improve in lead times and location prediction. This is primarily due to advances in Doppler radar and computer modeling of weather systems. The communicating of conditions and warnings have also improved through radio, TV, the Internet, and wireless technologies.

Lightning protection may be integrated into structures. More information is available from the National Lightning Safety Institute (NLSI) at www.lightningsafety.com. The National Lightning Detection Network can improve safety by providing real-time data and warnings at outdoor events. It can also help utilities decide how to dispatch repair crews while lightning occurs. Lighting continues to be the most common cause of electric failure. Some jurisdictional building codes require tie-downs and other reinforcement measures.

22. Severe Weather - Tornado

CW 5

(22.) Summary

Tornadoes occur in Michigan every year with grim regularity. NOAA places most of Michigan's lower peninsula in the high-risk category. Damage from these violent storms ranges from minor to devastating. Deaths and property loss are frequent by-products of these vicious winds. The Greater Grand Rapids Area has experienced more than its share of tornadoes. Although Genesee County has the highest number of recorded tornadoes in modern Michigan, by county, Kent is tied with two other counties (Lenawee and Oakland) behind it, with 31 notable tornado touch downs since 1950. Ottawa County had 18 tornadoes and one waterspout during that period.

Improved public education in tornado safety, through community efforts and media coverage, has increased the public's awareness of potential hazards from tornadoes and their response to those hazards. The National Weather Service has improved warning lead times from six to thirteen minutes. Local TV can also provide advanced warning with Doppler radar. Education and early awareness need to be continually improved to mitigate tornado hazards. Injuries can also occur after a tornado, during rescue and clean-up efforts.

(22.) Hazard Description

The National Weather Service defines a tornado as a rapidly rotating column of air, extending downward from the base of a severe thunderstorm, that is in contact with the ground or any objects on the ground. Tornadoes are the violent offspring of thunderstorms that often develop in warm, moist air in advance of eastward-moving cold fronts. These thunderstorms often produce large hail, strong winds, and tornadoes. The tornadoes of early spring are often associated with strong frontal systems that form in the Central States and move east. Occasionally, large outbreaks of tornadoes occur with this type of weather pattern, as in 1974, 2011, 2014 and 2016.

Waterspouts are weak tornadoes that occur over water, and are of two types. A non-thunderstorm waterspout, which forms when cold Canadian air moves over warm water, poses some risk to near-shore areas in Ottawa County. Once over land they lose much of their strength and are consequently not of much significance to Kent County. A waterspout that develops from a severe thunderstorm over Lake Michigan *can* move onshore and track further inland, including the Kent County area.

The intensity of a tornado is categorized by the Enhanced Fujita Scale associating expected damage with a range of wind speeds. The National Weather Service has also categorized tornadoes as weak, strong and violent as indicated in the following tables.

Weak Tornadoes (EF0 to EF1)	• 69% of all tornadoes • Less than 5% of tornado deaths • Lifetime 1-10+ minutes • Winds less than 111 mph
Strong Tornadoes (EF2 to EF3)	• 29% of all tornadoes • Nearly 30% of all tornado deaths • May last 20 minutes or longer • Winds 111-165 mph
Violent Tornadoes (EF4 to EF5)	• Only 2% of all tornadoes • 70% of all tornado deaths • Lifetime can exceed 1 hour • Winds greater than 165 mph

The Enhanced Fujita Scale of Tornado Intensity

EF-Scale Number	Intensity Descriptor	Wind Speed	Type of Damage	Intensity of Damage
EF0	Gale Tornado	65-85 mph	Light Damage	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards
EF1	Weak Tornado	86-110 mph	Moderate Damage	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed
EF2	Strong Tornado	111-135 mph	Considerable Damage	Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated
EF3	Severe Tornado	136-165 mph	Severe Damage	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown
EF4	Devastating Tornado	166-200 mph	Devastating Damage	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated
EF5	Incredible Tornado	>200 mph	Incredible Damage	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged. Incredible phenomena will occur

The NWS states those who are at highest risk are (1) people in automobiles, (2) the elderly, very young, and the physically or mentally challenged, (3) people in mobile homes, (4) people who may not understand the warning due to a language barrier.

Following a tornado additional hazards exist. A study of injuries after a tornado in Marion, Illinois, showed that 50 percent of the tornado-related injuries happened during rescue attempts, cleanup, and other post-tornado activities. Nearly a third of the injuries resulted from stepping on nails. Other common causes of injury included falling objects and heavy, rolling objects. Because tornadoes often damage power lines, gas lines, or electrical systems, there is a risk of fire, electrocution, or an explosion.

CW 8

(22.) Historically Significant and Related Events

Michigan is on the far northern end of what meteorologists call "tornado alley", which runs from the Texas panhandle north through the Midwest and into Lower Michigan. Tornado alley often sees the greatest number of tornadoes each year. The lower peninsula of Michigan is in the high-risk category, according to NOAA. Every county in Michigan has seen at least one tornado in the last 50 years. Since 1950, there have been 923 tornadoes recorded in Michigan. The infamous Beecher (or Flint) F-5 tornado of 1953 killed 116, injured 844 and caused $125 million (2003 dollars) in property damage. It ranks in the U.S. top 10 list of killer tornadoes and was the last tornado to kill over 100 people, until the 2011 event in Joplin, MO. Two tornadoes in Kent and Ottawa Counties in the last 48 years have caused multiple deaths. In 1956, a category F-5 tornado struck first at Hudsonville, traveled northeast and plowed through both Kent and Ottawa Counties killing 14 and injuring 200. Other sources cite 17 deaths and 300 injuries. Over 700 homes were destroyed. In 1965, an F-4 tornado hit the north side of Grand Rapids, killing five and injuring 142 during the Palm Sunday tornado outbreak. On April 21, 1965, a tornado injured 32 and destroyed $25 million in property in Kent County. On May 21, 1967, tornadoes classified as F2 and F3 resulted in 32 injuries and more than $25 million in property damages. Fortunately we have not seen such widespread human causalities from tornado events in recent decades.

Some of the more damaging incidents in more recent years include the following:

August 5, 1968: A Kent County F2 tornado causes about $250,000 in property damage.
May 20, 1975: A Kent County F2 tornado causes about $250,000 in property damage, and one injury.
March 12, 1976: An F1 tornado in Ottawa County caused about $250,000 in property damage, and 1 injury.
June 15, 1976: Another Ottawa County F1 tornado results in about $250,000 in damages.
July 28, 1976: A Kent County F1 tornado results in about $250,000 in damages, plus one injury.
May 21, 2001: F0 tornadoes at Marne, Grandville and other locations, plus Comstock Park (an F1 tornado touchdown) resulted in an estimated total of $475,000 in damages.
September 23, 2006: A tornado of EF-0 took place at 4:45pm near Caledonia, resulting in about $100,000 in property damage and an additional $20,000 in crop damage.

In July 6, 2014 a NWS storm survey determined that an EF1 tornado developed rapidly near 64th Street and Burlingame Avenue in Byron Center and tracked northeast for 6.25 miles through Wyoming and Kentwood. The tornado, on the ground for about 10 minutes, produced significant damage with estimated wind speeds up to at least 110 mph. Numerous trees, structures, and power lines were downed or damaged along a damage path 300-400 yards wide across southern Kent County. There were six injuries and no fatalities. This Sunday night tornado was the first EF-1 in Kent County since May 21, 2001, but not the last.

On August 20, 2016, 6 tornados went through Allegan, Ottawa and Kent counties. In both Ottawa and Kent, these were classified by the National Weather Service as EF1 tornados.

Kent County Totals (in the following chart):
32 tornadoes, 9 deaths, 316 injuries, $29,110,000 property damage, $30,000 crop damage.*

**Note:* Crop damage estimates appear to be a recent addition to assessing tornado damage, and have probably been understated in this data.

Tornadoes in Kent County 1956 through 2016 Source: NCDC/NOAA

Location	Date	Time	Type	Magnitude	Deaths	Injured	Property Damage	Crop Damage*
Kent	04/03/56	1815	Tornado	F5	4	130	25K	Unknown
Kent	07/01/56	1400	Tornado	F1	0	0	3K	Unknown
Kent	04/16/60	2340	Tornado	F0	0	0	25K	Unknown
Kent	09/22/61	1630	Tornado	F2	0	0	25K	Unknown
Kent	4/11/65	1710	Tornado	F4	5	142	2.5M	Unknown
Kent	4/11/65	1722	Tornado	F4	0	0	0	Unknown
Kent	4/20/66	1945	Tornado	F1	0	0	25K	Unknown
Kent	4/21/67	1758	Tornado	F3	0	32	25M	Unknown
Kent	4/21/67	1930	Tornado	F2	0	0	25K	Unknown
Kent	9/9/68	1224	Tornado	F2	0	1	25K	Unknown
Kent	6/25/69	2105	Tornado	F1	0	0	25K	Unknown
Kent	5/20/75	1814	Tornado	F2	0	1	250K	Unknown
Kent	6/15/76	1530	Tornado	F1	0	0	25K	Unknown
Kent	7/28/76	1600	Tornado	F1	0	1	250K	Unknown
Kent	7/24/79	1730	Tornado	F0	0	0	25K	Unknown
Kent	7/9/87	1035	Tornado	F1	0	2	3K	Unknown
Kent	9/6/89	1317	Tornado	F1	0	0	3K	Unknown
Kent	9/6/89	1345	Tornado	F1	0	1	25K	Unknown
Kent	9/14/90	0811	Tornado	F1	0	0	25K	Unknown
Kent	9/14/90	0827	Tornado	F1	0	0	3K	Unknown
Kent	7/7/91	1745	Tornado	F0	0	0	3K	Unknown
Kent	6/17/92	1500	Tornado	F1	0	0	0	Unknown
Rockford	8/19/96	1640	Tornado	F1	0	0	5K	Unknown
Grandville	5/21/01	1335	Tornado	F0	0	0	100K	Unknown
Comstock Pk.	5/21/01	1429	Tornado	F1	0	0	200K	Unknown
Plainfield Hts	5/21/01	1440	Tornado	F0	0	0	50K	Unknown
Alpine	5/21/01	1450	Tornado	F0	0	0	75K	Unknown
Rockford	8/13/02	2030	Tornado	F0	0	0	40K	10K
Caledonia	9/23/06	1645	Tornado	F0	0	0	100K	20K
Byron Center	7/6/14		Tornado	EF1	0	6	0	0
Wyoming	8/21/16		Tornado	EF1	0	0	0	0

Tornadoes in Ottawa County 1956 through 2016 **Source: NCDC/NOAA**

Location	Date	Time	Type	Magnitude	Deaths	Injured	Property Damage	Crop Damage*
Ottawa	3/6/56	1630	Tornado	F2	0	0	25K	Unknown
Ottawa	4/3/56	1605	Tornado	F3	0	0	250K	Unknown
Ottawa	4/3/56	1755	Tornado	F5	14	200	25M	Unknown
Ottawa	6/22/57	1530	Tornado	F2	0	0	25K	Unknown
Ottawa	9/22/61	1620	Tornado	F2	0	1	25K	Unknown
Ottawa	4/11/65	1654	Tornado	F4	0	0	25K	Unknown
Ottawa	9/4/65	1940	Tornado	F2	0	0	25K	Unknown
Ottawa	7/12/66	0300	Tornado	F2	0	0	25K	Unknown
Ottawa	6/17/75	1500	Tornado	F0	0	0	25K	Unknown
Ottawa	3/12/76	1519	Tornado	F1	0	1	250K	Unknown
Ottawa	6/15/76	1500	Tornado	F1	0	0	250K	Unknown
Ottawa	5/13/78	1248	Tornado	F0	0	0	0	Unknown
Ottawa	8/9/79	2230	Tornado	F1	0	0	250K	Unknown
Ottawa	8/9/79	2310	Tornado	F1	0	0	25K	Unknown
Ottawa	8/9/79	2330	Tornado	F0	0	0	3K	Unknown
Ottawa	7/9/87	1845	Tornado	F0	0	0	3K	Unknown
Ottawa	5/30/91	1844	Tornado	F1	0	0	3K	Unknown
Ottawa	6/17/92	1510	Tornado	F0	0	0	0	Unknown
Coopersville	4/11/01	1842	Tornado	F0	0	0	0	Unknown
Marne	5/21/01	1335	Tornado	F0	0	0	50K	Unknown
Zeeland	6/21/10		Tornado	EF0	0	0	200K	10K
Jamestown	6/20/16	1420	Tornado	EF1	0	0	0	unknown

Ottawa County Total:
22 tornadoes, 14 deaths, 202 injuries, $26,459,000 property damage, $10,000 crop damage (*see note*).

Note: Crop damage estimates are a recent addition to assessing tornado damage. It can be assumed that more such damage did occur, even if not reflected in this data. Injuries or deaths related to tornadoes most often occur when buildings collapse, people are hit by flying objects or are caught trying to escape the tornado.

CW 9

(22.) Risk/Likelihood

An examination of tornadoes in both counties shows that damaging and killer tornadoes can strike the area at any time of day, and most months of the year. The numbers indicate that, on average, Kent County will be struck by one tornado every two years and Ottawa County every 2.3 years. However, there are periods with more tornadoes, followed by periods of fewer tornadoes, making these probabilities not

deterministic in nature. It can only be said with certainty that tornadoes will be visiting the area again, but is cannot be predicted with any certainty which years will be more or less damaging than others.

(22.) Existing Prevention Programs

Public education and awareness are two means of preventing or minimizing death and injury. In addition, building codes can improve the storm worthiness of buildings and provide greater protection to occupants during a tornado. FEMA and NWS/NOAA have continually made educational information available to enhance communities' knowledge of tornado safety and are used continually in both counties.

The media can also help raise awareness about tornadoes by providing important information to communities. Here are some suggestions:
1. Publish a special section in local newspapers with emergency information about tornadoes.
2. Periodically inform and update communities of local public warning systems.
3. Sponsor a "Helping Your Neighbor" program at your local schools to encourage children to think of those persons who require special assistance such as elderly people, infants, or people with disabilities.
4. Conduct a series on how to protect yourself during a tornado in case you are at home, in a car, at the office, or outside.

The National Weather Service and local radio and TV stations have substantially improved their tornado watch and warning systems to alert the public to potentially dangerous weather. The National Weather Service continuously broadcasts updated weather warnings and forecasts that can be received by most cellphones and NOAA Weather Radios.

Doppler radar has been a significant factor in the NWS effort to forecast and alert the public of impending storms and tornadoes. In the past decade, the agency has increased its lead time for tornado warnings. Broadcasts in the Grand Rapids area make available a Doppler radar system to monitor and track severe weather. Such coverage gives "street level" precision in alerting viewers. The live display is also updated on cellphones and websites.
The Skywarn program in both Kent and Ottawa counties is active and resilient with training given to weather spotters by the National Weather Service on an annual basis. The use of trained spotters in the field can give verification and early warning to both the Weather Service and Emergency Management officials.
A listing of Kent and Ottawa siren locations appears in this plan. Anchoring of manufactured housing is being encouraged, as is structural bracing. Urban forestry and tree maintenance can reduce the amount of flying debris and help maintain electrical power.

23. Transportation Accident

(23.) Summary

Unsurprisingly, transportation accidents occur more frequently in high traffic areas across the entire Kent and Ottawa County area.

(23.) Hazard Description

A transportation accident is a crash or accident involving an air, land or water-based commercial passenger carrier that results in death or serious injury. Vulnerable areas would include (1) communities with, or near, an airport offering commercial passenger service; (2) communities with railroad tracks on which commercial rail passenger service is provided; (3) communities in which commercial intercity passenger bus or local transit bus service is provided; (4) communities with school bus service; and (5) communities in which commercial marine passenger ferry service is provided. A serious accident involving any of the above modes of passenger transportation could result in a mass casualty incident,

requiring immediate life-saving community response. In addition, a marine transportation accident would require a water rescue operation, possibly under dangerous conditions on the Great Lakes.

CW 8

(23.) ***Historically Significant and Related Events***

Holland Twp. (Ottawa County)--A freight train derailed, causing a spill of hydrogen fluoride. The accident prompted the evacuation of 1,500 persons. (November 12, 1979) Coopersville (Ottawa County) - A gasoline tanker truck rolled over on I-96 near Coopersville, resulting in a spill of 9,000 gallons of gasoline. The gasoline then caught fire, forcing the closure of I-96
for several hours until the fire could be suppressed and the site cleaned up and restored. (February 1, 1983)

Holland Twp. (Ottawa County) – Four tanker trucks exploded and burned at an oil company in Holland Township. The blaze injured four people who were rushed to the hospital to be treated for burns and smoke inhalation. A warehouse nearby also reportedly caught fire, but firefighters were able to extinguish the blaze within an hour. (February 24, 2003)

Grand Rapids (Kent County) – A snow plow truck rear ended a Grand Rapids bus in Plainfield Twp and the truck driver slammed into the bus without even hitting the breaks. The truck driver was the most seriously injured, and another nine others were sent to the hospital. (January 18, 2011)

MAJOR ROUTES – Kent and Ottawa Counties
Information about vehicular traffic fatalities (by county) from the 1990s and 2000s, obtained from the National Transportation Highway Safety Board, shows that Kent County tends to suffer between 50 and 85 deaths per year, while Ottawa County tends to experience between 25 and 40 such fatalities.

CW 9

(23.) ***Risk/Likelihood***

The map shown in the "hazard description" section illustrates the major railroads, highways, and Great Lakes ports in the area. These transportation links and nodes have the greatest probability of experiencing a hazardous material transportation incident. Although the greatest risk involving hazardous materials comes from highway and rail shipments, a petroleum or chemical spill on the Great Lakes could have disastrous consequences for shoreline communities, recreational areas, tourism, and the environment.

(23.) ***Existing Prevention Programs***

The NTSB was assigned the role of integrating the resources of the Federal Government with those their families. In July 2002, the NTSB changed its name to the Office of Transportation Disaster Assistance to better reflect the broad range of the Office's duties, and the extension of its services in many cases to all modes of transportation covered by the NTSB. This plan assigns responsibilities and describes the airline and Federal response to an aviation crash involving a significant number of passenger fatalities and/or injuries. It is the basic document for organizations which have been given responsibilities under this plan to develop supporting plans and establish procedures.

The Federal Aviation Administration initiated a new and innovative way of inspecting the nation's airlines. It is designed to identify safety trends in order to spot and correct problems at their root cause before an accident occurs. The Air Transportation Oversight System (ATOS) began with the nation's 10 largest airlines — which handle 95% of U.S. passengers — and will ultimately include all U.S. airlines.

The Federal Railroad Administration (FRA) Office of Safety promotes and regulates safety throughout the Nation's railroad industry. Over 400 Federal safety inspectors specialize in the following five safety disciplines and promote numerous grade crossing and trespass-prevention initiatives: (1) hazardous materials; (2) motive power and equipment; (3) operating practices; (4) signal and train control; (5) track; and (6) highway-rail at-grade crossing and trespassing prevention programs. Additionally, the FRA trains

and certifies State safety inspectors to enforce Federal rail safety regulations. Consistent with the Michigan DOT Vision, the Freight Services and Safety Division works to provide partnerships and teamwork for (1) public grade crossing and rail worker safety; (2) ensuring rail freight accessibility, and (3) customer satisfaction, continuous improvement, measurable results, personal satisfaction, and professional growth.

The MDOT Local Grade Crossing Program provides local governmental units and railroad companies with assistance for developing and implementing projects to enhance motorist safety at public highway-railroad grade crossings. Locations are selected using a statewide prioritization system which identifies crossings where safety enhancements will have the greatest benefit to the motoring public. Michigan Operation Lifesaver is part of a national, nonprofit continuing education program dedicated to ending tragic collisions, fatalities and injuries at highway-rail grade crossings and on railroad rights of way.

On the Great Lakes and its navigable waterways, the United States Coast Guard enforces federal regulations. Life safety is the top priority and is followed by environmental protection. Shipping accidents in the Ottawa County area, as measured by spill incidents in District 9, are lower than average.

The Federal Motor Carrier Safety Administration (FMCSA), a modal administration within the U.S. Department of Transportation, regulates and supports the Nation's interstate commercial carrier industry. FMCSA's primary mission is to reduce crashes, injuries, and fatalities involving large trucks and buses. In cooperation with our partners and customers, the FMCSA strives to reduce the large truck fatality rate by 41% from 1996 to 2008. This reduction translates into a rate of 1.65 fatalities in truck crashes per 100 million miles of truck travel.

24. Water System Failure

(24.) Summary

Loss of functional water system infrastructure would most likely be secondary to the loss of electrical power. Single point interruptions can be circumvented with looped mains and linked systems. Redundancy and back-up components help to ensure that outages can be quickly remedied. With an adequate back-up electrical supply, loss of the water system in a natural disaster seems unlikely.

(24.) Hazard Description

Water system failure is the loss of critical public or private potable water system infrastructure that affects essential services such as fire suppression and the potable water supply.

(24.) Historically Significant and Related Events

CW 8

Water towers are used to store water for periods of high demand and to stabilize pressure. Area water supply infrastructure incidents include:

- The infamous Armistice Day storm in the mid 1940s washed away a section of intake piping in Lake Michigan. Improper construction was likely part of the cause. There are two intakes today.
- In the 1960s, the only raw water line inside a plant ruptured at a joint when its 66-inch control valve was inappropriately closed. This valve now has a stop at 10% closed position.
- In the early 1980s, a header wye in the plant broke off the high pressure pumping line to Grand Rapids and flooded the high lift pumping station. There are two high lift pumping stations today.
- A major plant expansion completed about 1990 included two major incidents of construction related failure. One was a spectacular leak event on the 46-inch high pressure main to Grand Rapids, external to the building. Another involved a contractor boring a hole in the plant's major settled water conduit, which also resulted in a flood event and plant shut-down. We do not

anticipate construction of this magnitude again in the next 25 years.

Electrical outages are a common problem faced by all utility systems. The treatment plants are required to have standby power (electrical or gas driven) or double electrical feeds into the facility. Feeds from the north and south go into the substation at the plant, but still have periods of outages. The plant was built in 1964, with two gas engine pumps at both low service (lake shore) and high service (treatment plant) locations to move water during electrical power interruptions. In 2003 the gas engines were removed and replaced with two 2.5 MW electrical generators at the treatment plant. The gas engines at low service were removed and were trailer-mounted. A 1.7 MW generator was purchased for standby use at that location. This increased the capacity of the treatment system during power outages from 30 million gallons per day to 70 million gallons per day, with the added benefit of electrical power to run all the treatment processes and control systems.

Infrequent but recurrent failures of electrical source feeds from Consumers Power Co. have occurred and will continue to occur. There are multiple feeds to the plant and a complete outage has never been experienced, except possibly one event shortly after construction in the 1960s. A significant loss of grid reliability in its entirety has accompanied deregulation, and this liability is magnified by the possibility of terrorist events. Installation of electrical generators will substantially minimize the risk of total power failure.
The risk of grid failure may be as high as 5% per year, but with the completion of a generator project, this risk to the water plant will be reduced to 1% per year or less.
In general, water plants attempt to preclude such problems from impacting customers by having redundant operating systems.

Prior to 1990, the Grand Rapids Water System had an entirely separate filtration plant in Grand Rapids. With the moving of all capacity to the Lake Michigan plant, additional redundancies were built into that plant. Contamination events can also reduce the safety of water supply and result in the issuing of "boil water" notices. The Grand Rapids Water System experienced this in 1983 and has taken actions intended to reduce this risk to 1% per year or less.

The area has not suffered a catastrophic failure, such as loss of an entire portion of the system.
Lesser events have caused authorities to issue a "boil water" advisory. Grand Rapids had two instances in the mid 1980s, and Wyoming issued one in October, 2004. Byron and Gaines Townships also issued one in the early 2000s. Wyoming had an incident whereby three young men broke into the elevated water tower in March, 2003, the same day that the shooting war started in Iraq. It turned out to essentially be a prank, although the coincidence caused some concern at the time.
A pressurized chlorine supply line failed in 1990 allowing 400 to 800 pounds of chlorine gas to escape into the treatment facility. There was major damage to all electrical components, air compressors, pumps, computers and laboratory equipment. All metal surfaces within the building were affected. One employee required medical treatment.

Pump failures are a common problem, occurring on a regular basis with about two or three large pump failures every year. With more than 40 large pumps within the system, backup is in place for each and every one. The Lake Michigan intake and pipes were subject to Zebra Mussel infestation during the early 1990s. To resolve this problem, a chemical feed system was installed to deliver sodium hypochlorite to the cribs through a diffuser system. The 4" chemical feed pipe, mounted inside the 66" concrete intake pipe, failed in 2001. The anchors holding the pipe let go and the pipe coiled back toward shore. The pipe was cut into small pieces and removed by divers, and new pipe was installed with more and better anchors.

On July 21, 1998, the Holland Board of Public Works (BPW) had a chemical incident at their water plant, resulting in the release of chlorine gas and the evacuation of the plant for the majority of the day. Ten people were sent to the hospital, with one then being admitted for observation. The incident stemmed from accidental human error and did not result in an interruption to the water supply, although a voluntary reduction in water use was requested until the situation could be fully evaluated and stabilized.

In 2002, a metal water storage tank at the treatment facility required extensive repairs to its roof supports from metal fatigue and rust in 2002. The tank had been built in 1964.
In June, 2004, a contractor was excavating near one of the 36-inch transmission mains and removed the backfill that was supporting it. This caused the main to separate and become unusable for about 3 weeks, until repairs were complete. Fortunately, the BPW was able to feed water through the other existing main and maintain the water supply without interruption.

CW 9

(24.) Risk/Likelihood

Experts managing the water supply infrastructure are confident that the risk of catastrophic failure is less than 1% per year. When vulnerable areas have been identified in the past, the risks have been mitigated to an acceptable level.

(24.) Existing Prevention Programs

Water systems across the area vary from single residential wells to cross-linked municipal looped systems. Existing prevention measures include the generators that can operate plants and well heads, the interconnections between municipal systems, and existing comprehensive contingency plans. Both county health departments work to provide guidelines, testing and education for clean drinking water. The Well Head Protection program is in place to protect individual wells and aquifer quality. Redundancy and back-up systems are in place to reduce the risk of water infrastructure failure.

CW 11

HAZARD SUMMARY TABLE BY COMMUNITY	Climate Change	Comm./Cyber Failure	Drought	Earthquake	Electrical Failure	Extreme Temps.	Fire - General/Other	Fire - Urban/Structure	Fire - Wildfire	Flood - Dam Failure	Flood - Riverine	Flood - Shoreline	Flood - Urban	HazMat Release	Intentional Act	Landslide	Nuclear Power Plant	Public Health Emerg.	Sewer Syst. Failure	Severe WX - Winter	Severe WX - T-storm	Severe WX - Tornado	Transport. Accident	Water Syst. Failure
Ada Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Algoma Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Allendale Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Alpine Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Blendon Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Bowne Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Byron Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Caledonia (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Caledonia Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Cannon Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Cascade Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Casnovia (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Cedar Springs (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Chester Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Coopersville (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Courtland Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Crockery Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of East Grand Rapids (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Ferrysburg (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Gaines Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Georgetown Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Grand Haven (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Grand Haven Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Grand Rapids (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Grand Rapids Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Grandville (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Grattan Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Holland (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Holland Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Hudsonville (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Jamestown Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Kent City (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Kent County (K) (part NFIP)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Kentwood (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M

City of Lowell (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Lowell Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Nelson Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Oakfield Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Olive Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Ottawa County (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Park Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Plainfield Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Polkton Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Port Sheldon Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Rockford (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Robinson Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Sand Lake (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Solon Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Sparta (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Sparta Township (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Spencer Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Village of Spring Lake (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Spring Lake Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Tallmadge Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Tyrone Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Vergennes Township (K)	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Walker (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Wright Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Wyoming (K) NFIP	M	H	L	L	H	M	L	M	L	M	H	L	H	M	M	L	L	M	M	H	H	H	M	M
City of Zeeland (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M
Zeeland Township (O) NFIP	M	H	L	L	H	M	L	M	L	L	H	L	H	M	M	L	L	M	M	H	H	H	M	M

HAZARD MITIGATION PLAN 2017

SECTION THREE - ACTION PLAN: AUTHORITIES & RESOURCES

Goal

The goal of the regional Hazard Mitigation Plan is to reduce the impact of hazards on citizen life, health and economic well-being based on a continuing hazard risk and vulnerability analysis.

CW 15

Strategy

As a regional plan representing multiple agencies and jurisdictions, shared agreement exists regarding the need to mitigate the following top-priority hazards throughout the planning area.

Severe Weather – Timely alerts and notification information will be provided to the entire region during periods of threatening weather. Efforts toward public awareness and education about these hazards will be encouraged and promoted as resources permit.

Flooding – Efforts will continue to reduce the number of vulnerable structures in floodplain areas and make any such at-risk properties less vulnerable as resources and the informed cooperation of property owners permits. Previous mitigation actions include:

- ✓ The installation of better seals on sanitary sewer manholes.
- ✓ Raising the height of sanitary sewer manholes above the level of possible floodwaters.
- ✓ Covering the sanitary sewer openings in open basements during new construction projects.
- ✓ Improvements along Bliss Creek in Georgetown Township to alleviate flooding near the intersection of 44th Street and Kenowa Avenue.
- ✓ Construction of a relief drain at the Rose Drain in Zeeland.
- ✓ Construction of a flood control berm near Pine Creek in Holland Township, to help protect a home there.
- ✓ The installation of culverts where US-31 crosses New Holland Street, Quincy Street, and Riley Street.
- ✓ Improvements to three dams (Berens, Steenwyk, and Timmer) in the Black Creek Watershed
- ✓ Removal of flood-prone structures in Robinson Township, through two PDMP project grants from 2005.
- ✓ The removal of a flood-prone structure in Ada Township, through a PDMP project grant from 2006.
- ✓ An HMGP 1527 project grant for flood-prone property acquisitions through the Kent County Drain Commission.
- ✓ Ongoing work on flood-prone property acquisitions in Plainfield Township, through an HMGP 1777 project grant.
- ✓ A culvert replacement and acquired structure in Coopersville, through an HMGP 1346 project grant.
- ✓ The Plaster Creek flood control project in Grand Rapids, through an HMGP 1346 project grant.
- ✓ A culvert/bridge upgrade in Kent City, through an HMGP 1346 project grant.
- ✓ An HMGP 1346 grant-funded stormwater project in Kentwood.
- ✓ Two flood-prone structural acquisition projects through the Ottawa County Parks Department (one through an HMGP 1226 project grant and the other through an HMGP 1346 project grant).
- ✓ A culvert project of the Ottawa County Road Commission, funded through an HMGP 1346 grant.

- ✓ The acquisition of 3 flood-prone properties in the City of Wyoming, through an HMGP 1237 grant.
- ✓ A bridge replacement project (improving water flows) in Wyoming, through an HMGP 1226 grant.
- ✓ Two Ottawa County storm water/drain projects, through the Drain Commission and HMGP 1181 grants.
- ✓ An acquisition project in the City of Holland, through an HMGP 1181 grant.
- ✓ New acquisition projects for Plainfield Township, through HMGP 1777 and PDMP FY 2011 grants.
- ✓ An acquisition project involving 8 structures in Grand Rapids, through a PDMP FY 2011 grant.
- ✓ A $2.4 million reconstruction of 12th Street in Holland, including new storm drain pipes and a relief drain emptying into Lake Macatawa, intended to eliminate most of the flood problems in the downtown residential areas.

Strategies for further flood mitigation will include coordination with area planning and development agencies to discourage the further development of property that would, through its location or design, place any additional residents, businesses, visitors, or workers into any situation of undue risk. Proper land use management and strict enforcement of building codes can make communities safer from flood hazards and help reduce the high costs of flood losses.

Communication Failure – Continued reductions in communication infrastructure downtime will be sought and maintained, when possible. Redundant forms of communication are sought and maintained to ensure sustained capability.

Other Hazard Mitigation Measures – Other cost-effective or feasible hazard mitigation measures will be sought and considered as opportunities and resources permit in order to address any of the hazards considered within this plan.

Objectives

The risk assessment indicates general hazard risks through its scoring system, but hazard mitigation actions cannot simply be prioritized on the basis of estimated overall risks. Since many hazards are intertwined, project selection favored activities with the potential to lessen the impact of more than one hazard. Action plan priorities therefore involved a grouping of common hazard scores together, to favor such multi-purpose activities as shown below. A multi-functional approach was considered to be the most cost-effective and efficient way to address such a wide array of hazards. Although cost-effectiveness, political feasibility, equity and environmental issues, and technical feasibility were always part of the considerations involved in the strategy selection process (along with a preference for activities and resources that are more specific to the hazard mitigation phase of emergency management), a formal cost-benefit analysis will be added to some of the physical/structural projects as part of a formal application process for federal grants and other appropriate funding sources.

CW 17

Severe Weather (and other emergency) notification: tornado (456), thunderstorm (435), intentional acts (408), hazardous material releases (393), dam failures (384/354), nuclear power plant accidents (339), wildfires (330), cumulative score—2715.

a. Survey needs and add sirens to regions as needed.
b. Enhance, strengthen, and maintain emergency notification systems throughout the region. Investigate and acquire new warning technology as it becomes available.
c. Consider (and encourage) construction techniques and structural upgrades for weather resistance (e.g. wind resistance, safe rooms, ice dam prevention, leak prevention, storm sheltering, etc.)

CW 17

Flooding: riverine flooding (447), urban flooding (411), dam failures (384/354), shoreline flooding/erosion (342), cumulative score—1584

a. All communities in Kent County to consider NFIP participation.
b. Purchase eligible properties that are vulnerable to flooding as funds become available.
c. Decrease human susceptibility to flooding. Encourage flood-proofing homes and businesses.
d. Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in floodplains, and where feasible, include flood considerations in local and regional development plans; building permits; transportation and other infrastructure projects and plans; and capital facilities planning, construction and renovation.

CW 14

National Flood Insurance Program (NFIP) Participation

OTTAWA COUNTY

CID	Community Name	County	FHBM Ident.	FIRM Ident.	Current Map Date	Reg-Emer Date
260490#	ALLENDALE TWP.	OTTAWA COUNTY	03/25/77	07/05/82	05/16/13	07/05/82
261005#	BLENDON TWP.	OTTAWA COUNTY		12/16/11	(NSFHA)	05/16/13
260829#	CHESTER TWP.	OTTAWA COUNTY		11/20/91	12/16/11(M)	11/20/91
260491#	COOPERSVILLE CITY	OTTAWA COUNTY	09/26/75	03/02/83	12/16/11	03/02/83
260981#	CROCKERY TWP.	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
260184#	FERRYSBURG CITY	OTTAWA COUNTY	06/28/74	03/01/78	12/16/11	03/01/78
260589#	GEORGETOWN TWP.	OTTAWA COUNTY	09/26/75	07/18/85	05/16/13	07/18/85
260269#	GRAND HAVEN CITY	OTTAWA COUNTY	06/28/74	02/15/78	12/16/11	02/15/78
260270#	GRAND HAVEN TWP.	OTTAWA COUNTY	08/02/74	01/16/81	12/16/11	01/16/81
260006#	HOLLAND CITY	OTTAWA/ALLEGAN	04/12/74	11/15/78	12/16/11	11/15/78
260492#	HOLLAND TWP.	OTTAWA COUNTY	08/12/77	12/01/83	12/16/11	12/01/83
260493#	HUDSONVILLE CITY	OTTAWA COUNTY	09/05/75	12/04/84	12/16/11	12/04/84
261001#	JAMESTOWN TWP.	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
261006#	OLIVE TWP.	OTTAWA COUNTY		12/16/11	(NSFHA)	12/22/97(E)
260185#	PARK TWP.	OTTAWA COUNTY	08/16/74	05/15/78	12/16/11	05/15/78
260923#	POLKTON TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11
260278#	PORT SHELDON TWP.	OTTAWA COUNTY	08/16/74	05/15/78	12/16/11	05/15/78
260913#	ROBINSON TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11
260281#	SPRING LAKE TWP.	OTTAWA COUNTY	06/28/74	02/15/78	12/16/11	02/15/78
260282#	SPRING LAKE VILLAGE	OTTAWA COUNTY	06/28/74	06/01/78	12/16/11	06/01/78
260494#	TALLMADGE TWP.	OTTAWA COUNTY	06/10/77	03/02/83	05/16/13	03/02/83
260495#	WRIGHT TWP.	OTTAWA COUNTY	05/27/77	12/16/11	12/16/11(M)	11/12/97
260983#	ZEELAND CITY	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
260932#	ZEELAND TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11

CW 14a

NOTE: All of Ottawa County Jurisdictions participate in the NFIP

CW 14

KENT COUNTY

CID	Community Name	County	FHBM Ident.	FIRM Ident.	Current Map Date	Reg-Emer Date
260248#	ADA TWP.	KENT COUNTY	11/22/74	10/15/80	10/15/80	10/15/80
260738#	ALGOMA TWP.	KENT COUNTY		01/03/85	01/03/85	01/03/85
260961	ALPINE TWP.	KENT COUNTY				02/26/02(E)
260693#	CALEDONIA TWP.	KENT COUNTY	03/24/78	07/02/81	07/02/81	07/02/81
260734#	CANNON TWP.	KENT COUNTY		09/16/88	09/16/88(M)	09/16/88
260814#	CASCADE TWP.	KENT COUNTY		11/06/91	11/06/91(M)	11/06/91
260105#	EAST GRAND RAPIDS	KENT COUNTY	05/17/74	09/03/80	09/03/80	09/03/80
260106#	GRAND RAPIDS CITY	KENT COUNTY	11/09/73	01/17/79	11/05/86	01/17/79
260271#	GRANDVILLE	KENT COUNTY	07/13/73	09/16/82	09/16/82	09/16/82
260107#	KENTWOOD CITY	KENT COUNTY	11/02/73	11/18/81	11/18/81	11/18/81
260108#	LOWELL CITY	KENT COUNTY	05/10/74	05/16/83	05/16/83	05/16/83
260109#	PLAINFIELD TWP.	KENT COUNTY	11/09/73	01/02/81	01/02/81	01/02/81
260741#	SPARTA TWP.	KENT COUNTY		01/03/85	01/03/85	01/03/85
260336#	SPARTA VILLAGE	KENT COUNTY	10/15/76	02/16/83	02/16/83	02/16/83
260110#	WALKER CITY	KENT COUNTY	10/12/73	06/01/82	06/01/82	06/01/82
260111#	WYOMING CITY	KENT COUNTY	11/09/73	09/02/82	02/05/92	09/02/82

CW 17

Communication Failure: electrical failure (504), communications failure (444), cumulative score—948

a. Identify infrastructure vulnerabilities.
b. Work with local utilities to develop a plan.
c. Implement measures identified in the plan.

CW 17

Other Hazard Mitigation Measures: individually or jointly as appropriate: transportation accidents (393), urban/structural fires (390), water system failures (384), natural epidemic (381), sanitary sewer failure (366), earthquakes (327), drought (321/273), other fires (276), landslides (243/240). (Cumulative score not provided here—varies with the specific type of hazard mitigation strategy selected.)

a. Area Master Plan updates to consider hazard mitigation concepts and actions.

Existing Authorities and Resources

The assessment of which hazard mitigation actions are considered feasible, is partially rooted in knowledge of existing authorities, policies, programs, and the resources available to accomplish the envisioned mitigation projects. Although this is well-known to many local leaders (and used to select and prioritize various projects), the following summaries are provided to give other agencies an idea of the various resources (or resource limitations) that exist for the most relevant jurisdictions and agencies throughout the Kent and Ottawa County region. As stated in the main text of the plan, all communities have their own zoning.

KENT COUNTY AUTHORITIES AND RESOURCES

http://www.accesskent.com/

CW 13

Kent County Sheriff Dept.

http://www.accesskent.com/CourtsAndLawEnforcement/SheriffsDepartment/

https://www.accesskent.com/Sheriff/LEPC/

https://www.accesskent.com/Sheriff/getready/

http://www.kcraces.net/

http://www.weather.gov/

https://www.accesskent.com/Sheriff/meds_drop-off.htm

Kent County Road Commission

http://www.kentcountyroads.net/

Kent County Department of Public Works

http://www.accesskent.com/YourGovernment/PublicWorks/PublicWorks.htm

- Solid Waste Management
  http://www.accesskent.com/YourGovernment/PublicWorks/dpw_waste.htm
- Waste to Energy Facility
  http://www.accesskent.com/YourGovernment/PublicWorks/wte.htm
- Recycling and Education
  http://www.accesskent.com/YourGovernment/PublicWorks/mrf.htm
- Hazardous Waste Program
  http://www.accesskent.com/YourGovernment/PublicWorks/recycle_household.htm
- Recycling in Kent County
  http://www.accesskent.com/YourGovernment/PublicWorks/recycle_options.htm

Kent County Department of Equalization

http://www.accesskent.com/YourGovernment/Departments/BureauofEqualization/BureauofEqualization.htm

Kent County Drain Commission

http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_index.htm

- Storm water
  http://www.accesskent.com/YourGovernment/DrainCommisioner/stormwater_savvy.htm
- Drain Maps http://www.accesskent.com/YourGovernment/DrainCommisioner/drainmaps.htm
- Flood Insurance
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_insurance.htm
- Drain Developme
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_development.htm
- Stormwater Ord.
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_stormwater.htm
- Current Ordinances
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_projects.htm
- Permits http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_permits.htm
- Related Resources http://www.accesskent.com/YourGovernment/DrainCommisioner/links.htm
- Problem Reporting
  http://www.accesskent.com/YourGovernment/DrainCommisioner/contact.html

Overview

The County Drain Commissioner is elected to a four-year term to perform a number of duties assigned by State law. The office of the Drain Commissioner is responsible for the administration of the State Drain Code as it applies to the receipt of petitions for the establishment, improvement or maintenance of over 533 miles of County Drain and 356 storm water detention ponds in Kent County. Under the Subdivision Control Act, this office reviews storm water plans for all plats developed within the County and maintains records on over 1,800 developments. Other duties include the administration of 19 court established lake levels under the Lake Level Act, participation in the NPDES Phase II program, participation on lake improvement boards, maintenance of the GIS system as it pertains to County Drains and the resolution of citizen complaints and storm water concerns.

Currently, this office is actively developing a project and meeting with local government engineers to solve flooding of homes in the Shawmut Hills area of Grand Rapids, undertaking projects to address obstructions to the flow in the Troy with Mosher & Farnham Drain, the erosion of the stream bed and banks of the Black Creek Inter-County Drain which is causing sedimentation of Lincoln Lake, and is constructing a project on the Warner Drain to solve flooding problems experienced by homes at the upper end of the drainage district.

Goals of the Drain Commission

- Administer the Drain Code (Act 40, PA of 1956) as it pertains to the establishment and maintenance of drains in Kent County
- Administer the Subdivision Control Act (Act 288, PA of 1967) as it applies to stormwater management
- Administer Inland Lake Levels under Part 307 of the Natural Resources and Environmental Protection Act (Part 307, Act 451, PA of 1994) as it pertains to the establishment and maintenance of lake levels in Kent County

BLACK CREEK INTERCOUNTY DRAIN:

- Petition received on 08-15-06
- Drainage Board met for the Determination of Practicability on 10-19-06 and petition was found practicable
- Engineer was selected on 12-07-06
- Hearing of Necessity took place on 12-15-08 and project was found to be necessary

- An appeal against the Determination of Necessity was filed by Spencer and Nelson Townships on 12-23-08

KENOWA DRAIN

- Petition being circulated
- Drain Office meeting with the City of Walker on 03-12-09 to discuss possible solutions
- Scheduling Drain Board Meeting to Determine Necessity

SHAWMUT HILLS DRAIN

- Petition received 08-26-08
- Board of Determination met on 06-02-09 and found project to be necessary

TROY WITH MOSHER AND FARNHAM DRAIN

- Petition received on 05-20-09
- Scheduling Board of Determination

WATERS DRAIN

- Petition received on 05-07-07
- Board of Determination met on 01-17-08 and found project to be necessary
- Engineer was selected on 03-10-08
- DEQ Permit Application submitted on 01-30-09
- Bids received 06-01-09
- Day of Apportionment scheduled for 06-29-09
- Project Summary
- Drainage District Map
- Under Construction

WARNER DRAIN

- Petition received on 07-02-08
- Board of Determination met on 01-15-09 and found project to be necessary
- Request for Proposals from Engineers was sent out on 01-23-09
- Proposals due from Engineers on 03-06-09
- Stream survey complete
- Engineer Designing Drain Improvements

Development Drainage Rules and Fees: See website at:
http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_development.htm

Model Storm water Ordinance

The Drain Commissioner and many other individuals have worked on a Task Force to draft a model storm water ordinance since late 1999. This Task Force was started in anticipation of the Nation Pollution Discharge Elimination System Phase II (NPDES). NPDES Phase II are regulations created by the Environmental Protection Agency to address storm water discharges into the nation's lakes, rivers, streams, and the oceans.

Phase I of the regulations addressed the point discharges such as wastewater treatment plants and industrial discharges. Phase II of NPDES addresses non-point source pollution such as fertilizers, soil erosion, etc... that is carried into our inland lakes and streams by runoff.

The model ordinance that resulted from this collaborative effort is the result of many committee and subcommittee meetings. Input from Engineers, Legal Representatives, Biologists, Hydrologists, Developers and Local Officials was sought and incorporated into the document. The document can be obtained in pdf format from the link below or a copy can be picked up from the Drain Commissioner's Office.

Link to: Model Ordinance Document (36 page document)

Kent County storm water web site:
http://www.accesskent.com/YourGovernment/DrainCommisioner/stormwater_savvy.htm

Kent County Health Department

http://www.accesskent.com/Health/HealthDepartment/

- Communicable diseases
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/default.htm
- Illness prevention
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Illness_Prev.htm
- Health Education
  http://www.accesskent.com/Health/HealthDepartment/Health_Promotion/Health_Promotion.htm
- Resources for Health Care Providers
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Disease_Reporting.htm
- Resources for Schools/Daycare providers

  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/school_daycare.htm
- Data and Reports http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Reports.htm
- Additional Resources
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Resources.htm
- Animal Control
  http://www.accesskent.com/Health/HealthDepartment/AnimalControl/kcas_index.htm
- Educational Services
  http://www.accesskent.com/Health/HealthDepartment/AnimalControl/kcas_serv_edu.htm

Kent County Department of Aeronautics
http://www.accesskent.com/YourGovernment/Departments/Aeronautics/aeronautics.htm

Kent County Information Technology Department

http://www.accesskent.com/YourGovernment/Departments/InformationTechnology

Kent County Housing Commission
http://www.accesskent.com/YourGovernment/Departments/HousingCommission/

Kent County/MSU Cooperative Extension

http://www.accesskent.com/CultureLeisureAndTransit/Kent_MSU_Ext/

Kent County Community Development
http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/CommunityDevelopment.htm

- Community Action Plan
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/action_plan.htm

- Housing Rehabilitation Program
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/Housing_Rehabilitation.htm

- Neighborhood Stabilization Program
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/NSP.htm

Kent County Parks Department

http://www.accesskent.com/CultureLeisureAndTransit/Parks/

- County Parks

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/park_directory.htm
- Campgrounds

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/campground.htm
- Community Trails

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/comm_trails.html
- Millennium Park

  http://www.accesskent.com/CultureLeisureAndTransit/MillenniumPark/
- Kent County Parks Master Plan

  http://www.accesskent.com/CultureLeisureAndTransit/MillenniumPark/masterplan.htm

Kent County Purchasing Department
http://www.accesskent.com/YourGovernment/Departments/Purchasing/pur_index.htm

Kent County Facilities Management

http://www.accesskent.com/YourGovernment/Departments/FacilitiesManagement/FacilitiesManagement.htm

JURISDICTIONS IN KENT COUNTY

Ada Township

http://ada.mi.us/

http://adamichigan.org/uploads/township/Planning-Zoning/Master-Plan/Master-Plan-Docs/Cover-Ack-TOC-11-06-07.pdf

Algoma Township

http://www.algomatwp.org/

http://www.algomatwp.org/documents/master_plan.php

Alpine Township

http://www.alpinetwp.org/

http://www.alpinetwp.org/Planning%20Zoning/2015%20Master%20Plan%20Update.pdf

Bowne Township

http://bownetwp.org/index.html

http://bownetwp.org/adobe/BowneEndFiles.pdf

Byron Township

http://www.byrontownship.org/index.php

http://www.byrontownship.org/documents/planzone/DDA%20Master%20Plan.pdf

http://www.byrontownship.org/department.php?d=24&p=97

http://www.byrontownship.org/department.php?d=24&p=98

Caledonia Township

http://www.caledoniatownship.org/

http://www.caledoniatownship.org/departments/zoning_department/master_plan/index.php#.WKIMaUoo4aB

Village of Caledonia

http://villageofcaledonia.org/Portals/21/REFERENCE%20MATERIALS/Village%20of%20Caledonia%20General%20Development%20Plan%202014-%20Final.pdf

http://villageofcaledonia.org/Default.aspx?tabid=4093

http://villageofcaledonia.org/Default.aspx?tabid=1057

http://www.caledoniatownship.org/2015%20Compiled%20Master%20Plan.pdf

Cannon Township

http://www.cannontwp.org/egov/documents/1433270111_63271.pdf

Cascade Township

http://www.cascadetwp.com/

http://cascadetwp.com/Reference-Desk/Stormwater/Master-Plan.aspx

http://search.blossom.com/query/Xp3/245/form0/link2/type0/nohover/pdf0/compact2?key=Master+Development+Plan

Village of Casnovia

http://www.casnoviavillage.org/

Coty of Cedar Springs

http://cityofcedarsprings.org/

http://cityofcedarsprings.org/2016/12/08/2016-draft-master-plan-for-city-of-cedar-springs/

Courtland Township

http://www.courtlandtwp.org/

http://www.courtlandtwp.org/adobe/Adopted%20Plan%206.06.07.pdf

Gaines Township

http://gainestownship.net/

http://www.gainestownship.org/departments/docs/Adopted_Plan_12_8_08.pdf

http://www.gainestownship.org/departments/planning_zoning.php

City of East Grand Rapids

http://www.eastgr.org/

City of Grand Rapids Authorities and Resources

http://grcity.us/Pages/Departments.aspx

Police Department
http://grcity.us/police-department/Pages/default.aspx

Community Development
http://grcity.us/community-development/Pages/Housing-Rehabilitation-and-Grant-Program-Administration.aspx

- Neighborhood Enterprise Zones
  http://grcity.us/community-development/Pages/Neighborhood-Enterprise-Zones.aspx
- Neighborhood Associations
  http://www.cridata.org/Neighb_GR.aspx
- Code Compliance Division
  http://grcity.us/community-development/Code-Compliance-Division/Pages/default.aspx

Design and Development Services
http://grcity.us/design-and-development-services/Pages/default.aspx

- Development Center
  http://grcity.us/design-and-development-services/Development-Center/Pages/default.aspx
- Economic Development
  http://grcity.us/design-and-development-services/Economic-Development/Pages/default.aspx
- Planning Department
  http://grcity.us/design-and-development-services/Planning-Department/Pages/default.aspx
  http://grcity.us/design-and-development-services/Planning-Department/Pages/Master-Plan---Preface.aspx
- Downtown Development Authority
  http://grcity.us/design-and-development-services/Downtown-Development-Authority/Pages/default.aspx

Energy and Sustainability
http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/default.aspx

- Energy
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/OfficeofEnergySustainability.aspx
- Water

  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/Water.aspx
- Urban Development
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/UrbanDevelopment.aspx
- Economic Development
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/EconomicDevelopment.aspx
- Waste
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/Waste.aspx

Environmental Services
http://grcity.us/enterprise-services/Environment-Services/Pages/default.aspx

- Department Overview
  http://grcity.us/enterprise-services/Environment-Services/Pages/Department-Overview.aspx
- Facts
  http://grcity.us/enterprise-services/Environment-Services/Pages/ESD-FAQs.aspx

Engineering Department
http://grcity.us/engineering-department/Pages/default.aspx

Facilities Management
http://grcity.us/facilities-and-fleet-management/Pages/default.aspx

Parks and Recreation
http://grcity.us/public-services/Parks-Recreation-Forestry/Pages/parks-recreation-forestry.aspx

Water System
http://grcity.us/enterprise-services/Water-System/Pages/default.aspx

Technology and Change Management
http://grcity.us/technology-and-change-management/Pages/default.aspx

Fire Department
http://grcity.us/fire-department/Pages/default.aspx

Grand Rapids Township

http://www.grandrapidstwp.org/

http://cms3.revize.com/revize/grandrapidstownship/grandrapidstownship/services/planning_and_zoning/uploads/Master_Plan.pdf

City of Grandville

http://cityofgrandville.com/

http://cityofgrandville.com/images/pdf/Master%20Plan%20FINAL%201-28-2008.pdf

Grattan Township

http://www.grattantownship.org/

http://www.grattantownship.org/

Village of Kent City

http://www.kentcitymi.org/

http://www.kentcitymi.org/wp-content/uploads/MasterLandUsePlan2015.pdf

http://www.kentcitymi.org/?page_id=306

Cit of Kentwood

http://www.ci.kentwood.mi.us/

http://www.ci.kentwood.mi.us/getattachment/afca316a-48cb-47f4-859b-4d06cb280d69/Kentwood-Master-Plan-2012-PreChange

http://www.ci.kentwood.mi.us/getattachment/4204eb5b-3bce-44d9-8596-b2fce2bf5ca0/Complete-Kentwood-Master-Plan-2005

http://www.ci.kentwood.mi.us/getattachment/6a0627a1-74d3-4a0b-9cd2-40785b8e92f0/WirelessCommPlan

http://www.ci.kentwood.mi.us/getattachment/d0050b04-bebc-4de7-b86e-d9b52780f81b/DivisionAveRedevPlan

City of Lowell

http://ci.lowell.mi.us/

http://www.ci.lowell.mi.us/Portals/1/Government/Planning%20and%20Zoning/Lowell%20Master%20Plan%20(with%20maps).pdf

Lowell Township

http://www.twp.lowell.mi.us/

http://www.twp.lowell.mi.us/MASTERPLAN/Adopted%202014%20Master%20Plan%20for%20printing%20and%20distribution.pdf

Nelson township

http://www.nelsontownship.org/

http://www.nelsontownship.org/adobe/Master%20Plan%204.13.07.pdf

Oakfield Township

http://oakfieldtwp.org/

http://oakfieldtwp.org/adobe/Ordinance.pdf

Plainfield Township

http://www.plainfieldmi.org/

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2008_master_plan_with_maps.pdf

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2017_master_plan_supplement_with_future_land_use_map_and_amendments_to_childsdale_rockford.pdf

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2017_update_-_future_land_use_map.pdf

City of Rockford

http://rockford.mi.us/

https://rockford.mi.us/wp-content/uploads/2014/07/Rockford-Master-Plan.pdf

Village of Sand Lake

http://villageofsandlake.org/Portals/1047/Map%201%20Existing%20Land%20Use.pdf

http://villageofsandlake.org/Portals/1047/Map%202%20Water%20System.pdf

http://villageofsandlake.org/Portals/1047/Map%205%20Future%20Land%20Use.pdf

Solon Township

http://www.solontwp.org/

http://www.solontwp.org/2016/11/28/master-plan-survey/

Sparta Township

https://www.bing.com/search?q=sparta+township+mi+&form=PRUSEN&mkt=en-us&httpsmsn=1&refig=9dbe87824e704c0ea241cc46c55b34e5&sp=-1&pq=sparta+township+mi+&sc=8-19&qs=n&sk=&cvid=9dbe87824e704c0ea241cc46c55b34e5

http://spartatownship.com/documents/Ordinance_Book_revision_2012_GkRmM.pdf?zoom_highlight=master+plan#search=%22master plan%22

Village of Sparta

http://spartami.org/

http://spartami.org/documents/2015_Master_Plan_Document_Final2_9d3Js.pdf

Spencer Township

http://www.spencertwp.org/

http://www.spencertwp.org/adobe/Future%20Use.pdf

Tyrone Township

http://www.tyronetownship.us/

http://www.tyronetownship.us/portals/149/Master%20Plan/MASTER%20PLAN%202012.pdf

Vergennes Township

http://www.vergennestwp.org/

http://www.vergennestwp.org/masterplan/Final%20Adopted%20Master%20Plan%202012-07-09.pdf

City of Walker

http://www.ci.walker.mi.us/

http://www.ci.walker.mi.us/business/planning/master_plan_information/index.php

City of Wyoming

http://www.ci.wyoming.mi.us/

http://www.wyomingmi.gov/Planning/KCGRWY_Regional_Consolidated_Plan_Final.pdf

http://www.wyomingmi.gov/Planning/documents/Wyoming_Master_Plan_%20Final_Revised_2012.pdf

http://www.wyomingmi.gov/Planning/communitydev.asp

OTTAWA COUNTY AUTHORITIES AND RESOURCES

NOTE: To follow most links in a digital version of this document press Ctrl + Click

CW 13

County Government: Each entity listed below has its' own section of the county website at www.miottawa.org. The following are links to each of these information resources.

Board of Commissioners
County Administrator

RELEVANT DEPARTMENTS

Equalization / Property Description & Mapping
Insurance & Risk Management
Planning and Performance Improvement
Sheriff's Office

Water Resources Commissioner

The Water Resources Commissioner and his staff are responsible for construction, operation and maintenance of over 800 storm water management systems, "County Drains" in Ottawa County. These systems are designed to provide storm water management, drainage, flood prevention and stream protection for urban and agricultural lands. A County Drain may be an open ditch, stream, or underground pipe, retention pond or swale that conveys storm water.

Routine maintenance of county drains is necessary from time to time to ensure their proper function. The Water Resources Commissioner may in any one year, expend up to $5,000.00 per mile, per drain for maintenance and repair. Major projects are initiated through a petition process. Either property owners or a local municipality can petition the Water Resources Commissioner. To recover costs expended for a project, Special Assessments are levied against private properties, local municipalities, the County and the County Road Commission, railroads and state highways benefited by the construction and/or maintenance.

Ottawa County Road Commission

See www.ottawacorc.com. This website also provides direct links to city and township websites under the red tab "links".

City, Township & Village Directory

The **Ottawa County** website (www.miottawa.org) provides further information under the blue tabs "Parks and Visitors" and "Property Resources" for the following **departments** that may be relevant to hazard mitigation:

*** MSU Extension**

*** County Parks & Recreation**

*** Water Resources Commission:** *Notes from the County Water Resources Commissioner:*

- The Ottawa Drain Commission works through consultants and contractors.
- Drains are the responsibility of either the 1) local jurisdiction, 2) the drain commission, or 3) the road commission.
- An open drainage ditch is designed to convey a 25 year, or 4% chance storm.
- An enclosed culvert system is designed to convey a 10 year, or 10% chance storm.

*** Equalization**

*** Environmental Permits**

*** GIS**

The Ottawa County GIS Department manages the County's Geographic Information System (GIS). A GIS is a computer-based mapping system which relates various types of data and information with real-world locations.

The GIS Department has established collaborative data partnerships with 17 of the County's 24 local units as well as the Ottawa County Road Commission. Under the partnership agreements, the GIS Department provides each partner with automated data updates, access to the GIS data library, access to exclusive Web mapping applications, and technical support. In addition, the GIS Department will also create customized data layers by request to meet the needs of its partners.

*** Ottawa Conservation District**

*** Planning and Performance Improvement**

*** Soil Erosion:**

The Ottawa County Water Resource Commissioner's office is responsible for enforcement of the Soil Erosion and Sedimentation Control Act, Part 91 of P.A. 451, 1994 as amended. The office is also responsible for an Ordinance to establish rules and regulations to control soil erosion and sedimentation, to establish a system of permits for the regulation of earth changes, to establish the Ottawa County Drain Commissioner as the Officer responsible for implementation and enforcement, and to establish a system of fees, penalties, and civil infraction penalties for the violation of the Ordinance, all as authorized by the Part 91 Soil Erosion and Sedimentation Control of the Natural Resources and Environmental Protection Act, Act 451 of the Public Acts of 1994 as amended.

WATERSHED ORGANIZATIONS IN OTTAWA COUNTY

Lower Grand Watershed

The Lower Grand River Watershed Project resulted in a nonpoint source watershed management plan for the approximately 3,020 square miles of the Lower Grand River Watershed (LGRW). This was made possible as a result of a 319 Nonpoint Source Watershed Planning Grant. A nonpoint source plan can improve water quality, and the quality of life in human communities. The draft version of the 2010 LGRW Management Plan is now available for review.

The LGRW has many small rivers and streams that have been studied, and some already have their own nonpoint source plans. The idea behind creating a plan for the large basin of the LGRW was to focus human, financial, and technical resources across political boundaries and sub-watershed boundaries. The project included numerous communities, agencies, and institutions. The LGRW boundary falls over ten counties and over 120 sub-watersheds. Many communities gave either time or financial support to this project.

Ottawa County participants included:

Ottawa County Water Resources Commissioner

Ottawa County Road Commission

Ottawa County

Ottawa County Jurisdiction participants included:

City of Coopersville	Spring Lake Twp.
City of Ferrysburg	Tallmadge Twp.
City of Grand Haven	Wright Twp.
City of Hudsonville	Allendale Charter Twp.
Chester Twp.	Georgetown Charter Twp.
Crockery Twp.	Robinson Twp.

A portion of the project dealt with two pilot project areas in the LGRW. The LGRW is very large and to gain an understanding of what is happening in the watershed, two smaller sub-watersheds were studied. The LGRW was divided into two major land uses, rural and urban. It was decided by project members that one pilot project would be focused on rural watershed issues, Sand Creek Watershed, and that the other would be focused on urban watershed issues, Buck Creek Watershed.

As a result of these pilot projects, two nonpoint source management plans were developed and can now be used as examples for other subwatersheds in the LGRW to make management plans:

Click here for a copy of the Sand Creek Management Plan
Click here for a copy of the Buck Creek Management Plan

Sand Creek Watershed

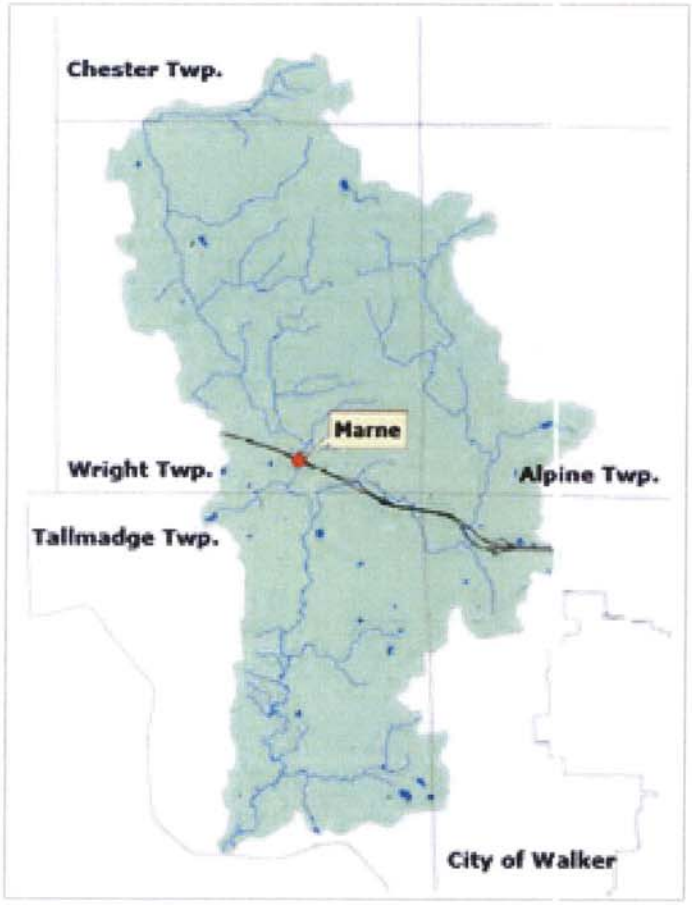
Sand Creek Watershed is part of the Grand River Watershed. It is covered by parts of Tallmadge, Wright, Chester Townships in Ottawa County.

Sand Creek is:

- 22 miles in length
- 55 square miles in area
- A tributary to the Grand River
- A designated cold water stream

Based on the 2003 Sand Creek Watershed Plan, there were 8 known pollutants identified as impacting the Sand Creek Watershed. They were sediment, nutrients, temperature, changes in flow, bacteria, oil/grease,

invasive/exotic plant species, and trash. The greatest potential threat to the water quality of Sand Creek comes from storm water runoff.



Macatawa Watershed

The Macatawa Watershed covers approximately 175 square miles of land and consists of all the land that drains to Lake Macatawa, including all or part of Fillmore, Overisel, Holland, Park, Zeeland, Port Sheldon, Olive and Blendon Townships and the cities of Holland and Zeeland.

The Macatawa Watershed Project was created in 1999 with a goal to reduce the amount of phosphorus that enters Lake Macatawa by rain runoff by approximately 70% through public awareness, education, and Best Management Practices.

The Watershed Project works with local units of government, farmers, homeowners, developers, educators, and other members of the community to increase awareness of how we impact the watershed, and what we can do to help reduce phosphorus. This information is detailed in the Macatawa Watershed Phosphorus Reduction Implementation Plan.

Pigeon Creek Watershed

The Pigeon River Watershed is located in west-central Ottawa County, covering 41,395 acres or roughly 65 square miles. The main branch of the Pigeon River, which is 11.8 miles from 104th Ave. to the mouth, flows through the center of Port Sheldon and Olive Townships. Most of the tributaries are county drains, road ditches, or private ditches. The head waters are contained in Blendon Township, with reaches of the watershed touching Grand Haven, Robinson, Park and Zeeland Townships.

The Pigeon River Watershed consists of all the land area and water bodies that drain into the Pigeon River, flowing into Pigeon Lake and then into Lake Michigan.

The focus of the Pigeon River Watershed Project is to improve water quality and enhance the designated uses listed below by educating and informing the community and installing conservation practices and landowners in improving the quality of "their" watershed.

Agriculture
Habitat and Indigenous Aquatic Life and Wildlife
Industrial Water Supply
Partial or Total Body Contact Recreation
Public Water Supply at the Point of Intake
Warm Water Fishery
Cold Water Fisher

LAW ENFORCEMENT AND FIRE IN OTTAWA COUNTY

Fire Departments:

Allendale Twp.	Grand Haven City	Olive Twp.	Robinson Twp.
Blendon Twp.	Grand Haven Twp.	Chester Twp.	Port Sheldon Twp.
Coopersville City	Holland City	Spring Lake Twp.	Park Twp.
Crockery Twp.	Holland Twp.	Polkton Twp.	Wright/Tallmadge
Georgetown Twp.	Hudsonville City	Jamestown Twp.	Zeeland City
Ferrysburg			Zeeland Twp.

Law Enforcement Agencies:

Ottawa County Sheriff	Hope College Campus Safety
Grand Haven Dept. of Public Safety	Grand Valley Police Department
Holland Department of Public Safety	Zeeland Police

JURISDICTIONS IN OTTAWA COUNTY

Allendale Charter Township http://www.allendale-twp.org/

Allendale storm water: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

Allendale utilities: http://www.allendale-twp.org/clerk/publicworks.html

Allendale (GVSU)

http://www.gvsu.edu/stormwater/

http://www.gvsu.edu/wri/isc/index.cfm?id=5D222890-DC3E-FE05-6449A01A6C69980D

http://www.gvsu.edu/cms3/assets/56DCA9CB-EC2F-5B8F-2554D65FC045BC23/epagrantdocs/wampler_storm_water_report_8_7_09.pdf

http://www.gvsu.edu/sustainability/water-271.htm

Blendon Township

http://www.blendontownship-mi.gov/

Road Department

Under the supervision of the Engineering Director, the Roads and Bridges Department is responsible for the preparation of plans and specifications, construction engineering and coordinating construction activities with other departments and agencies. These activities pertain to road resurfacing, road reconstruction, bridge replacement, bridge rehabilitation, and culvert replacement.

Chester Township http://www.chester-twp.org/

RELEVANT DEPARTMENTS:

Supervisor
Clerk
Zoning & Planning
Assessor
Building Dept.
Fire

City of Coopersville http://cityofcoopersville.com/

Coopersville functions under a Council/Manager government. With this system, the City Council acts as the legislative and policy-making voice of the city. It is an elected body, with the Mayor and Council Members chosen by the voters. The City Council appoints a City Manager, who serves as the city's chief administrator.

RELEVANT DEPARTMENTS (Coopersville):

City Manager

City Assessor
Building Department

Department of Public Works
Fire Department
Planning and Zoning Department
Ottawa County Sheriff

Water and Sewer Department

Crockery Township http://www.crockery-township.org/

City of Ferrysburg http://www.ferrysburg.org/

Georgetown Charter Township http://www.gtwp.com/

RELEVANT DEPARTMENTS:
Department of Public works
Water

Cross Connections Ordinance Section 58-44
Limiting Use- Section 58-45
Sanitary Sewer

Backwater preventer aka Backflow preventer
A backwater valve will help prevent raw sewage from backing up into your basement by allowing sewage to only flow one way (out of your home).

City of Grand Haven http://www.grandhaven.org/

The City of Grand Haven has an Emergency Manager.

Grand Haven Board of Light & Power: http://www.ghblp.org/

Grand Haven Master Plan:
http://www.grandhaven.org/uploads/pdf_documents/departments/planning_building/city_of_gh_2010_adopted_mp_final_doc020110.pdf

RELEVANT DEPARTMENTS/SERVICES:

Assessor
City Clerk
City Manager
Planning & Community Development
Public Safety
Public Works
Wastewater
Water Filtration

Grand Haven Charter Township http://www.ght.org/

RELEVANT DEPARTMENTS:

Assessing
Community Development
Fire & Rescue
Public Services

Stormwater

One of the most significant, yet unrecognized groups of water contaminants is storm water pollutants. When it rains, storm water runs over yards, streets, roads, highways, parking lots, parks, and playgrounds, carrying with it everything in its path, including debris and pollutants. Eventually, the water will travel to a stream, either over land or via a storm drain. Storm drains are frequently located alongside streets and parking lots. Unlike sanitary sewers that divert water to a treatment plant directly from your home, storm drains lead directly to surrounding lakes and rivers without any type of treatment. All the debris and pollutants that were picked up by storm water runoff, end up in your lakes and streams!

National Pollutant Discharge Elimination System (NPDES) Phase II Program

The Clean Water Act of 1972 set up the NPDES. The NPDES program required communities around the country with urbanized areas to begin tackling the issue of storm water pollution. In recent years, several communities in Kent and Ottawa Counties were required to develop an illicit discharge elimination program (IDEP). The IDEP was required to include an investigation of the waters of the state to identify, and eventually eliminate, illicit discharges and connections to the storm sewer.

Water

Grand Haven Charter Township operates two water distribution systems. The largest system receives its water from the North Ottawa Water System or NOWS water treatment plant located within the city of Grand Haven. NOWS is a joint municipal water system providing water to the cities of Grand Haven, Ferrysburg, the village of Spring Lake, and the townships of Grand Haven, Spring Lake, Robinson and Crockery.

The second distribution system serves the southern third of the township and receives its water from the Grand Rapids water treatment plant.

The township's water distribution system includes two 500,000 above ground storage tanks and 86 miles of water mains. About 530 million gallons of water are distributed annually to 4,500 homes and businesses. This is approximately a 175% increase since 1990.

City of Holland http://www.cityofholland.com/

The City of Holland has an Emergency Manager.

Water

Part 14 of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended and the Water Supply Cross Connection Rules of the Michigan Department of Environmental Quality, R 325.11401 to R 325.11407 of the Michigan Administrative Code, contain the rules that public water systems must follow regarding

cross connection control. Section 37-28 of the City of Holland Code of Ordinances charges the Holland BPW with determining the presence of cross-connections in the municipal water system.

Water Distribution in Holland, MI

The Holland Board of Public Works' water distribution system contains 230 miles of water main. It is located mostly within the City of Holland, with some sections of Park, Laketown, and Holland Charter Townships included. Most of the water mains are 6, 8, or 12 inch diameter, but some are as large as 36 inch diameter. There are approximately 13,000 service connections and over 2,300 fire hydrants. There are four water storage tanks, and five pump stations pumping to five pressure zones within the system.

The Water Filtration Plant, located on Lake Michigan, began operating in 1955. It filters 38.5 million gallons per day (MGD).

Wastewater

The Holland Board of Public Works maintains all of the sanitary sewer collection system south of Lake Macatawa and the Macatawa River. This system contains nearly 190 miles of sanitary sewer pipe and 34 sewage lift stations. It is located mostly within the City of Holland, but also includes portions of Park, Laketown, Fillmore and Holland Charter Township. The majority of the system is 8-inch pipe with some pipes as large as 36-inches. The system is a separated system meaning that surface drainage is collected into a system known as the storm sewers and drains and the sewage from homes and businesses go into a separate system known as the sanitary sewer system.

Industrial Pretreatment Program: Protecting the health and safety of the public and the environment

The Pollution Control Department is a division of the Holland Area Wastewater Treatment Plant. The purpose of the program is to regulate the disposal of industrial wastewater into the sanitary wastewater collection system and to protect physical structures and the safety of operation and maintenance personnel of the wastewater system (collection and treatment). The program ensures compliance with pretreatment regulations as required under the Federal General Pretreatment Regulations and Categorical Standards and local source control ordinances.

Electric

The Holland Board of Public Works owns three electric generation facilities: the James De Young Power Plant; 48th Street Generation Station; and 6th Street Generation Station.

In addition, the Holland Board of Public Works owns shares in the J.H. Campbell Complex and the Belle River Plant, both are coal fired electrical generating plants. The plants are operated by Consumers Energy and Detroit Edison, respectively.

Gas Pipeline

The Holland Board of Public Works does not provide natural gas service to customers. However the Holland Board of Public Works owns and operates a natural gas pipeline that traverses a portion of Allegan County. This pipeline is a transmission line only, supplying natural gas to our three electric generating turbines at our 48th Street Generation Station.

Holland Charter Township http://www.hct.holland.mi.us/

Roads (administered by Ottawa County Road Commission)

Storm drainage system (administered by Ottawa County Water Resources Commission)
Street lighting (lighting services provided by Consumers Energy, Holland Board of Public Works, and Zeeland Board of Public Works)

City of Hudsonville http://www.hudsonville.org/

Department of Public Works
Storm Sewer
http://www.gvsu.edu/wri/
http://www.lowergrandriver.org/
http://www.epa.gov/weatherchannel/stormwater.html
Cross connection control program
Hazardous Waste
http://co.ottawa.mi.us/HealthComm/Health/Waste.htm

RELEVANT DEPARTMENTS:

City Commission
City Manager
Assessing Department
Planning/Zoning Department
Department of Public Works
Emergency Management
Fire Department
Sheriff Department

Jamestown Township http://www.twp.jamestown.mi.us/

Supervisor

http://cfpub.epa.gov/npdes/home.cfm?program_id=6
http://water.epa.gov/polwaste/nps/nps.cfm

Olive Township http://www.olivetownship.com/

RELEVANT DEPARTMENTS:

Supervisor
Township Assessor
Planning and Zoning
Fire Department

Park Township http://www.parktownship.org/

Park Township is a general law Township established in 1915, consisting of approximately 20 square miles divided by Lake Macatawa with over 90% lying North of the lake.

A seven-member board elected at large, consisting of the Supervisor, Clerk, Treasurer and four Trustees governs the Township.

Land use is primarily residential and agricultural with a small amount of commercial. The township has no industrial zoning district.

RELEVANT DEPARTMENTS:

Assessing
Building and Zoning
Clerk
Fire Department
Recreation
Utilities

Polkton Township http://www.polktontownship.com/

Polkton's Master Plan can be found under the "resources" tab on the side of their website.

Port Sheldon Township http://www.portsheldontwp.org/

RELEVANT DEPARTMENTS:

Supervisor
Assessor
Fire
Building
Planning & Zoning
Parks & Recreation

Wyoming (Kent County) Water Treatment Plant is located in Port Sheldon Township.
The only industrial property in the township is the sight of the Consumers Energy Campbell Plant.

Robinson Township http://www.robinson-twp.org/

RELEVANT DEPARTMENTS:

Assessor's Office
Building & Zoning
Fire Department
Parks & Recreation
Supervisor's Office

Village of Spring Lake http://springlakevillage.org/

The Village of Spring Lake is run by a Council – Manager form of government. There is an elected Village Council and Village President. The Village Council hires a Village Manager who hires and supervises the Village staff and runs the day to day operations of the Village.

There are no wards in the Village; the six members of Village Council are elected at large from the community. Village Council members are elected for staggered four-year terms. The Village President is elected every two years.

The government is also made up of a number of Boards and Commission that act in an advisory capacity to the Village Council. These include the Planning Commission, the Zoning Board of Appeals, the Central Business District Development Authority (CBDDA), Historic Conservation District Commission, Parks and Recreation Committee, to name a few.

RELEVANT DEPARTMENTS:

Village Manager
Dept. of Public Works (DPW)
Police

Master Plan: http://springlakevillage.org/images/pdf/Master%20Plan%20-%20Finished%20Copy%20from%20CD.pdf

Spring Lake Township http://www.springlaketwp.org/

RELEVANT DEPARTMENTS:

Assessing
Building & Planning
Fire
Law Enforcement
Manager
Parks & Recreation
Water & Sewer

APPLICABLE ORDINANCES:

Storm Water Management Ordinance:

http://library.municode.com/HTML/14508/level3/COOR_CH14EN_ARTVISTMA.html#TOPTITLE

Water System Ordinance:

http://library.municode.com/HTML/14508/level4/COOR_CH38UT_ARTIIWA_DIV2WASY.html#TOPTITLE

Sewer Usage Ordinance:

http://library.municode.com/HTML/14508/level3/COOR_CH38UT_ARTIIISEUSAD.html#TOPTITLE

Fertilizer Use:

http://library.municode.com/HTML/14508/level3/COOR_CH14EN_ARTIVUSFE.html#TOPTITLE

Tallmadge & Wright Townships http://www.tallmadge.com/ http://wrighttownship.com/

Wright Township officials include a Supervisor, Clerk, Assessor, Treasurer and two Trustees.

Tallmadge Township officials include a Supervisor, Clerk, Assessor, Planner, Treasurer and four Trustees.

Both have floodplain ordinances, both belong to the Sand Creek Watershed Council.
They share a fire department with 2 stations.

City of Zeeland http://ci.zeeland.mi.us/

The City of Zeeland operates a Clean Water Treatment Plant that treats affluent water from residential homes and businesses. The treatment plant is operated by licensed personnel. The CWTP is notified when hazardous spills occur that can drain into the collection system so that the water may be properly treated.

Zeeland Street Department has large equipment including dump trucks with scrapers and plows used for hauling sand and gravel, sand spreaders, backhoes, loader and street sweeper with long suction hose. This equipment can be used to dike an area of a spill, clean out street drains, and clean streets of debris.

Master Plan:
http://ci.zeeland.mi.us/LinkClick.aspx?fileticket=Fmm%2bclnwwlM%3d&tabid=3463&mid=5506

The Fire Chief in the City of Zeeland also functions as their Emergency Manager and they have an EOC.

Zeeland Charter Township http://www.zeelandtwp.org/

RELEVANT DEPARTMENTS:

Assessing
Fire Department
Township Parks

Zeeland Charter Twp. MASTER PLAN:
http://www.zeelandtwp.org/Portals/0/Maps/finalMasterPlan.pdf

Hazard Mitigation Objectives by Jurisdiction

The following table provides a local breakdown of hazard mitigation actions and considerations that are considered acceptable for local jurisdictions participating in this regional plan. The column headers contain abbreviations for the following hazard mitigation objectives:

1. "Communication" – Actions to bolster the dependability of emergency communication systems.

2. "Emergency Notification" – Actions to strengthen and maintain emergency notification systems.

3. "Consider NFIP" – Those communities that have not yet, give consideration to the potential benefits of active NFIP participation.

4. "Masterplan Consideration" – Giving consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps (or other plans and documents, as appropriate).

5. "Flood Mitigation" – Coordinating in the voluntary purchase of developed properties with structures at risk from significant and regular flooding, or other actions associated with floodplain management.

6. "Severe Weather." – Severe weather preparedness, such as the tracking and identification of warning system needs, the promotion of public awareness/education, investigation of new warning technology and shelter sites, consideration or use of emergency generators, training of emergency responders and community officials, participation in exercises and planning activities, keeping resources/equipment prepared for response and recovery activities.

7. "Infrastructure Strength." – Consideration of and coordination in infrastructure-strengthening activities and studies, which may include drainage needs, other infrastructure and utilities, to maintain and improve capabilities and performance.

8. "Fire Preparedness." – Fire-related actions such as prevention and awareness activities, evaluating staffing, training, and resource needs, consideration of fire-related regulations, evaluation of equipment, water supplies and wildfire risks.

The following table represents the known willingness of communities at the time of writing. Communities may decide, as necessary and appropriate, to pursue additional hazard mitigation activities subsequent to the adoption of this plan.

Hazard Mitigation Objectives By Jurisdiction	Climate Change	Commuication Failure Mitigation	Emergency Warning and Notification	Consider NFIP	Masterplan Consideration	Flood Mitigation	Intentional Acts	Infrastructure Strengthening	Fire Preparedness
Ada Township (K)		Y	Y	NFIP	Y	Y		Y	Y
Algoma Township (K)			Y	NFIP	Y			Y	Y
Allendale Township/GVSU (O)			YY	NFIP	Y		Y	Y	YY
Alpine Township (K)			Y	NFIP	Y	Y	Y		Y
Blendon Township (O)			Y	NFIP	Y			Y	Y
Bowne Township (K)			Y	Y		Y		Y	Y
Byron Township (K)			Y	Y	Y	Y		Y	Y
Caledonia Township (K)			Y	NFIP	Y			Y	Y
Village of Caledonia (K)			Y	Y	Y	Y		Y	Y
Cannon Township (K)		Y	Y	NFIP	Y			Y	Y
Cascade Township (K)			Y	NFIP	Y			Y	Y
Village of Casnovia (K)			Y	Y	Y	Y		Y	Y
City of Cedar Springs (K)			Y	Y	Y	Y		Y	Y
Chester Township (O)	Y	Y	Y	NFIP		Y		Y	Y
City of Coopersville (O)			Y	NFIP	Y			Y	Y
Courtland Township (K)			Y	Y	Y	Y		Y	Y
Crockery Township (O)			Y	NFIP	Y			Y	Y
City of East Grand Rapids (K)			Y	NFIP	Y			Y	Y
City of Ferrysburg (O)			Y	NFIP	Y			Y	Y
Gaines Township (K)			Y	Y	Y	Y		Y	Y
Georgetown Township (O)			Y	NFIP	Y	Y		Y	Y
City of Grand Haven (O)			Y	NFIP	Y			Y	Y
Grand Haven Township (O)			Y	NFIP	Y			Y	Y
City of Grand Rapids (K)	Y		Y	NFIP				Y	Y
Grand Rapids Township (K)			Y	Y	Y	Y		Y	Y
City of Grandville (K) NFIP			Y	NFIP	Y	Y	Y	Y	Y
Grattan Township (K)			Y	Y	Y	Y		Y	Y
City of Holland (O)			Y	NFIP	Y	Y		Y	Y
Holland Township (O)			Y	NFIP	Y	Y		Y	
City of Hudsonville (O)			Y	NFIP	Y			Y	Y
Jamestown Township (O)			Y	NFIP	Y			Y	Y

Hazard Mitigation Objectives By Jurisdiction *(continued)*	Climate Change	Commuication Disruption	Emergency Warning and Notification	Consider NFIP	Masterplan Consideration	Flood Mitigation	Intentional Acts	Infrastructure Strengthening	Fire Preparedness
Village of Kent City (K)			Y	Y	Y	Y		Y	Y
Kent County (part NFIP)		Y	Y	Y	Y	Y		Y	Y
City of Kentwood (K)	Y	Y	Y	NFIP	Y			Y	
City of Lowell (K)			Y	NFIP	Y			Y	Y
Lowell Township (K)			Y	Y	Y	Y		Y	Y
Nelson Township (K)			Y	Y	Y	Y		Y	
Oakfield Township (K)			Y	Y	Y	Y		Y	Y
Olive Township (O)			Y	NFIP	Y			Y	Y
Ottawa County		Y	Y	NFIP	Y	Y		Y	
Park Township (O)			Y	NFIP	Y			Y	Y
Plainfield Township (K)			Y	NFIP	Y	Y		Y	Y
Polkton Township (O)			Y	NFIP	Y			Y	Y
Port Sheldon Township (O)			Y	NFIP	Y			Y	Y
City of Rockford (K)			Y	Y	Y	Y		Y	Y
Robinson Township (O)		Y	Y	NFIP	Y	Y			Y
Village of Sand Lake (K)			Y	Y	Y	Y		Y	Y
Solon Township (K)			Y	Y	Y			Y	Y
Sparta Township (K)			Y	NFIP	Y			Y	Y
Village of Sparta (K)			Y	NFIP	Y			Y	Y
Spencer Township (K)			Y	Y	Y	Y		Y	Y
Spring Lake Township (O)			Y	NFIP	Y			Y	Y
Village of Spring Lake (O)			Y	NFIP	Y	Y		Y	Y
Tallmadge Township (O)			Y	NFIP	Y			Y	Y
Tyrone Township (K)			Y	Y	Y	Y		Y	Y
Vergennes Township (K)			Y	Y	Y	Y		Y	Y
City of Walker (K)			Y	NFIP	Y	Y	Y	Y	Y
Wright Township (O)			Y	NFIP	Y			Y	Y
City of Wyoming (K)			Y	NFIP	Y			Y	Y
City of Zeeland (O)			Y	NFIP	Y	Y	Y	Y	Y
Zeeland Township (O) NFIP			Y	NFIP	Y			Y	Y

HAZARD MITIGATION PLAN 2017

SECTION THREE - ACTION PLAN: AUTHORITIES & RESOURCES

Goal

The goal of the regional Hazard Mitigation Plan is to reduce the impact of hazards on citizen life, health and economic well-being based on a continuing hazard risk and vulnerability analysis.

CW 15

Strategy

As a regional plan representing multiple agencies and jurisdictions, shared agreement exists regarding the need to mitigate the following top-priority hazards throughout the planning area.

Severe Weather – Timely alerts and notification information will be provided to the entire region during periods of threatening weather. Efforts toward public awareness and education about these hazards will be encouraged and promoted as resources permit.

Flooding – Efforts will continue to reduce the number of vulnerable structures in floodplain areas and make any such at-risk properties less vulnerable as resources and the informed cooperation of property owners permits. Previous mitigation actions include:

- ✓ The installation of better seals on sanitary sewer manholes.
- ✓ Raising the height of sanitary sewer manholes above the level of possible floodwaters.
- ✓ Covering the sanitary sewer openings in open basements during new construction projects.
- ✓ Improvements along Bliss Creek in Georgetown Township to alleviate flooding near the intersection of 44th Street and Kenowa Avenue.
- ✓ Construction of a relief drain at the Rose Drain in Zeeland.
- ✓ Construction of a flood control berm near Pine Creek in Holland Township, to help protect a home there.
- ✓ The installation of culverts where US-31 crosses New Holland Street, Quincy Street, and Riley Street.
- ✓ Improvements to three dams (Berens, Steenwyk, and Timmer) in the Black Creek Watershed
- ✓ Removal of flood-prone structures in Robinson Township, through two PDMP project grants from 2005.
- ✓ The removal of a flood-prone structure in Ada Township, through a PDMP project grant from 2006.
- ✓ An HMGP 1527 project grant for flood-prone property acquisitions through the Kent County Drain Commission.
- ✓ Ongoing work on flood-prone property acquisitions in Plainfield Township, through an HMGP 1777 project grant.
- ✓ A culvert replacement and acquired structure in Coopersville, through an HMGP 1346 project grant.
- ✓ The Plaster Creek flood control project in Grand Rapids, through an HMGP 1346 project grant.
- ✓ A culvert/bridge upgrade in Kent City, through an HMGP 1346 project grant.
- ✓ An HMGP 1346 grant-funded stormwater project in Kentwood.
- ✓ Two flood-prone structural acquisition projects through the Ottawa County Parks Department (one through an HMGP 1226 project grant and the other through an HMGP 1346 project grant).
- ✓ A culvert project of the Ottawa County Road Commission, funded through an HMGP 1346 grant.

- ✓ The acquisition of 3 flood-prone properties in the City of Wyoming, through an HMGP 1237 grant.
- ✓ A bridge replacement project (improving water flows) in Wyoming, through an HMGP 1226 grant.
- ✓ Two Ottawa County storm water/drain projects, through the Drain Commission and HMGP 1181 grants.
- ✓ An acquisition project in the City of Holland, through an HMGP 1181 grant.
- ✓ New acquisition projects for Plainfield Township, through HMGP 1777 and PDMP FY 2011 grants.
- ✓ An acquisition project involving 8 structures in Grand Rapids, through a PDMP FY 2011 grant.
- ✓ A $2.4 million reconstruction of 12th Street in Holland, including new storm drain pipes and a relief drain emptying into Lake Macatawa, intended to eliminate most of the flood problems in the downtown residential areas.

Strategies for further flood mitigation will include coordination with area planning and development agencies to discourage the further development of property that would, through its location or design, place any additional residents, businesses, visitors, or workers into any situation of undue risk. Proper land use management and strict enforcement of building codes can make communities safer from flood hazards and help reduce the high costs of flood losses.

Communication Failure – Continued reductions in communication infrastructure downtime will be sought and maintained, when possible. Redundant forms of communication are sought and maintained to ensure sustained capability.

Other Hazard Mitigation Measures – Other cost-effective or feasible hazard mitigation measures will be sought and considered as opportunities and resources permit in order to address any of the hazards considered within this plan.

Objectives

The risk assessment indicates general hazard risks through its scoring system, but hazard mitigation actions cannot simply be prioritized on the basis of estimated overall risks. Since many hazards are intertwined, project selection favored activities with the potential to lessen the impact of more than one hazard. Action plan priorities therefore involved a grouping of common hazard scores together, to favor such multi-purpose activities as shown below. A multi-functional approach was considered to be the most cost-effective and efficient way to address such a wide array of hazards. Although cost-effectiveness, political feasibility, equity and environmental issues, and technical feasibility were always part of the considerations involved in the strategy selection process (along with a preference for activities and resources that are more specific to the hazard mitigation phase of emergency management), a formal cost-benefit analysis will be added to some of the physical/structural projects as part of a formal application process for federal grants and other appropriate funding sources.

CW 17

Severe Weather (and other emergency) notification: tornado (456), thunderstorm (435), intentional acts (408), hazardous material releases (393), dam failures (384/354), nuclear power plant accidents (339), wildfires (330), cumulative score—2715.

a. Survey needs and add sirens to regions as needed.
b. Enhance, strengthen, and maintain emergency notification systems throughout the region. Investigate and acquire new warning technology as it becomes available.
c. Consider (and encourage) construction techniques and structural upgrades for weather resistance (e.g. wind resistance, safe rooms, ice dam prevention, leak prevention, storm sheltering, etc.)

CW 17

Flooding: riverine flooding (447), urban flooding (411), dam failures (384/354), shoreline flooding/erosion (342), cumulative score—1584

a. All communities in Kent County to consider NFIP participation.
b. Purchase eligible properties that are vulnerable to flooding as funds become available.
c. Decrease human susceptibility to flooding. Encourage flood-proofing homes and businesses.
d. Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in floodplains, and where feasible, include flood considerations in local and regional development plans; building permits; transportation and other infrastructure projects and plans; and capital facilities planning, construction and renovation.

CW 14

National Flood Insurance Program (NFIP) Participation

OTTAWA COUNTY

CID	Community Name	County	FHBM Ident.	FIRM Ident.	Current Map Date	Reg-Emer Date
260490#	ALLENDALE TWP.	OTTAWA COUNTY	03/25/77	07/05/82	05/16/13	07/05/82
261005#	BLENDON TWP.	OTTAWA COUNTY		12/16/11	(NSFHA)	05/16/13
260829#	CHESTER TWP.	OTTAWA COUNTY		11/20/91	12/16/11(M)	11/20/91
260491#	COOPERSVILLE CITY	OTTAWA COUNTY	09/26/75	03/02/83	12/16/11	03/02/83
260981#	CROCKERY TWP.	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
260184#	FERRYSBURG CITY	OTTAWA COUNTY	06/28/74	03/01/78	12/16/11	03/01/78
260589#	GEORGETOWN TWP.	OTTAWA COUNTY	09/26/75	07/18/85	05/16/13	07/18/85
260269#	GRAND HAVEN CITY	OTTAWA COUNTY	06/28/74	02/15/78	12/16/11	02/15/78
260270#	GRAND HAVEN TWP.	OTTAWA COUNTY	08/02/74	01/16/81	12/16/11	01/16/81
260006#	HOLLAND CITY	OTTAWA/ALLEGAN	04/12/74	11/15/78	12/16/11	11/15/78
260492#	HOLLAND TWP.	OTTAWA COUNTY	08/12/77	12/01/83	12/16/11	12/01/83
260493#	HUDSONVILLE CITY	OTTAWA COUNTY	09/05/75	12/04/84	12/16/11	12/04/84
261001#	JAMESTOWN TWP.	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
261006#	OLIVE TWP.	OTTAWA COUNTY		12/16/11	(NSFHA)	12/22/97(E)
260185#	PARK TWP.	OTTAWA COUNTY	08/16/74	05/15/78	12/16/11	05/15/78
260923#	POLKTON TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11
260278#	PORT SHELDON TWP.	OTTAWA COUNTY	08/16/74	05/15/78	12/16/11	05/15/78
260913#	ROBINSON TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11
260281#	SPRING LAKE TWP.	OTTAWA COUNTY	06/28/74	02/15/78	12/16/11	02/15/78
260282#	SPRING LAKE VILLAGE	OTTAWA COUNTY	06/28/74	06/01/78	12/16/11	06/01/78
260494#	TALLMADGE TWP.	OTTAWA COUNTY	06/10/77	03/02/83	05/16/13	03/02/83
260495#	WRIGHT TWP.	OTTAWA COUNTY	05/27/77	12/16/11	12/16/11(M)	11/12/97
260983#	ZEELAND CITY	OTTAWA COUNTY		12/16/11	12/16/11	06/24/14
260932#	ZEELAND TWP.	OTTAWA COUNTY		12/16/11	12/16/11	12/16/11

CW 14a

NOTE: All of Ottawa County Jurisdictions participate in the NFIP

CW 14

KENT COUNTY

CID	Community Name	County	FHBM Ident.	FIRM Ident.	Current Map Date	Reg-Emer Date
260248#	ADA TWP.	KENT COUNTY	11/22/74	10/15/80	10/15/80	10/15/80
260738#	ALGOMA TWP.	KENT COUNTY		01/03/85	01/03/85	01/03/85
260961	ALPINE TWP.	KENT COUNTY				02/26/02(E)
260693#	CALEDONIA TWP.	KENT COUNTY	03/24/78	07/02/81	07/02/81	07/02/81
260734#	CANNON TWP.	KENT COUNTY		09/16/88	09/16/88(M)	09/16/88
260814#	CASCADE TWP.	KENT COUNTY		11/06/91	11/06/91(M)	11/06/91
260105#	EAST GRAND RAPIDS	KENT COUNTY	05/17/74	09/03/80	09/03/80	09/03/80
260106#	GRAND RAPIDS CITY	KENT COUNTY	11/09/73	01/17/79	11/05/86	01/17/79
260271#	GRANDVILLE	KENT COUNTY	07/13/73	09/16/82	09/16/82	09/16/82
260107#	KENTWOOD CITY	KENT COUNTY	11/02/73	11/18/81	11/18/81	11/18/81
260108#	LOWELL CITY	KENT COUNTY	05/10/74	05/16/83	05/16/83	05/16/83
260109#	PLAINFIELD TWP.	KENT COUNTY	11/09/73	01/02/81	01/02/81	01/02/81
260741#	SPARTA TWP.	KENT COUNTY		01/03/85	01/03/85	01/03/85
260336#	SPARTA VILLAGE	KENT COUNTY	10/15/76	02/16/83	02/16/83	02/16/83
260110#	WALKER CITY	KENT COUNTY	10/12/73	06/01/82	06/01/82	06/01/82
260111#	WYOMING CITY	KENT COUNTY	11/09/73	09/02/82	02/05/92	09/02/82

CW 17

Communication Failure: electrical failure (504), communications failure (444), cumulative score—948

a. Identify infrastructure vulnerabilities.
b. Work with local utilities to develop a plan.
c. Implement measures identified in the plan.

CW 17

Other Hazard Mitigation Measures: individually or jointly as appropriate: transportation accidents (393), urban/structural fires (390), water system failures (384), natural epidemic (381), sanitary sewer failure (366), earthquakes (327), drought (321/273), other fires (276), landslides (243/240). (Cumulative score not provided here—varies with the specific type of hazard mitigation strategy selected.)

a. Area Master Plan updates to consider hazard mitigation concepts and actions.

Existing Authorities and Resources

The assessment of which hazard mitigation actions are considered feasible, is partially rooted in knowledge of existing authorities, policies, programs, and the resources available to accomplish the envisioned mitigation projects. Although this is well-known to many local leaders (and used to select and prioritize various projects), the following summaries are provided to give other agencies an idea of the various resources (or resource limitations) that exist for the most relevant jurisdictions and agencies throughout the Kent and Ottawa County region. As stated in the main text of the plan, all communities have their own zoning.

KENT COUNTY AUTHORITIES AND RESOURCES

http://www.accesskent.com/

CW 13

Kent County Sheriff Dept.

http://www.accesskent.com/CourtsAndLawEnforcement/SheriffsDepartment/

https://www.accesskent.com/Sheriff/LEPC/

https://www.accesskent.com/Sheriff/getready/

http://www.kcraces.net/

http://www.weather.gov/

https://www.accesskent.com/Sheriff/meds_drop-off.htm

Kent County Road Commission

http://www.kentcountyroads.net/

Kent County Department of Public Works

http://www.accesskent.com/YourGovernment/PublicWorks/PublicWorks.htm

- Solid Waste Management
  http://www.accesskent.com/YourGovernment/PublicWorks/dpw_waste.htm
- Waste to Energy Facility
  http://www.accesskent.com/YourGovernment/PublicWorks/wte.htm
- Recycling and Education
  http://www.accesskent.com/YourGovernment/PublicWorks/mrf.htm
- Hazardous Waste Program
  http://www.accesskent.com/YourGovernment/PublicWorks/recycle_household.htm
- Recycling in Kent County
  http://www.accesskent.com/YourGovernment/PublicWorks/recycle_options.htm

Kent County Department of Equalization

http://www.accesskent.com/YourGovernment/Departments/BureauofEqualization/BureauofEqualization.htm

Kent County Drain Commission

http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_index.htm

- Storm water
  http://www.accesskent.com/YourGovernment/DrainCommisioner/stormwater_savvy.htm
- Drain Maps http://www.accesskent.com/YourGovernment/DrainCommisioner/drainmaps.htm
- Flood Insurance
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_insurance.htm
- Drain Developme
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_development.htm
- Stormwater Ord.
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_stormwater.htm
- Current Ordinances
  http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_projects.htm
- Permits http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_permits.htm
- Related Resources http://www.accesskent.com/YourGovernment/DrainCommisioner/links.htm
- Problem Reporting
  http://www.accesskent.com/YourGovernment/DrainCommisioner/contact.html

Overview

The County Drain Commissioner is elected to a four-year term to perform a number of duties assigned by State law. The office of the Drain Commissioner is responsible for the administration of the State Drain Code as it applies to the receipt of petitions for the establishment, improvement or maintenance of over 533 miles of County Drain and 356 storm water detention ponds in Kent County. Under the Subdivision Control Act, this office reviews storm water plans for all plats developed within the County and maintains records on over 1,800 developments. Other duties include the administration of 19 court established lake levels under the Lake Level Act, participation in the NPDES Phase II program, participation on lake improvement boards, maintenance of the GIS system as it pertains to County Drains and the resolution of citizen complaints and storm water concerns.

Currently, this office is actively developing a project and meeting with local government engineers to solve flooding of homes in the Shawmut Hills area of Grand Rapids, undertaking projects to address obstructions to the flow in the Troy with Mosher & Farnham Drain, the erosion of the stream bed and banks of the Black Creek Inter-County Drain which is causing sedimentation of Lincoln Lake, and is constructing a project on the Warner Drain to solve flooding problems experienced by homes at the upper end of the drainage district.

Goals of the Drain Commission

- Administer the Drain Code (Act 40, PA of 1956) as it pertains to the establishment and maintenance of drains in Kent County
- Administer the Subdivision Control Act (Act 288, PA of 1967) as it applies to stormwater management
- Administer Inland Lake Levels under Part 307 of the Natural Resources and Environmental Protection Act (Part 307, Act 451, PA of 1994) as it pertains to the establishment and maintenance of lake levels in Kent County

BLACK CREEK INTERCOUNTY DRAIN:

- Petition received on 08-15-06
- Drainage Board met for the Determination of Practicability on 10-19-06 and petition was found practicable
- Engineer was selected on 12-07-06
- Hearing of Necessity took place on 12-15-08 and project was found to be necessary

- An appeal against the Determination of Necessity was filed by Spencer and Nelson Townships on 12-23-08

KENOWA DRAIN

- Petition being circulated
- Drain Office meeting with the City of Walker on 03-12-09 to discuss possible solutions
- Scheduling Drain Board Meeting to Determine Necessity

SHAWMUT HILLS DRAIN

- Petition received 08-26-08
- Board of Determination met on 06-02-09 and found project to be necessary

TROY WITH MOSHER AND FARNHAM DRAIN

- Petition received on 05-20-09
- Scheduling Board of Determination

WATERS DRAIN

- Petition received on 05-07-07
- Board of Determination met on 01-17-08 and found project to be necessary
- Engineer was selected on 03-10-08
- DEQ Permit Application submitted on 01-30-09
- Bids received 06-01-09
- Day of Apportionment scheduled for 06-29-09
- Project Summary
- Drainage District Map
- Under Construction

WARNER DRAIN

- Petition received on 07-02-08
- Board of Determination met on 01-15-09 and found project to be necessary
- Request for Proposals from Engineers was sent out on 01-23-09
- Proposals due from Engineers on 03-06-09
- Stream survey complete
- Engineer Designing Drain Improvements

Development Drainage Rules and Fees: See website at:
http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_development.htm

Model Storm water Ordinance

The Drain Commissioner and many other individuals have worked on a Task Force to draft a model storm water ordinance since late 1999. This Task Force was started in anticipation of the Nation Pollution Discharge Elimination System Phase II (NPDES). NPDES Phase II are regulations created by the Environmental Protection Agency to address storm water discharges into the nation's lakes, rivers, streams, and the oceans.

Phase I of the regulations addressed the point discharges such as wastewater treatment plants and industrial discharges. Phase II of NPDES addresses non-point source pollution such as fertilizers, soil erosion, etc... that is carried into our inland lakes and streams by runoff.

The model ordinance that resulted from this collaborative effort is the result of many committee and subcommittee meetings. Input from Engineers, Legal Representatives, Biologists, Hydrologists, Developers and Local Officials was sought and incorporated into the document. The document can be obtained in pdf format from the link below or a copy can be picked up from the Drain Commissioner's Office.

Link to: Model Ordinance Document (36 page document)

Kent County storm water web site:
http://www.accesskent.com/YourGovernment/DrainCommisioner/stormwater_savvy.htm

Kent County Health Department

http://www.accesskent.com/Health/HealthDepartment/

- Communicable diseases
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/default.htm
- Illness prevention
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Illness_Prev.htm
- Health Education
  http://www.accesskent.com/Health/HealthDepartment/Health_Promotion/Health_Promotion.htm
- Resources for Health Care Providers
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Disease_Reporting.htm
- Resources for Schools/Daycare providers

  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/school_daycare.htm
- Data and Reports http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Reports.htm
- Additional Resources
  http://www.accesskent.com/Health/HealthDepartment/CD_Epid/Resources.htm
- Animal Control
  http://www.accesskent.com/Health/HealthDepartment/AnimalControl/kcas_index.htm
- Educational Services
  http://www.accesskent.com/Health/HealthDepartment/AnimalControl/kcas_serv_edu.htm

Kent County Department of Aeronautics
http://www.accesskent.com/YourGovernment/Departments/Aeronautics/aeronautics.htm

Kent County Information Technology Department

http://www.accesskent.com/YourGovernment/Departments/InformationTechnology

Kent County Housing Commission
http://www.accesskent.com/YourGovernment/Departments/HousingCommission/

Kent County/MSU Cooperative Extension

http://www.accesskent.com/CultureLeisureAndTransit/Kent_MSU_Ext/

Kent County Community Development
http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/CommunityDevelopment.htm

- Community Action Plan
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/action_plan.htm

- Housing Rehabilitation Program
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/Housing_Rehabilitation.htm

- Neighborhood Stabilization Program
  http://www.accesskent.com/YourGovernment/Departments/CommunityDevelopment/NSP.htm

Kent County Parks Department

http://www.accesskent.com/CultureLeisureAndTransit/Parks/

- County Parks

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/park_directory.htm
- Campgrounds

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/campground.htm
- Community Trails

  http://www.accesskent.com/CultureLeisureAndTransit/Parks/comm_trails.html
- Millennium Park

  http://www.accesskent.com/CultureLeisureAndTransit/MillenniumPark/
- Kent County Parks Master Plan

  http://www.accesskent.com/CultureLeisureAndTransit/MillenniumPark/masterplan.htm

Kent County Purchasing Department
http://www.accesskent.com/YourGovernment/Departments/Purchasing/pur_index.htm

Kent County Facilities Management

http://www.accesskent.com/YourGovernment/Departments/FacilitiesManagement/FacilitiesManagement.htm

JURISDICTIONS IN KENT COUNTY

Ada Township

http://ada.mi.us/

http://adamichigan.org/uploads/township/Planning-Zoning/Master-Plan/Master-Plan-Docs/Cover-Ack-TOC-11-06-07.pdf

Algoma Township

http://www.algomatwp.org/

http://www.algomatwp.org/documents/master_plan.php

Alpine Township

http://www.alpinetwp.org/

http://www.alpinetwp.org/Planning%20Zoning/2015%20Master%20Plan%20Update.pdf

Bowne Township

http://bownetwp.org/index.html

http://bownetwp.org/adobe/BowneEndFiles.pdf

Byron Township

http://www.byrontownship.org/index.php

http://www.byrontownship.org/documents/planzone/DDA%20Master%20Plan.pdf

http://www.byrontownship.org/department.php?d=24&p=97

http://www.byrontownship.org/department.php?d=24&p=98

Caledonia Township

http://www.caledoniatownship.org/

http://www.caledoniatownship.org/departments/zoning_department/master_plan/index.php#.WKIMaUoo4aB

Village of Caledonia

http://villageofcaledonia.org/Portals/21/REFERENCE%20MATERIALS/Village%20of%20Caledonia%20General%20Development%20Plan%202014-%20Final.pdf

http://villageofcaledonia.org/Default.aspx?tabid=4093

http://villageofcaledonia.org/Default.aspx?tabid=1057

http://www.caledoniatownship.org/2015%20Compiled%20Master%20Plan.pdf

Cannon Township

http://www.cannontwp.org/egov/documents/1433270111_63271.pdf

Cascade Township

http://www.cascadetwp.com/

http://cascadetwp.com/Reference-Desk/Stormwater/Master-Plan.aspx

http://search.blossom.com/query/Xp3/245/form0/link2/type0/nohover/pdf0/compact2?key=Master+Development+Plan

Village of Casnovia

http://www.casnoviavillage.org/

Coty of Cedar Springs

http://cityofcedarsprings.org/

http://cityofcedarsprings.org/2016/12/08/2016-draft-master-plan-for-city-of-cedar-springs/

Courtland Township

http://www.courtlandtwp.org/

http://www.courtlandtwp.org/adobe/Adopted%20Plan%206.06.07.pdf

Gaines Township

http://gainestownship.net/

http://www.gainestownship.org/departments/docs/Adopted_Plan_12_8_08.pdf

http://www.gainestownship.org/departments/planning_zoning.php

City of East Grand Rapids

http://www.eastgr.org/

City of Grand Rapids Authorities and Resources

http://grcity.us/Pages/Departments.aspx

Police Department
http://grcity.us/police-department/Pages/default.aspx

Community Development
http://grcity.us/community-development/Pages/Housing-Rehabilitation-and-Grant-Program-Administration.aspx

- Neighborhood Enterprise Zones
  http://grcity.us/community-development/Pages/Neighborhood-Enterprise-Zones.aspx
- Neighborhood Associations
  http://www.cridata.org/Neighb_GR.aspx
- Code Compliance Division
  http://grcity.us/community-development/Code-Compliance-Division/Pages/default.aspx

Design and Development Services
http://grcity.us/design-and-development-services/Pages/default.aspx

- Development Center
  http://grcity.us/design-and-development-services/Development-Center/Pages/default.aspx
- Economic Development
  http://grcity.us/design-and-development-services/Economic-Development/Pages/default.aspx
- Planning Department
  http://grcity.us/design-and-development-services/Planning-Department/Pages/default.aspx
  http://grcity.us/design-and-development-services/Planning-Department/Pages/Master-Plan---Preface.aspx
- Downtown Development Authority
  http://grcity.us/design-and-development-services/Downtown-Development-Authority/Pages/default.aspx

Energy and Sustainability
http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/default.aspx

- Energy
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/OfficeofEnergySustainability.aspx
- Water
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/Water.aspx
- Urban Development
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/UrbanDevelopment.aspx
- Economic Development
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/EconomicDevelopment.aspx
- Waste
  http://mygrcity.us/departments/enterpriseservices/serviceareas/es/public/Pages/Waste.aspx

Environmental Services
http://grcity.us/enterprise-services/Environment-Services/Pages/default.aspx

- Department Overview
  http://grcity.us/enterprise-services/Environment-Services/Pages/Department-Overview.aspx
- Facts
  http://grcity.us/enterprise-services/Environment-Services/Pages/ESD-FAQs.aspx

Engineering Department
http://grcity.us/engineering-department/Pages/default.aspx

Facilities Management
http://grcity.us/facilities-and-fleet-management/Pages/default.aspx

Parks and Recreation
http://grcity.us/public-services/Parks-Recreation-Forestry/Pages/parks-recreation-forestry.aspx

Water System
http://grcity.us/enterprise-services/Water-System/Pages/default.aspx

Technology and Change Management
http://grcity.us/technology-and-change-management/Pages/default.aspx

Fire Department
http://grcity.us/fire-department/Pages/default.aspx

Grand Rapids Township

http://www.grandrapidstwp.org/

http://cms3.revize.com/revize/grandrapidstownship/grandrapidstownship/services/planning_and_zoning/uploads/Master_Plan.pdf

City of Grandville

http://cityofgrandville.com/

http://cityofgrandville.com/images/pdf/Master%20Plan%20FINAL%201-28-2008.pdf

Grattan Township

http://www.grattantownship.org/

http://www.grattantownship.org/

Village of Kent City

http://www.kentcitymi.org/

http://www.kentcitymi.org/wp-content/uploads/MasterLandUsePlan2015.pdf

http://www.kentcitymi.org/?page_id=306

Cit of Kentwood

http://www.ci.kentwood.mi.us/

http://www.ci.kentwood.mi.us/getattachment/afca316a-48cb-47f4-859b-4d06cb280d69/Kentwood-Master-Plan-2012-PreChange

http://www.ci.kentwood.mi.us/getattachment/4204eb5b-3bce-44d9-8596-b2fce2bf5ca0/Complete-Kentwood-Master-Plan-2005

http://www.ci.kentwood.mi.us/getattachment/6a0627a1-74d3-4a0b-9cd2-40785b8e92f0/WirelessCommPlan

http://www.ci.kentwood.mi.us/getattachment/d0050b04-bebc-4de7-b86e-d9b52780f81b/DivisionAveRedevPlan

City of Lowell

http://ci.lowell.mi.us/

http://www.ci.lowell.mi.us/Portals/1/Government/Planning%20and%20Zoning/Lowell%20Master%20Plan%20(with%20maps).pdf

Lowell Township

http://www.twp.lowell.mi.us/

http://www.twp.lowell.mi.us/MASTERPLAN/Adopted%202014%20Master%20Plan%20for%20printing%20and%20distribution.pdf

Nelson township

http://www.nelsontownship.org/

http://www.nelsontownship.org/adobe/Master%20Plan%204.13.07.pdf

Oakfield Township

http://oakfieldtwp.org/

http://oakfieldtwp.org/adobe/Ordinance.pdf

Plainfield Township

http://www.plainfieldmi.org/

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2008_master_plan_with_maps.pdf

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2017_master_plan_supplement_with_future_land_use_map_and_amendments_to_childsdale_rockford.pdf

http://www.plainfieldmi.org/uploads/9/3/5/7/93577888/2017_update_-_future_land_use_map.pdf

City of Rockford

http://rockford.mi.us/

https://rockford.mi.us/wp-content/uploads/2014/07/Rockford-Master-Plan.pdf

Village of Sand Lake

http://villageofsandlake.org/Portals/1047/Map%201%20Existing%20Land%20Use.pdf

http://villageofsandlake.org/Portals/1047/Map%202%20Water%20System.pdf

http://villageofsandlake.org/Portals/1047/Map%205%20Future%20Land%20Use.pdf

Solon Township

http://www.solontwp.org/

http://www.solontwp.org/2016/11/28/master-plan-survey/

Sparta Township

https://www.bing.com/search?q=sparta+township+mi+&form=PRUSEN&mkt=en-us&httpsmsn=1&refig=9dbe87824e704c0ea241cc46c55b34e5&sp=-1&pq=sparta+township+mi+&sc=8-19&qs=n&sk=&cvid=9dbe87824e704c0ea241cc46c55b34e5

http://spartatownship.com/documents/Ordinance_Book_revision_2012_GkRmM.pdf?zoom_highlight=master+plan#search=%22master plan%22

Village of Sparta

http://spartami.org/

http://spartami.org/documents/2015_Master_Plan_Document_Final2_9d3Js.pdf

Spencer Township

http://www.spencertwp.org/

http://www.spencertwp.org/adobe/Future%20Use.pdf

Tyrone Township

http://www.tyronetownship.us/

http://www.tyronetownship.us/portals/149/Master%20Plan/MASTER%20PLAN%202012.pdf

Vergennes Township

http://www.vergennestwp.org/

http://www.vergennestwp.org/masterplan/Final%20Adopted%20Master%20Plan%202012-07-09.pdf

City of Walker

http://www.ci.walker.mi.us/

http://www.ci.walker.mi.us/business/planning/master_plan_information/index.php

City of Wyoming

http://www.ci.wyoming.mi.us/

http://www.wyomingmi.gov/Planning/KCGRWY_Regional_Consolidated_Plan_Final.pdf

http://www.wyomingmi.gov/Planning/documents/Wyoming_Master_Plan_%20Final_Revised_2012.pdf

http://www.wyomingmi.gov/Planning/communitydev.asp

OTTAWA COUNTY AUTHORITIES AND RESOURCES

NOTE: To follow most links in a digital version of this document press Ctrl + Click

CW 13

County Government: Each entity listed below has its' own section of the county website at www.miottawa.org. The following are links to each of these information resources.

Board of Commissioners
County Administrator

RELEVANT DEPARTMENTS

Equalization / Property Description & Mapping
Insurance & Risk Management
Planning and Performance Improvement
Sheriff's Office

Water Resources Commissioner

The Water Resources Commissioner and his staff are responsible for construction, operation and maintenance of over 800 storm water management systems, "County Drains" in Ottawa County. These systems are designed to provide storm water management, drainage, flood prevention and stream protection for urban and agricultural lands. A County Drain may be an open ditch, stream, or underground pipe, retention pond or swale that conveys storm water.

Routine maintenance of county drains is necessary from time to time to ensure their proper function. The Water Resources Commissioner may in any one year, expend up to $5,000.00 per mile, per drain for maintenance and repair. Major projects are initiated through a petition process. Either property owners or a local municipality can petition the Water Resources Commissioner. To recover costs expended for a project, Special Assessments are levied against private properties, local municipalities, the County and the County Road Commission, railroads and state highways benefited by the construction and/or maintenance.

Ottawa County Road Commission

See www.ottawacorc.com. This website also provides direct links to city and township websites under the red tab "links".

City, Township & Village Directory

The **Ottawa County** website (www.miottawa.org) provides further information under the blue tabs "Parks and Visitors" and "Property Resources" for the following **departments** that may be relevant to hazard mitigation:

*** MSU Extension**

*** County Parks & Recreation**

*** Water Resources Commission:** *Notes from the County Water Resources Commissioner:*

- The Ottawa Drain Commission works through consultants and contractors.
- Drains are the responsibility of either the 1) local jurisdiction, 2) the drain commission, or 3) the road commission.
- An open drainage ditch is designed to convey a 25 year, or 4% chance storm.
- An enclosed culvert system is designed to convey a 10 year, or 10% chance storm.

*** Equalization**

*** Environmental Permits**

*** GIS**

The Ottawa County GIS Department manages the County's Geographic Information System (GIS). A GIS is a computer-based mapping system which relates various types of data and information with real-world locations.

The GIS Department has established collaborative data partnerships with 17 of the County's 24 local units as well as the Ottawa County Road Commission. Under the partnership agreements, the GIS Department provides each partner with automated data updates, access to the GIS data library, access to exclusive Web mapping applications, and technical support. In addition, the GIS Department will also create customized data layers by request to meet the needs of its partners.

*** Ottawa Conservation District**

*** Planning and Performance Improvement**

*** Soil Erosion:**

The Ottawa County Water Resource Commissioner's office is responsible for enforcement of the Soil Erosion and Sedimentation Control Act, Part 91 of P.A. 451, 1994 as amended. The office is also responsible for an Ordinance to establish rules and regulations to control soil erosion and sedimentation, to establish a system of permits for the regulation of earth changes, to establish the Ottawa County Drain Commissioner as the Officer responsible for implementation and enforcement, and to establish a system of fees, penalties, and civil infraction penalties for the violation of the Ordinance, all as authorized by the Part 91 Soil Erosion and Sedimentation Control of the Natural Resources and Environmental Protection Act, Act 451 of the Public Acts of 1994 as amended.

WATERSHED ORGANIZATIONS IN OTTAWA COUNTY

Lower Grand Watershed

The Lower Grand River Watershed Project resulted in a nonpoint source watershed management plan for the approximately 3,020 square miles of the Lower Grand River Watershed (LGRW). This was made possible as a result of a 319 Nonpoint Source Watershed Planning Grant. A nonpoint source plan can improve water quality, and the quality of life in human communities. The draft version of the 2010 LGRW Management Plan is now available for review.

The LGRW has many small rivers and streams that have been studied, and some already have their own nonpoint source plans. The idea behind creating a plan for the large basin of the LGRW was to focus human, financial, and technical resources across political boundaries and sub-watershed boundaries. The project included numerous communities, agencies, and institutions. The LGRW boundary falls over ten counties and over 120 sub-watersheds. Many communities gave either time or financial support to this project.

Ottawa County participants included:

Ottawa County Water Resources Commissioner

Ottawa County Road Commission

Ottawa County

Ottawa County Jurisdiction participants included:

City of Coopersville	Spring Lake Twp.
City of Ferrysburg	Tallmadge Twp.
City of Grand Haven	Wright Twp.
City of Hudsonville	Allendale Charter Twp.
Chester Twp.	Georgetown Charter Twp.
Crockery Twp.	Robinson Twp.

A portion of the project dealt with two pilot project areas in the LGRW. The LGRW is very large and to gain an understanding of what is happening in the watershed, two smaller sub-watersheds were studied. The LGRW was divided into two major land uses, rural and urban. It was decided by project members that one pilot project would be focused on rural watershed issues, Sand Creek Watershed, and that the other would be focused on urban watershed issues, Buck Creek Watershed.

As a result of these pilot projects, two nonpoint source management plans were developed and can now be used as examples for other subwatersheds in the LGRW to make management plans:

Click here for a copy of the Sand Creek Management Plan
Click here for a copy of the Buck Creek Management Plan

Sand Creek Watershed

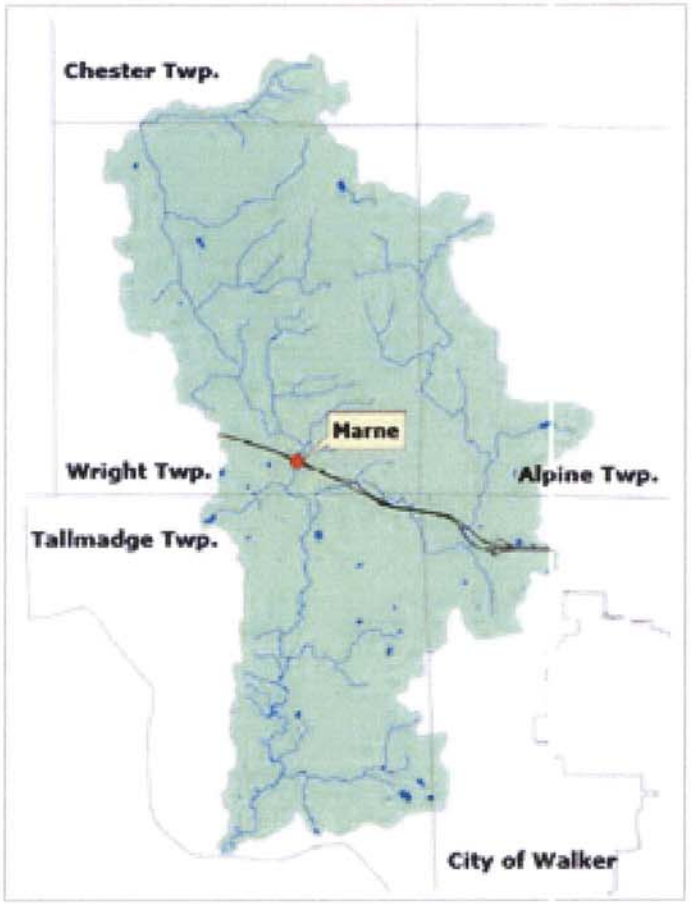
Sand Creek Watershed is part of the Grand River Watershed. It is covered by parts of Tallmadge, Wright, Chester Townships in Ottawa County.

Sand Creek is:

- 22 miles in length
- 55 square miles in area
- A tributary to the Grand River
- A designated cold water stream

Based on the 2003 Sand Creek Watershed Plan, there were 8 known pollutants identified as impacting the Sand Creek Watershed. They were sediment, nutrients, temperature, changes in flow, bacteria, oil/grease,

invasive/exotic plant species, and trash. The greatest potential threat to the water quality of Sand Creek comes from storm water runoff.



Macatawa Watershed

The Macatawa Watershed covers approximately 175 square miles of land and consists of all the land that drains to Lake Macatawa, including all or part of Fillmore, Overisel, Holland, Park, Zeeland, Port Sheldon, Olive and Blendon Townships and the cities of Holland and Zeeland.

The Macatawa Watershed Project was created in 1999 with a goal to reduce the amount of phosphorus that enters Lake Macatawa by rain runoff by approximately 70% through public awareness, education, and Best Management Practices.

The Watershed Project works with local units of government, farmers, homeowners, developers, educators, and other members of the community to increase awareness of how we impact the watershed, and what we can do to help reduce phosphorus. This information is detailed in the Macatawa Watershed Phosphorus Reduction Implementation Plan.

Pigeon Creek Watershed

The Pigeon River Watershed is located in west-central Ottawa County, covering 41,395 acres or roughly 65 square miles. The main branch of the Pigeon River, which is 11.8 miles from 104th Ave. to the mouth, flows through the center of Port Sheldon and Olive Townships. Most of the tributaries are county drains, road ditches, or private ditches. The head waters are contained in Blendon Township, with reaches of the watershed touching Grand Haven, Robinson, Park and Zeeland Townships.

The Pigeon River Watershed consists of all the land area and water bodies that drain into the Pigeon River, flowing into Pigeon Lake and then into Lake Michigan.

The focus of the Pigeon River Watershed Project is to improve water quality and enhance the designated uses listed below by educating and informing the community and installing conservation practices and landowners in improving the quality of "their" watershed.

Agriculture
Habitat and Indigenous Aquatic Life and Wildlife
Industrial Water Supply
Partial or Total Body Contact Recreation
Public Water Supply at the Point of Intake
Warm Water Fishery
Cold Water Fisher

LAW ENFORCEMENT AND FIRE IN OTTAWA COUNTY

Fire Departments:

Allendale Twp.	Grand Haven City	Olive Twp.	Robinson Twp.
Blendon Twp.	Grand Haven Twp.	Chester Twp.	Port Sheldon Twp.
Coopersville City	Holland City	Spring Lake Twp.	Park Twp.
Crockery Twp.	Holland Twp.	Polkton Twp.	Wright/Tallmadge
Georgetown Twp.	Hudsonville City	Jamestown Twp.	Zeeland City
Ferrysburg			Zeeland Twp.

Law Enforcement Agencies:

Ottawa County Sheriff	Hope College Campus Safety
Grand Haven Dept. of Public Safety	Grand Valley Police Department
Holland Department of Public Safety	Zeeland Police

JURISDICTIONS IN OTTAWA COUNTY

Allendale Charter Township http://www.allendale-twp.org/

Allendale storm water: http://cfpub.epa.gov/npdes/home.cfm?program_id=6

Allendale utilities: http://www.allendale-twp.org/clerk/publicworks.html

Allendale (GVSU)

http://www.gvsu.edu/stormwater/

http://www.gvsu.edu/wri/isc/index.cfm?id=5D222890-DC3E-FE05-6449A01A6C69980D

http://www.gvsu.edu/cms3/assets/56DCA9CB-EC2F-5B8F-2554D65FC045BC23/epagrantdocs/wampler_storm_water_report_8_7_09.pdf

http://www.gvsu.edu/sustainability/water-271.htm

Blendon Township

http://www.blendontownship-mi.gov/

Road Department

Under the supervision of the Engineering Director, the Roads and Bridges Department is responsible for the preparation of plans and specifications, construction engineering and coordinating construction activities with other departments and agencies. These activities pertain to road resurfacing, road reconstruction, bridge replacement, bridge rehabilitation, and culvert replacement.

Chester Township http://www.chester-twp.org/

RELEVANT DEPARTMENTS:

Supervisor
Clerk
Zoning & Planning
Assessor
Building Dept.
Fire

City of Coopersville http://cityofcoopersville.com/

Coopersville functions under a Council/Manager government. With this system, the City Council acts as the legislative and policy-making voice of the city. It is an elected body, with the Mayor and Council Members chosen by the voters. The City Council appoints a City Manager, who serves as the city's chief administrator.

RELEVANT DEPARTMENTS (Coopersville):

City Manager

City Assessor
Building Department

Department of Public Works
Fire Department
Planning and Zoning Department
Ottawa County Sheriff

Water and Sewer Department

Crockery Township http://www.crockery-township.org/

City of Ferrysburg http://www.ferrysburg.org/

Georgetown Charter Township http://www.gtwp.com/

RELEVANT DEPARTMENTS:
Department of Public works
Water

Cross Connections Ordinance Section 58-44
Limiting Use- Section 58-45
Sanitary Sewer

Backwater preventer aka Backflow preventer
A backwater valve will help prevent raw sewage from backing up into your basement by allowing sewage to only flow one way (out of your home).

City of Grand Haven http://www.grandhaven.org/

The City of Grand Haven has an Emergency Manager.

Grand Haven Board of Light & Power: http://www.ghblp.org/

Grand Haven Master Plan:
http://www.grandhaven.org/uploads/pdf_documents/departments/planning_building/city_of_gh_2010_adopted_mp_final_doc020110.pdf

RELEVANT DEPARTMENTS/SERVICES:

Assessor
City Clerk
City Manager
Planning & Community Development
Public Safety
Public Works
Wastewater
Water Filtration

Grand Haven Charter Township http://www.ght.org/

RELEVANT DEPARTMENTS:

Assessing
Community Development
Fire & Rescue
Public Services

Stormwater

One of the most significant, yet unrecognized groups of water contaminants is storm water pollutants. When it rains, storm water runs over yards, streets, roads, highways, parking lots, parks, and playgrounds, carrying with it everything in its path, including debris and pollutants. Eventually, the water will travel to a stream, either over land or via a storm drain. Storm drains are frequently located alongside streets and parking lots. Unlike sanitary sewers that divert water to a treatment plant directly from your home, storm drains lead directly to surrounding lakes and rivers without any type of treatment. All the debris and pollutants that were picked up by storm water runoff, end up in your lakes and streams!

National Pollutant Discharge Elimination System (NPDES) Phase II Program

The Clean Water Act of 1972 set up the NPDES. The NPDES program required communities around the country with urbanized areas to begin tackling the issue of storm water pollution. In recent years, several communities in Kent and Ottawa Counties were required to develop an illicit discharge elimination program (IDEP). The IDEP was required to include an investigation of the waters of the state to identify, and eventually eliminate, illicit discharges and connections to the storm sewer.

Water

Grand Haven Charter Township operates two water distribution systems. The largest system receives its water from the North Ottawa Water System or NOWS water treatment plant located within the city of Grand Haven. NOWS is a joint municipal water system providing water to the cities of Grand Haven, Ferrysburg, the village of Spring Lake, and the townships of Grand Haven, Spring Lake, Robinson and Crockery.

The second distribution system serves the southern third of the township and receives its water from the Grand Rapids water treatment plant.

The township's water distribution system includes two 500,000 above ground storage tanks and 86 miles of water mains. About 530 million gallons of water are distributed annually to 4,500 homes and businesses. This is approximately a 175% increase since 1990.

City of Holland http://www.cityofholland.com/

The City of Holland has an Emergency Manager.

Water

Part 14 of the Michigan Safe Drinking Water Act, 1976 PA 399, as amended and the Water Supply Cross Connection Rules of the Michigan Department of Environmental Quality, R 325.11401 to R 325.11407 of the Michigan Administrative Code, contain the rules that public water systems must follow regarding

cross connection control. Section 37-28 of the City of Holland Code of Ordinances charges the Holland BPW with determining the presence of cross-connections in the municipal water system.

Water Distribution in Holland, MI

The Holland Board of Public Works' water distribution system contains 230 miles of water main. It is located mostly within the City of Holland, with some sections of Park, Laketown, and Holland Charter Townships included. Most of the water mains are 6, 8, or 12 inch diameter, but some are as large as 36 inch diameter. There are approximately 13,000 service connections and over 2,300 fire hydrants. There are four water storage tanks, and five pump stations pumping to five pressure zones within the system.

The Water Filtration Plant, located on Lake Michigan, began operating in 1955. It filters 38.5 million gallons per day (MGD).

Wastewater

The Holland Board of Public Works maintains all of the sanitary sewer collection system south of Lake Macatawa and the Macatawa River. This system contains nearly 190 miles of sanitary sewer pipe and 34 sewage lift stations. It is located mostly within the City of Holland, but also includes portions of Park, Laketown, Fillmore and Holland Charter Township. The majority of the system is 8-inch pipe with some pipes as large as 36-inches. The system is a separated system meaning that surface drainage is collected into a system known as the storm sewers and drains and the sewage from homes and businesses go into a separate system known as the sanitary sewer system.

Industrial Pretreatment Program: Protecting the health and safety of the public and the environment

The Pollution Control Department is a division of the Holland Area Wastewater Treatment Plant. The purpose of the program is to regulate the disposal of industrial wastewater into the sanitary wastewater collection system and to protect physical structures and the safety of operation and maintenance personnel of the wastewater system (collection and treatment). The program ensures compliance with pretreatment regulations as required under the Federal General Pretreatment Regulations and Categorical Standards and local source control ordinances.

Electric

The Holland Board of Public Works owns three electric generation facilities: the James De Young Power Plant; 48th Street Generation Station; and 6th Street Generation Station.

In addition, the Holland Board of Public Works owns shares in the J.H. Campbell Complex and the Belle River Plant, both are coal fired electrical generating plants. The plants are operated by Consumers Energy and Detroit Edison, respectively.

Gas Pipeline

The Holland Board of Public Works does not provide natural gas service to customers. However the Holland Board of Public Works owns and operates a natural gas pipeline that traverses a portion of Allegan County. This pipeline is a transmission line only, supplying natural gas to our three electric generating turbines at our 48th Street Generation Station.

Holland Charter Township http://www.hct.holland.mi.us/

Roads (administered by Ottawa County Road Commission)

Storm drainage system (administered by Ottawa County Water Resources Commission)
Street lighting (lighting services provided by Consumers Energy, Holland Board of Public Works, and Zeeland Board of Public Works)

City of Hudsonville http://www.hudsonville.org/

Department of Public Works
Storm Sewer
http://www.gvsu.edu/wri/
http://www.lowergrandriver.org/
http://www.epa.gov/weatherchannel/stormwater.html
Cross connection control program
Hazardous Waste
http://co.ottawa.mi.us/HealthComm/Health/Waste.htm

RELEVANT DEPARTMENTS:

City Commission
City Manager
Assessing Department
Planning/Zoning Department
Department of Public Works
Emergency Management
Fire Department
Sheriff Department

Jamestown Township http://www.twp.jamestown.mi.us/

Supervisor

http://cfpub.epa.gov/npdes/home.cfm?program_id=6
http://water.epa.gov/polwaste/nps/nps.cfm

Olive Township http://www.olivetownship.com/

RELEVANT DEPARTMENTS:

Supervisor
Township Assessor
Planning and Zoning
Fire Department

Park Township http://www.parktownship.org/

Park Township is a general law Township established in 1915, consisting of approximately 20 square miles divided by Lake Macatawa with over 90% lying North of the lake.

A seven-member board elected at large, consisting of the Supervisor, Clerk, Treasurer and four Trustees governs the Township.

Land use is primarily residential and agricultural with a small amount of commercial. The township has no industrial zoning district.

RELEVANT DEPARTMENTS:

Assessing
Building and Zoning
Clerk
Fire Department
Recreation
Utilities

Polkton Township http://www.polktontownship.com/

Polkton's Master Plan can be found under the "resources" tab on the side of their website.

Port Sheldon Township http://www.portsheldontwp.org/

RELEVANT DEPARTMENTS:

Supervisor
Assessor
Fire
Building
Planning & Zoning
Parks & Recreation

Wyoming (Kent County) Water Treatment Plant is located in Port Sheldon Township.
The only industrial property in the township is the sight of the Consumers Energy Campbell Plant.

Robinson Township http://www.robinson-twp.org/

RELEVANT DEPARTMENTS:

Assessor's Office
Building & Zoning
Fire Department
Parks & Recreation
Supervisor's Office

Village of Spring Lake http://springlakevillage.org/

The Village of Spring Lake is run by a Council – Manager form of government. There is an elected Village Council and Village President. The Village Council hires a Village Manager who hires and supervises the Village staff and runs the day to day operations of the Village.

There are no wards in the Village; the six members of Village Council are elected at large from the community. Village Council members are elected for staggered four-year terms. The Village President is elected every two years.

The government is also made up of a number of Boards and Commission that act in an advisory capacity to the Village Council. These include the Planning Commission, the Zoning Board of Appeals, the Central Business District Development Authority (CBDDA), Historic Conservation District Commission, Parks and Recreation Committee, to name a few.

RELEVANT DEPARTMENTS:

Village Manager
Dept. of Public Works (DPW)
Police

Master Plan: http://springlakevillage.org/images/pdf/Master%20Plan%20-%20Finished%20Copy%20from%20CD.pdf

Spring Lake Township http://www.springlaketwp.org/

RELEVANT DEPARTMENTS:

Assessing
Building & Planning
Fire
Law Enforcement
Manager
Parks & Recreation
Water & Sewer

APPLICABLE ORDINANCES:

Storm Water Management Ordinance:

http://library.municode.com/HTML/14508/level3/COOR_CH14EN_ARTVISTMA.html#TOPTITLE

Water System Ordinance:

http://library.municode.com/HTML/14508/level4/COOR_CH38UT_ARTIIWA_DIV2WASY.html#TOPTITLE

Sewer Usage Ordinance:

http://library.municode.com/HTML/14508/level3/COOR_CH38UT_ARTIIISEUSAD.html#TOPTITLE

Fertilizer Use:

http://library.municode.com/HTML/14508/level3/COOR_CH14EN_ARTIVUSFE.html#TOPTITLE

Tallmadge & Wright Townships http://www.tallmadge.com/ http://wrighttownship.com/

Wright Township officials include a Supervisor, Clerk, Assessor, Treasurer and two Trustees.

Tallmadge Township officials include a Supervisor, Clerk, Assessor, Planner, Treasurer and four Trustees.

Both have floodplain ordinances, both belong to the Sand Creek Watershed Council.
They share a fire department with 2 stations.

City of Zeeland http://ci.zeeland.mi.us/

The City of Zeeland operates a Clean Water Treatment Plant that treats affluent water from residential homes and businesses. The treatment plant is operated by licensed personnel. The CWTP is notified when hazardous spills occur that can drain into the collection system so that the water may be properly treated.

Zeeland Street Department has large equipment including dump trucks with scrapers and plows used for hauling sand and gravel, sand spreaders, backhoes, loader and street sweeper with long suction hose. This equipment can be used to dike an area of a spill, clean out street drains, and clean streets of debris.

Master Plan:
http://ci.zeeland.mi.us/LinkClick.aspx?fileticket=Fmm%2bclnwwlM%3d&tabid=3463&mid=5506

The Fire Chief in the City of Zeeland also functions as their Emergency Manager and they have an EOC.

Zeeland Charter Township http://www.zeelandtwp.org/

RELEVANT DEPARTMENTS:

Assessing
Fire Department
Township Parks

Zeeland Charter Twp. MASTER PLAN:
http://www.zeelandtwp.org/Portals/0/Maps/finalMasterPlan.pdf

Hazard Mitigation Objectives by Jurisdiction

The following table provides a local breakdown of hazard mitigation actions and considerations that are considered acceptable for local jurisdictions participating in this regional plan. The column headers contain abbreviations for the following hazard mitigation objectives:

1. "Communication" – Actions to bolster the dependability of emergency communication systems.

2. "Emergency Notification" – Actions to strengthen and maintain emergency notification systems.

3. "Consider NFIP" – Those communities that have not yet, give consideration to the potential benefits of active NFIP participation.

4. "Masterplan Consideration" – Giving consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps (or other plans and documents, as appropriate).

5. "Flood Mitigation" – Coordinating in the voluntary purchase of developed properties with structures at risk from significant and regular flooding, or other actions associated with floodplain management.

6. "Severe Weather." – Severe weather preparedness, such as the tracking and identification of warning system needs, the promotion of public awareness/education, investigation of new warning technology and shelter sites, consideration or use of emergency generators, training of emergency responders and community officials, participation in exercises and planning activities, keeping resources/equipment prepared for response and recovery activities.

7. "Infrastructure Strength." – Consideration of and coordination in infrastructure-strengthening activities and studies, which may include drainage needs, other infrastructure and utilities, to maintain and improve capabilities and performance.

8. "Fire Preparedness." – Fire-related actions such as prevention and awareness activities, evaluating staffing, training, and resource needs, consideration of fire-related regulations, evaluation of equipment, water supplies and wildfire risks.

The following table represents the known willingness of communities at the time of writing. Communities may decide, as necessary and appropriate, to pursue additional hazard mitigation activities subsequent to the adoption of this plan.

Hazard Mitigation Objectives By Jurisdiction	Climate Change	Commuication Failure Mitigation	Emergency Warning and Notification	Consider NFIP	Masterplan Consideration	Flood Mitigation	Intentional Acts	Infrastructure Strengthening	Fire Preparedness
Ada Township (K)		Y	Y	NFIP	Y	Y		Y	Y
Algoma Township (K)			Y	NFIP	Y			Y	Y
Allendale Township/GVSU (O)			YY	NFIP	Y		Y	Y	YY
Alpine Township (K)			Y	NFIP	Y	Y	Y		Y
Blendon Township (O)			Y	NFIP	Y			Y	Y
Bowne Township (K)			Y	Y		Y		Y	Y
Byron Township (K)			Y	Y	Y	Y		Y	Y
Caledonia Township (K)			Y	NFIP	Y			Y	Y
Village of Caledonia (K)			Y	Y	Y	Y		Y	Y
Cannon Township (K)		Y	Y	NFIP	Y			Y	Y
Cascade Township (K)			Y	NFIP	Y			Y	Y
Village of Casnovia (K)			Y	Y	Y	Y		Y	Y
City of Cedar Springs (K)			Y	Y	Y	Y		Y	Y
Chester Township (O)	Y	Y	Y	NFIP		Y		Y	Y
City of Coopersville (O)			Y	NFIP	Y			Y	Y
Courtland Township (K)			Y	Y	Y	Y		Y	Y
Crockery Township (O)			Y	NFIP	Y			Y	Y
City of East Grand Rapids (K)			Y	NFIP	Y			Y	Y
City of Ferrysburg (O)			Y	NFIP	Y			Y	Y
Gaines Township (K)			Y	Y	Y	Y		Y	Y
Georgetown Township (O)			Y	NFIP	Y	Y		Y	Y
City of Grand Haven (O)			Y	NFIP	Y			Y	Y
Grand Haven Township (O)			Y	NFIP	Y			Y	Y
City of Grand Rapids (K)	Y		Y	NFIP				Y	Y
Grand Rapids Township (K)			Y	Y	Y	Y		Y	Y
City of Grandville (K) NFIP			Y	NFIP	Y	Y	Y	Y	Y
Grattan Township (K)			Y	Y	Y	Y		Y	Y
City of Holland (O)			Y	NFIP	Y	Y		Y	Y
Holland Township (O)			Y	NFIP	Y	Y		Y	
City of Hudsonville (O)			Y	NFIP	Y			Y	Y
Jamestown Township (O)			Y	NFIP	Y			Y	Y

Hazard Mitigation Objectives By Jurisdiction *(continued)*	Climate Change	Commuication Disruption	Emergency Warning and Notification	Consider NFIP	Masterplan Consideration	Flood Mitigation	Intentional Acts	Infrastructure Strengthening	Fire Preparedness
Village of Kent City (K)			Y	Y	Y	Y		Y	Y
Kent County (part NFIP)		Y	Y	Y	Y	Y		Y	Y
City of Kentwood (K)	Y	Y	Y	NFIP	Y			Y	
City of Lowell (K)			Y	NFIP	Y			Y	Y
Lowell Township (K)			Y	Y	Y	Y		Y	Y
Nelson Township (K)			Y	Y	Y	Y		Y	
Oakfield Township (K)			Y	Y	Y	Y		Y	Y
Olive Township (O)			Y	NFIP	Y			Y	Y
Ottawa County		Y	Y	NFIP	Y	Y		Y	
Park Township (O)			Y	NFIP	Y			Y	Y
Plainfield Township (K)			Y	NFIP	Y	Y		Y	Y
Polkton Township (O)			Y	NFIP	Y			Y	Y
Port Sheldon Township (O)			Y	NFIP	Y			Y	Y
City of Rockford (K)			Y	Y	Y	Y		Y	Y
Robinson Township (O)		Y	Y	NFIP	Y	Y			Y
Village of Sand Lake (K)			Y	Y	Y	Y		Y	Y
Solon Township (K)			Y	Y	Y			Y	Y
Sparta Township (K)			Y	NFIP	Y			Y	Y
Village of Sparta (K)			Y	NFIP	Y			Y	Y
Spencer Township (K)			Y	Y	Y	Y		Y	Y
Spring Lake Township (O)			Y	NFIP	Y			Y	Y
Village of Spring Lake (O)			Y	NFIP	Y	Y		Y	Y
Tallmadge Township (O)			Y	NFIP	Y			Y	Y
Tyrone Township (K)			Y	Y	Y	Y		Y	Y
Vergennes Township (K)			Y	Y	Y	Y		Y	Y
City of Walker (K)			Y	NFIP	Y	Y	Y	Y	Y
Wright Township (O)			Y	NFIP	Y			Y	Y
City of Wyoming (K)			Y	NFIP	Y			Y	Y
City of Zeeland (O)			Y	NFIP	Y	Y	Y	Y	Y
Zeeland Township (O) NFIP			Y	NFIP	Y			Y	Y

HAZARD MITIGATION PLAN 2017

SECTION THREE - LOCAL COMMUNITY SUBSECTIONS

The communities listed in this section have expressed specific concerns or ideas/needs for hazard-related actions. Local and county emergency management personnel and those of relevant departments coordinate on hazard mitigation issues. Such coordination produced this list of community-specific concerns, and these ideas and concerns are the local hazard mitigation action list in this plan. These local ideas and needs may not necessarily be eligible for federal hazard mitigation grant funds, but they are appropriate in order to lessen local vulnerabilities.

Priorities have been assigned to those projects that are most ready for implementation (or have already started to be implemented), although many such projects require additional funding and preparation before work may begin (or be completed). Those projects that are most ready for implementation (or funding applications) and have been identified as relevant for one or more of the community's hazard mitigation concerns have been marked as "High Priority". These priorities are for each individual community so that various communities do not have undue or inappropriate comparisons made between their needs. Cooperation between communities, especially between each community and the corresponding county emergency management office, is expected for the majority of the high priority projects listed. Since the status of activities identified in previous versions of this plan have already been reported in updated versions, projects that have already been completed will often not be included in these new community lists, so that more consideration can be given to newer, forward-looking strategies instead.

Projects that address a community's significant hazards, but do not have enough specific detail to allow them to be considered immediately ready for implementation, or for a grant application process, have been marked as "Medium Priority" (for that individual community). Actions that have been labeled as medium priority (or as lower priority) may be implemented within the next 5 years in cases where coordinated activities or ease of implementation makes such a process convenient, even if higher priority projects are still awaiting funds or other preparatory work. *In other words, the priorities assigned here do not necessarily limit or predict a specific implementation sequence, which will vary according to the (sometimes unpredictable) circumstances of each community over the next 5 years.*

Projects that are considered to be preliminary ideas, or that address only lower-priority hazards in an area, are marked as "Low Priority" —not because they are considered unimportant but rather to encourage efforts toward higher priority hazard mitigation and preparedness strategies. In cases where communities do not have any higher-priority strategies, the community's position can generally be interpreted as one of coordination with the priorities of the county's emergency management office (and the county's prioritized actions), since it is not uncommon for rural areas within the region to have minimal staff time and resources to plan for and implement the strategies under consideration.

The lists of hazard mitigation strategies, concerns, and input in the following community subsections have all been listed in prioritized order, although many listings with the same classification (High, Medium, Low) may be considered to be of equal priority with each other. Some lower priority concepts may address some important concerns, but are often not yet developed into the form of an implementable hazard mitigation action, and have temporarily been assigned a lower priority due to their undeveloped, conceptual state.

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Kent County (part NFIP) 2010 population 602,622 (up 5% from 2000)

Hazard Priorities

High: Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather

Medium: Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard

Low: Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Thunderstorms, tornados**
Strategy:	**Survey needs and add sirens to regions as needed.**
Primary Responsibility:	Kent County
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner, if funding is available.
Cost(s):	Survey $ 10,000 111 Sirens @ $18,500 = $2,053,500
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	Sirens surveys are updated every year. To date, grant funds from the fiscal year 2007 Homeland Security Grant Program (HSGP) have been used to update and replace sirens for three jurisdictions in Kent County. Other jurisdictions have used local funds to upgrade sirens. Future funds for hazard mitigation would be used to enhance and expand upon those efforts, as well as to research new technologies.
2016 Status:	No change due to lack of funding.
#2 High Priority	**Severe Weather Hazards**
Strategy:	**Investigate and acquire new warning technology as it becomes available.**
Primary Responsibility:	Kent County
Initiatives Needed:	Funding Source
Implementation:	By 2022 or sooner, if funding is available.
Cost(s):	Reverse 911 system $100,000

	6 Short-range AM/FM Transmitter Systems @ $50,000 $300,000
Benefit(s):	Lessened potential for personal injury.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	Grant funds have been used to purchase the satellite-based EM Net system for Kent County and the City of Grand Rapids. Kent County has received two systems and provided one to the National Weather Service. Grant funds have also been used to purchase the City Watch notification system for Kent County (the system is also used in Ottawa County). Future funds for hazard mitigation would be used to enhance and expand upon those efforts, as well as to research new technologies.
2016 Status:	No change due to lack of funding.
#3 High Priority	**Riverine Flooding**
Strategy:	**Take measures to mitigate flood damage and reduce vulnerability to existing structures**
Primary Responsibility:	Kent County
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	12 wood frame structures @ $40,000 = $480,000 (Based on average property values)
Benefit(s):	Less Potential for flood damage.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	Hazard mitigation funding has been approved for Plainfield Township, and for the York Creek Watershed. The Shawmut Hills Watershed has applied for funding, which is currently awaiting an agreement between the City of Grand Rapids and FEMA regarding the matching grant shares. At the time of this writing, the status of other jurisdictions' progress with this strategy is still pending.
2016 Status:	No change due to lack of funding.
#4 High Priority	**Flood Hazard** (general)
Strategy:	Study potential flood areas for consideration of future flood mitigation field projects. Additionally, **consideration will be given to Kent County communities' participation in the National Flood Insurance Program** (NFIP). Not all of the residents in some communities are eager to participate primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against each community's risks for all types of potential flood problems (riverine, urban, etc.) when making this decision.

Primary Responsibility:	Kent County
Implementation:	By 2022 or sooner, if funding is available.
Benefit(s):	Less likelihood of future flood damage claims.
2016 Status:	No known progress.

#5 High Priority Strategy:	**Communication Disruption** **Identify infrastructure vulnerabilities that could cause communication disruptions**
Primary Responsibility:	Kent & Ottawa Counties
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner, if funding is available.
Cost(s):	Regional Survey $50,000
Benefit(s):	Higher security through less potential for long term interruption of communication.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	In 2010, the West Michigan Cyber Security Consortium was formed. The purpose of this consortium is to identify risks and vulnerabilities in the cyber arena, which includes IT and communications. Training, security software, networking, and best practices have been a focus of this group. Future hazard mitigation grant funds can be used to enhance and expand these efforts, and to explore new technologies.
2016 Status:	No change due to lack of funding.

#6 High Priority	**Communication Disruption**
Strategy:	Work with local telephone and cable utilities to **develop a plan** for dealing with the communication disruptions
Primary Responsibility:	Kent County
Initiatives Needed:	Funding Source
Implementation:	By 2022 or sooner, if funding is available.
Cost(s):	Plan $120,000
Benefit(s):	Higher security through less potential for long-term interruption of communication.
Anticipated Funding:	Federal Mitigation grants as well as other funding sources if available.
2011 Status:	In 2010, the West Michigan Cyber Security Consortium was formed. The purpose of this consortium is to identify risks and vulnerabilities in the cyber arena, which includes IT and communications. Training, security software, networking, and best practices have been a focus of this group. Future hazard mitigation grant funds can be used to enhance and expand these efforts, and to explore new technologies.
2016 Status:	No change due to lack of funding.

#7 High Priority	**Communication Disruption**
Strategy:	In process of utilizing grants to fund an **800 MHz radio system** for the entire county. This system is used by the State Police and many counties in the state of Michigan are moving toward it. Ottawa County is also moving to the 800MHZ
Primary Responsibility:	Kent County
Initiatives Needed:	This project is currently underway
Implementation:	This project is scheduled for completion befire the next HMP update.
Cost(s):	Already funded
Benefit(s):	Higher security through less potential for long term interruption of communication.
Anticipated Funding:	Grant funding and millage
2011 Status:	Narrow-band radio compliance has been, and continues to be, a major project in which Department of Homeland Security grant funds are used. It is anticipated that these efforts toward narrow-band compliance will continue, using a combination of local funds, DHS grants, hazard mitigation grants (if available), and other funding sources, as these possibilities are identified.
2016 Status:	It was decided to go to the 800MHz in 2016. The project has begun but is in its infancy stages per the 2017 update of this plan.

#8 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts **in the next update of the master plan** and associated zoning maps throughout the county's jurisdictions. Since this strategy can only be implemented at the township, city, or village level, its mention here concerns the giving of information and encouragement by the county to support such local plan revisions.
Primary Responsibility:	Kent County
Initiatives Needed:	Speak with boards and planning managers to encourage consideration.
Implementation:	By 2022 or sooner
Benefits:	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#9 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Kent County
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2011 Status:	Grant funds have been used to purchase the satellite-based EM Net system for Kent County and the City of Grand Rapids. Kent County has received two systems and provided one to the National Weather Service. Grant funds have also been used to purchase the City Watch notification system for Kent County (the system is also used in Ottawa County). Future funds for hazard mitigation would be used to enhance and expand upon those efforts, as well as to research new technologies.
2016 Status:	New technologies in notification systems have allowed for cell phone applications for citizens. The applications are provided by the National Weather Service, American Red Cross, as well as many of the local media outlets. Emergency management has been making a rigorous effort via informational releases from our public information officers, as well as local media venues for the purchase and use of NOAA weather radios.

#10 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify potential projects** to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Kent County
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	The in 2010 formed West Michigan Cyber Security consortium has grown to over 600 agencies in the private and public sectors. Meetings are held quarterly with presenters on cyber security-related topics. In 2016 two exercises were done by the Department of Homeland Security, the first a school-based exercise held at the Kent Intermediate School District, and the second was business security related. In March of 2016 members of this committee met with US Senator Gary Peters to discuss our cyber related activities. In addition to this, a critical infrastructure project began in Kent County in 2012 and continues. This project connects surveillance cameras to a system that can be viewed on the floor of the PSAP center as well as in the EOC.

#11 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Kent County
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

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Ada Township (Kent County) NFIP, 2010 population 13,142 (up 33% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Riverine Flooding**
Strategy:	**Purchase property** to mitigate flood damage and reduce vulnerability to existing structures
Primary Responsibility:	Ada Township
Implementation:	Identify new properties and seek additional funding by 2016.
Cost(s):	1 residence @ $180,000 (Based on actual property value)
Benefit(s):	Lowering the impacts of flooding upon occupied structures.
2011 Status:	Ada Township applied for and received funding for this strategy in 2006, and funds were used to purchase property in the floodplain. Final funds were received in 2010. Over the next 5 years, the township will assess the effectiveness of this project and identify any similar projects for potential flood mitigation.
2016 Status:	No known progress

#2 Medium Priority Strategy:	**Electrical Failure Hazard Strategy** **Add a generator to the fire station**, capable of powering the furnace and thus allowing citizens to be brought there if sheltering is needed. This addresses various weather-related hazards, or other incidents in which temporary evacuation may be required. Ada Township has primary responsibility, but is eager to coordinate with Kent County if it has a means to acquire this generator in an affordable manner. The implementation timeframe will likely take a year or two, if funds are available.

#3 Medium Priority	**Emergency Communication**
Strategy:	The Department has its own radio channel for communications. Coordinate as needed to bolster the dependability of emergency

communication systems (as detail is found, this strategy might be elevated to a higher priority in the future). This strategy also includes the identification of any warning system needs in the township for severe weather preparedness.

2016 Status: No known progress

#4 Medium Priority **Master Plan Consideration**

Strategy: **Give consideration to hazard mitigation** needs and **concepts in the next update of the community's master plan** and associated zoning maps. The current plan dates from 2007 and includes elements regarding hazardous materials, transportation safety, and environmental sustainability, but did not have an all-hazard mitigation focus. Ada Township will be responsible for this effort.

2016 Status: No known progress

#5 Medium Priority **Infrastructure Strengthening**

Strategy: **Identify potential** improvements or **projects** to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

2016 Status: No known progress

#6 Low Priority **Fire - Urban and Structural**

Strategy: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, FIREWISE protection techniques, and risk assessment detail. Burning ordinance examination could be relevant for hazard mitigation.

2016 Status: No known progress

Algoma Township (Kent County) NFIP, 2010 population 9,932 (up 31% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1: Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts **in the next update of the community's master plan** and associated zoning maps. During the next master plan development process, Algoma Township should adjust the master plan to accommodate viable hazard-related strategies.
Primary Responsibility:	Algoma Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Algoma Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Algoma Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Algoma Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Algoma Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Alpine Township (Kent County) NFIP, 2010 population 13,336 (down 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**Urban Flooding**
Strategy:	Public education. Enforcing stronger storm water and drainage requirements. Seek grant to improve water storage area capabilities. Continue enforcement of stricter ordinances, etc. Enact long range plan for drainage issues. Construct ponds and clean out existing waterways as necessary .
Primary Responsibility:	Kent County
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Unknown at this time.
Benefit(s):	Lessened potential for flood damage.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	Hazard mitigation funds were approved for the purchase of three flood-prone structures in Alpine Township in 2006.
2016 Status:	No known progress at this time

#2 Medium Priority	**Wildfire**
Strategy:	**Expanding public education** and awareness
Primary Responsibility:	Alpine Township
Initiatives Needed:	Secure Funding
Implementation:	By 2022 or sooner if funding is available
Cost(s):	$3,000-$5,000
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Federal Mitigation grants as well as other funding sources if available.
2011 Status:	No known progress beyond normal activities
2016 Status:	No known progress

#3 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts **in the next update of the community's master plan** and associated zoning maps. During the next planning process, the Alpine Township Planning and Zoning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies
Primary Responsibility:	Alpine Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress

#4 Medium Priority	**Severe Weather**
Strategy:	Work with Kent County Emergency Management to conduct spring tests of sirens and provide public education on weather effects. **Add three additional sirens** for public notification. Continue/expand public education, working with and supporting the efforts of local news media.
Primary Responsibility:	Alpine Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding

#5 Medium Priority	**Riverine Flood Hazard**
Strategy:	Apply for grants to increase the area available for water storage. Ensure that the condition of drains, creeks, etc. are clean and able to handle water levels. Proceed with a long range plan to remove houses in the floodplain area and improve water storage capabilities. Improve drainage ditch and pond retention.
Primary Responsibility:	Alpine Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding

#6 Medium Priority	**Intentional Acts**
Strategy:	Support good relationship with police and rescue individuals in our community and surrounding ones. Provide public education to minimize risk of such occurrence. Educate ourselves as government officials. Continue and expand efforts.
Primary Responsibility:	Alpine Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#7 Medium Priority	**Urban and Structural Fire Hazard**
Strategy:	Public education. Presentations at schools and local shopping malls, etc. Enforcement of current zoning and building ordinances to guard against the spread of fire.
Primary Responsibility:	Alpine Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

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Bowne Township (Kent County), 2010 population 3,084 (up 12% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Sanitary Sewer Failure**
Strategy:	**Stationary generator for pumping station**
Primary Responsibility:	Bowne Township
Initiatives Needed:	Secure funding
Implementation:	2018
Cost(s):	$40,000-$50,000
Benefit(s):	Lessened potential for wastewater backup into homes and businesses
Anticipated Funding:	Federal Mitigation grants as well as Alto/Bowne Township DDA
2016 Status:	Due to revising this plan this subject is now being revisited to investigate funding sources and fully understanding the consequences.
#2 Medium Priority	**Severe Weather**
Strategy:	**Additional tornado warning sirens** in populated areas and anticipated future population centers. Coordinate as needed to bolster the dependability of emergency communication systems.
Primary Responsibility:	Bowne Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding

#3 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Bowne Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Flood Hazards**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Bowne Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	Bowne Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

Additional information, strategies, input, and concerns from the Alto Fire Department

Communication Failure:	Fire station is staffed whenever the phone service goes out.
Hazardous Materials:	All firefighters are trained to the Operational level. All hazardous materials incidents are turned over to Young's Environmental. Alto FD will assist with evacuations and, if safe to do so, will identify the hazardous material involved in an emergency event.
Tornado:	Tornado siren in place. Additional tornado sirens would prove valuable.
Wildfire:	Fire safety training at the local elementary school. Small fires are to be contained in barrels with 3/4 inch holes in the top.

Byron Township (Kent County), 2010 population 20,317 (up 16% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Byron Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Byron Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Byron Township

Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Byron Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Byron Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Byron Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Caledonia Township (Kent County) NFIP, 2010 population 12,332* (up 38% from 2000)
**population figure includes the Village of Caledonia*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Caledonia Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Caledonia Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township
Primary Responsibility:	Caledonia Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#4 Medium Priority	**Infrastructure Strengthening**

Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Caledonia Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Caledonia Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Village of Caledonia (Kent County), 2010 population 1,511* (up 37% from 2000)

**Population included in Caledonia Township*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Currently there is a grant application # HMGP 4195 for a second early warning siren to be placed at 230 S Maple. This siren would cover the southern / historic portion of the Village.

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Village of Caledonia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Cannon Township (Kent County) NFIP, 2010 population 13,336 (up 10% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Water System Failure**
Strategy:	Consider **consolidating private systems** and changing to public authority, or possibly just tying all three private systems together
Primary Responsibility:	Cannon Township
Initiatives Needed:	Secure Funding
Implementation:	To be considered when funding is available.
Cost(s):	Unknown
Benefit(s):	Lessened potential for loss of water due to power failure.
Anticipated Funding:	Federal Mitigation grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress at this time

#2 High Priority	**Wildfire Mitigation**
Strategy:	**ATV set up to fight fire in wooded area** and increase public education.
Primary Responsibility:	Cannon Township
Initiatives Needed:	Secure Funding
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	$30,000-$40,000
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#4 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#7 Low Priority	**Communication Failure**
Strategy:	Fire Dept. has portable radios. **Install a base station & repeater** system to allow the township to communicate
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#8 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Cannon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

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Cascade Township (Kent County) NFIP, 2010 population 17,134 (up 13% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility: Implementation: Benefit(s):	Cascade Township By 2022 or sooner Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility: Implementation: Benefit(s):	Cascade Township By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility: Implementation: Benefit(s):	Cascade Township By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Cascade Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Cascade Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Village of Casnovia (Kent County) 2010 population 319* (up 2% from 2000)

**Population included with Tyrone Township*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#2 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#3 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner

Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Village of Casnovia
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Cedar Springs (Kent County) 2010 population 3,509 (up 11% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#2 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#3 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner

Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Cedar Springs
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding

Courtland Township (Kent County), 2010 population 7,678 (up 32% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Wildfire Hazard**
Strategy:	**Enforce burning permit requirements** with additional staff enforcement
Primary Responsibility:	Courtland Township Fire Department
Initiatives Needed:	Develop Program
Implementation:	To be completed with existing staff and overtime during peak fire seasons.
Cost(s):	Unknown
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	To be completed with existing staff resources.
2011 Status:	No known request was made for funding beyond local funds.
2016 Status:	No known progress

#2 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#3 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance.

	Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#7 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Courtland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding

City of East Grand Rapids (Kent County) NFIP, 2010 population 10,694 (down 1% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility: Implementation: Benefit(s):	City of East Grand Rapids By 2022 or sooner Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility: Implementation: Benefit(s):	City of East Grand Rapids By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility: Implementation: Benefit(s):	City of East Grand Rapids By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of East Grand Rapids
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of East Grand Rapids
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Gaines Township (Kent County), 2010 population 25,146 (up 25% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#2 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding
#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Gaines Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Grand Rapids (Kent County) NFIP, 2010 population 188,040 (down 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Severe Weather** Investigate and acquire **new warning technology as it becomes available, add sirens**
Primary Responsibility:	City of Grand Rapids
Initiatives Needed:	Funding Source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Less potential for personal injury
Anticipated Funding:	Grants as well as other funding sources if available
2011 Status:	The City of Grand Rapids used local funds, supplemented with HSGP funding from the fiscal year 2009 grant, to upgrade sirens within the city. Future funds for hazard mitigation would be used to enhance and expand upon those efforts, as well as to research new technologies.
2016 Status:	The City of Grand Rapids continues to improve their outdoor warning capabilities by purchasing additional sirens to enhance coverage for the city

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Grand Rapids
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2011 Status:	Grant funds have been used to purchase the satellite-based EM Net system for Kent County and the City of Grand Rapids. Grant funds have also been used to purchase the CityWatch notification system for Kent

County. Future funds for hazard mitigation would be used to enhance and expand upon those efforts, as well as to research new technologies.

2016 Status: New technologies in notification systems have allowed for cell phone applications for citizens. The applications are provided by the National Weather Service, American Red Cross, as well as many of the local media outlets. Emergency management has been making a rigorous effort via informational releases from our public information officers, as well as local media venues for the purchase and use of NOAA weather radios

#3 Medium Priority **Severe Weather**

Strategy: **Identify any warning system needs** in the township.

Primary Responsibility: City of Grand Rapids

Implementation: By 2022 or sooner

Benefit(s): Less potential for personal injury.

2016 Status: No progress at this time

#4 Medium Priority **Infrastructure Strengthening**

Strategy: **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.

Primary Responsibility: City of Grand Rapids

Implementation: By 2022 or sooner

Benefit(s): Less potential for destruction and disruption.

2016 Status: No progress at this time due to lack of funding

#5 Low Priority **Fire - Urban and Structural**

Strategy: **Consideration of additional fire-related public awareness activities**

Primary Responsibility: City of Grand Rapids

Implementation: By 2022 or sooner

Benefit(s): Less potential for personal injury.

2016 Status: No progress at this time due to lack of funding.

#6 Medium Priority **Climate Change**

Strategy: The recommendations provided in this section were developed with an understanding that Grand Rapids represents a complex system with differing perspectives, resources, goals, and processes. Each sector possesses unique and valuable knowledge and direction, which will be needed to understand and solve the problem that increasing resiliency to climate change represents.

Process Recommendations

1) Grand Rapids needs an individual(s) or organization(s) to own and champion the responsibility of building climate resiliency in our community.

2) The champion(s) need a directive and resources to engage the community across sectors. Existing local community climate-resiliency narratives and leaders should be highlighted.

3) Champion(s) should utilize resiliency concepts, issues, and strategies identified in this report to evaluate existing plans (Green Grand Rapids, Sustainability Plan, etc.) to inform priority implementation.

4) City resiliency efforts going forward should focus on the selection, financing, and implementation of projects, as current planning documents identify existing best practices.

5) Underserved low-income and minority populations will be dis-proportionately impacted by climate change. Resiliency efforts in all aspects of community planning should recognize this.

6) Organizations should use economic valuation tools and comprehensive, triple bottom line impact analyses when considering major project spending.

Environmental Recommendations

Grand Rapids is in a unique position as an urban center that has aspects of a natural ecosystem within its boundaries and immediate surroundings. As such, it is important when planning for climate resiliency to consider not only solutions for the ecosystem components themselves but also those that will preserve communities' ability to interact with these resources.

7) Grand Rapids should strive to reduce GHG emissions through City operations and in the community as stated in the City of Grand Rapids Sustainability Plan and the U.S. Conference of Mayors Climate Protection Agreement (Grand Rapids Sustainability Plan).

8) Capture the "first-flush" precipitation of the 90th–95th percentile wet-weather event near where it falls.

9) Study the impact of climate change on the Grand Rapids water filtration plant.

10) Promote best practice regional settlement patterns in the Grand Rapids metropolitan area. Better integrate development with existing infrastructure (GVMC).

11) Increase watershed-level cooperation among sewer, water, and storm water authorities.

12) Establish a metro-wide system of environmental corridors, greenways, or landscapes, which create convenient, non-destructive public use of our natural environment, including bikeways, recreation areas, nature walks, and scenic preserves (GVMC).

13) Preserve and grow mixed-use and dense development neighborhoods, making essential services and businesses accessible through multimodal means of transportation (Green Grand Rapids).

14) Continue the Grand Rapids Metro Council's policy of "no new road construction in Grand Rapids," focusing instead on maintenance and "vital streets" improvement of existing roads where appropriate (GVMC).

15) Continue monitoring Great Lakes and aquifer water levels to more precisely understand the multiple causes and effects of fluctuations.

16) Water efficiency efforts should be strengthened in Grand Rapids through a variety of technological, policy, pricing, and programming means (Grand Rapids Sustainability Plan).

17) P.A. 98 of 2013 alters Michigan's wetland program. The City of Grand Rapids should advocate to the state and federal government for a robust wetlands program that at a minimum equals the previous standard.

18) Improve the quality of the Grand River and its tributaries by restoring it to a more natural state. This should involve the improvement of riparian buffers, daylighting tributary streams, continuing the development of greenways, and softening channels (Green Grand Rapids).

19) Reconnect residents and visitors to Grand Rapids urban waterways to increase citizen awareness of our fundamentally important water resources, build a sense of place, and maximize opportunities to create economic and social capital (Grand Rapids Whitewater).

20) Adopt a stronger urban canopy goal—at least 40%—and implement a program that reflects heat island, air quality, and other documented resiliency values delivered by a diverse, healthy urban tree canopy (Grand Rapids Urban Forestry Plan).

21) Engage citizens and private property owners in characterizing, managing, and growing the urban canopy through innovative programs and tools such as the GR Tree Map app (Friends of Grand Rapids Parks).

22) Parks, pools, splash pads, and natural and green recreation areas should be considered by City decision makers as critical climate infrastructure that enhances quality of life and makes Grand Rapids more resilient.

23) Use critical climate infrastructure such as low-impact development and green infrastructure to wholly implement the paradigm shift in storm

water management best practices (Green Grand Rapids; Green Infrastructure Portfolio Standard Projects).

Social Recommendations

A unique impact of climate change is the exacerbation of existing social inequities, which disproportionately affects vulnerable populations with limited resources and mobility. Collaborative efforts and resources should be pooled to understand impacts and solutions concerning food insecurity, housing, economic uncertainty, physical displacement, and health.

24) Citizens should develop a disaster-preparedness plan of their own by using resources such as the American Red Cross.

25) Grand Rapids should expand on existing strategies to improve long-term air quality efforts by researching and forwarding more powerful policy tools, locally and statewide, such as incentives to reduce vehicle miles traveled.

26) Grand Rapids and its partners (i.e., American Red Cross, Essential Needs Task Force, Kent County Emergency Preparedness, etc.) should analyze the effectiveness of resources used by citizens during extreme heat events, such as cooling centers and ozone action alerts, in order to continue providing the most useful and efficient responses.

27) Consider mitigating the production and exposure to low-level ozone and the urban heat island when planning and developing new infrastructure.

28) Continue to improve access to food sources by developing local food infrastructure.

29) Evaluate data-driven, flexible police staffing program for correlation with seasonal and daily temperature modulations.

Recommendations: Economic

The economic impacts of a changing climate will be far-reaching, interconnected, and difficult to precisely anticipate. Grand Rapids is fortunate to have organizations and leaders who already collaborate to resolve market-based problems and increase the sustainability of businesses and organizations wherever possible. However, climate change will likely require new levels of analysis using the triple bottom line principle to consider solutions that address climate change impacts and allow the organizations, businesses, and individuals of the community to thrive.

30) Support policy proposals to increase energy efficiency at the state level, such as the energy efficiency resource standard in P.A. 295. Simultaneously move to identify and adopt a triple bottom line, balanced, community-wide efficiency target (Grand Rapids Sustainability Plan).

31) Explore legal, policy, and economic frameworks that enable the City of Grand Rapids to build a more autonomous and resilient energy system. Such a system would enable Grand Rapids to pursue ambitious goals around pricing, decentralized energy systems, efficiency, and renewable energy.

32) Request that the MI Public Service Commission or another appropriate institution study climate change impacts on the energy sector, including supply, demand, infrastructure, and the energy/water resource nexus.

33) Research and implement climate-resilient street maintenance and construction practices, particularly for materials and physical infrastructure (Sustainable Streets Task Force; Green Grand Rapids).

34) Change the transportation culture in Grand Rapids to one built around multimodal, vital streets, providing equal access for all social levels with diverse transportation requirements (Green Grand Rapids).

35) Municipal insurance, capital projects, and asset-management planning should include assessments for exposure to drought, temperature change, flooding, storms, and climate mitigation.

36) Increase the number of commercial, residential, redevelopment, and remodeling building projects certified to be sustainable (i.e., LEED, Green Built, Green Star, etc.) beyond the existing 2015 goal. Study and recommend policy tools to reduce barriers and expand use beyond early adopters (Grand Rapids Sustainability Plan; City of Grand Rapids zoning Ordinance).

37) Retain green building leadership by encouraging the construction of best-in-class green building projects (i.e., Living Building Challenge, 2030, Netzero, LEED V.4 Platinum).

38) Prepare the agricultural industry for future climate scenarios by encouraging the use of existing decision-making resources, and where possible, host resiliency informational forums.

Grand Rapids Township (Kent County) 2010 population 16,661 (up 19% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2016 Status:	No progress at this time due to lack of funding.
#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding
#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Grand Rapids Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Grandville (Kent County) NFIP 2010 population 15,377 (down 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A Grandville 2020 Master Plan has already been produced, so it is not clear when the best opportunity will be to have hazard considerations incorporated into the plan. During the next update process, though, the Grandville Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.
Primary Responsibility:	City of Grandville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems** **Promote community messaging systems**
Primary Responsibility:	City of Grandville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.

Primary Responsibility:	City of Grandville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Grandville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Grandville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Additional hazard information and mitigation ideas:

Urban and Structural Fire:	Installation of fire stops in older buildings downtown. Standpipes for the critical dune area. Smaller all-wheel drive fire apparatus.
Riverine Flooding:	Dredge the Grand River to provide extra flow capacity (better able to accommodate ice flow). Rebuild the Warber Drain to increase its capacity. Seek funding for a study on ice jam mitigation.
Water System Failure:	Upgrade current water system.
Electrical Failure:	Offsite computer backup system. Burial of power lines.
Intentional Acts:	Cameras for security. Cameras and fencing for the power plant
Hazardous Material Release:	Emergency preparedness education for citizens

Grattan Township (Kent County) 2010 population 3,621 (up 2% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2016 Status:	No progress at this time due to lack of funding.
#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding
#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Gratten Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Village of Kent City (Kent County) 2010 population 1,057* (down 1% from 2000)

**population included in Tyrone Township*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**Flooding** **Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner

Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

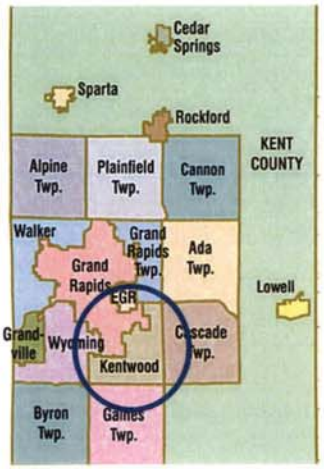
#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Village of Kent City
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Kentwood (Kent County) NFIP, 2010 population 48,707 (up 8% from 2000)

Hazard Priorities

High: Communication/Cyber Failure, Electrical Failure, Tornado, Transportation (Aircraft) Accident, Water System Failure, Severe Winter Weather

1. Introduction



In 2005 the City of Kentwood, Michigan adopted, and the Federal Emergency Management Agency (FEMA) approved, a Hazard Mitigation Plan for the City as required by the Federal Disaster Mitigation Act of 2000. In early 2010 the City of Kentwood terminated its independent emergency management program and agreed to participate in the Kent County program. Because Kentwood did not participate in the planning process of the regional Kent County, Ottawa County, and City of Grand Rapids Pre-Hazard Mitigation Plan ("regional plan"), the regional plan must be amended to include a Kentwood supplement.

2. All Hazard Mitigation Plan Review

The City of Kentwood has met FEMA amendment requirements. The City of Kentwood has reviewed the Pre-Hazard Mitigation Plan – Kent County, Ottawa County, City of Grand Rapids, Michigan dated March 18, 2005 and revised March 2006 and is in agreement with the plan's goals and mitigation strategies.

3. General Information and Unique Aspects

Kentwood is located in Kent County, southeast of Grand Rapids and east of Wyoming. The majority of the Kentwood's topography is generally flat. Greater changes in elevations are found in the north and central portions of the City. The highest elevation within Kentwood is 805 feet above sea level, found in the central area of the City. The elevation decreases progressively in a southwestern direction, where the lowest elevation is 670 feet above sea level.

There is one river system in Kentwood – Plaster Creek, with numerous tributaries such as Whiskey Creek and Little Plaster Creek. The west half of Kentwood is served by two major drains: Heyboer Drain and the Crippen Drain, which are tributaries to Buck Creek located outside of the city limits. Each of the creek systems have associated wetlands.

Soil types in Kentwood have been identified by the U.S. Department of Agriculture. The soil type in Kentwood is loam followed by sandy soils. Silt and muck are also found in small, isolated areas.

Weather in Kentwood is the same as that of Kent County and the City of Grand Rapids, consistent with non-coastal, western areas of Michigan.

The major land use in Kentwood is residential; however, industrial and commercial land uses have a significant presence.

The Kent County Landfill is a 72-acre, closed landfill centrally located within Kentwood, and adjacent to numerous residential developments. The landfill is listed as a U.S. Environmental Protection Agency Superfund site and is currently being remediated due to soil and groundwater impacts.

Approximately 1.7 miles of Interstate 96 is located in the northeast corner of Kentwood. The interstate serves as a primary transportation route to locations outside of Kentwood. Other major thoroughfares include Broadmoor, East Paris, 28th Street, and 44th Street.

A portion of CSX Railroad is located within Kentwood. The railroad is for freight transportation; there is no passenger rail transportation within the city. The Gerald R. Ford International Airport is located adjacent to Kentwood along the southeastern border in the City of Grand Rapids and Cascade Township. The airport offers numerous flights each day to various national/international locations. A public bus transportation system is offered to residents with connections to five surrounding cities (Grand Rapids, Grandville, Walker, East Grand Rapids, and Wyoming).

The following list of facilities and infrastructures have been identified as critical to providing essential products and services to the general public, preserving the welfare and quality of life of the community, and assuring public safety, emergency response, and disaster recovery.

Schools	Water/Sewer Structures
Public Facilities/Government Buildings	
Fire Stations (3)	Community Activities Center
Justice Center	Public Works Facilities
City Hall	Electrical Power and Utilities
Library	Roads

The following top hazards were identified by respondents to the survey questionnaire:

1. Communication Failures
2. Tornadoes
3. Water System Failure
4. Electrical Failure
5. Aircraft Accident
6. Winter Hazards

Ninety-three percent (93%) of the survey respondents agreed with the goals listed in the regional plan. Ninety-six percent (96%) agreed with the identified Kentwood goals:

- To protect citizens, especially special needs groups, such as the youth and elderly;
- To protect transportation infrastructure and ensure access for emergency response vehicles;

- To train for and coordinate communications and response activities, both internally and across jurisdictions;
- To protect and improve infrastructure in future planning; and
- To create effective education and communication systems between the public and officials.

4. Hazard Mitigation Actions

Ninety-six percent (96%) of those responding to the survey questionnaire agreed with Kentwood's mitigation actions:

#1 Educate the public about non-emergency hazards, identify tools for citizen mitigation, and encourage personal ownership of mitigation strategies.

#2 Assure that warming and cooling centers have adequate backup power generators.

#3 Accurately identify flood-prone areas. Restrict building permits in floodplain areas. Relocate, elevate or purchase structures in floodplain and other flood-prone areas.

#4 Train all essential services personnel (first responders and Emergency Operations Center staff) in an incident command/management system in coordination with the National Incident Management System (NIMS) requirements so that all incidents are handled in a coordinated, consistent manner.

#5 Enforce and maintain construction codes to ensure buildings' ability to withstand severe weather.

#6 Enforce and maintain construction codes and standards to maintain and preserve a safe and orderly community that mitigates development of blighted conditions, older structures and neighborhoods and eliminates potential dangers while maintaining public services and quality of life.

#7 Ensure access of emergency vehicles to and from affected areas.

#8 Ensure access to needed additional tools, supplies and equipment for emergency response.

#9 Maintain school/city collaboration.

#10 Replace/enhance public warning systems (sirens, City Watch, cable TV)

#11 Evaluate the need for emergency shelters for hazard prone areas.

#12 Maintain adequate staffing in emergency services and organize emergency support teams.

#13 Assure adequate wastewater collection pumping capacity.

#14 Assure adequate water system distribution capacity and reliability.

2011 Status:

The City of Kentwood prepared a survey questionnaire (City of Kentwood Hazard Mitigation Plan Survey – 2010) that asked a wide range of questions concerning the opinions of the public regarding natural and human caused hazards, agreement with regional and local (Kentwood) goals, agreement with proposed Kentwood mitigation actions, and methods for providing hazard information to the public. A Hazard Mitigation Plan Workshop was held on May 7, 2010. Eleven (11) members of the Local Planning Team reviewed the planning process and requirements and completed the survey questionnaire. At the meeting on June 15, 2010 a presentation was made to the Safety Committee of the Kentwood City Commission about the update/amendment requirements. The Safety Committee meetings are open, public meetings. Copies of the survey questionnaire were distributed.

In June the Kentwood Hazard Mitigation Plan Survey was mailed to approximately 250 people who had been identified as "community leaders." In addition, the survey was posted on the City's website for broader public input, and an article in the June 21, 2010 Grand Rapids Press further publicized the process and provided the web address for public access to the survey. As of the July 31, 2010 deadline, eighty-four (84) surveys had been completed and returned.

On September 10, 2010 the Local Planning Team met to review the regional Kent County, Ottawa County, and City of Grand Rapids Pre-Hazard Mitigation Plan, evaluate responses to the Kentwood survey questionnaire, and prepare a draft supplement to the regional plan. The Local Planning Team recommended that the Kentwood City Commission, by resolution:

Adopt the regional Kent County, Ottawa County, and City of Grand Rapids Pre-Hazard Mitigation Plan;

Adopt the Kentwood amendment to the regional Kent County, Ottawa County, and City of Grand Rapids Pre-Hazard Mitigation Plan;

Request review of the Kentwood amendment by the Michigan State Police/Emergency Management Division and Federal Emergency Management Agency, Region V officials and approval contingent upon adoption by Kent County, Ottawa County, and the City of Grand Rapids; and

Request that Kent County, Ottawa County, and the City of Grand Rapids adopt the City of Kentwood amendment (supplement) to the regional plan.

The Kentwood City Commission held a public hearing on the proposed Kentwood amendment to the Kent County, Ottawa County, and City of Grand Rapids Pre-Hazard Mitigation Plan on September 20, 2010 and adopted Resolution 69-2010 to approve the proposed Kentwood amendment and adopt the regional plan with the Kentwood amendment.

2016 Status:

No known progress at this time

City of Lowell (Kent County) NFIP, 2010 population 3,783 (down 6% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts **in the** next update of the **community's master plan** and associated zoning maps.
Primary Responsibility:	City of Lowell
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems Promote community messaging systems**
Primary Responsibility:	City of Lowell
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Lowell
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Lowell
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Lowell
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Lowell Township (Kent County) 2010 population 5,949 (up 14% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium priority	**Sanitary Sewer Failure Hazard**
Strategy:	**Attach temporary generator to pumping station**, we have a very small and simple public sewer system.

#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No known progress at this time

#7 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Lowell Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Additional Input, Concerns, and Strategies from the Alto Fire Department:

Water System Failure:	No public water system is available.
Tornado:	An emergency generator at the fire station is usable for temporary housing of people displaced by tornados and bad weather. A tornado siren is in place. Able to monitor weather conditions from various points in the township.
Wildfire:	Distribute pamphlets. Display fire trucks and rescue vehicles when possible. Expand public education and awareness. Fire safety training at the local elementary school. Small fires are to be contained in barrels with 3/4 inch holes in the top of the screen. No burning without permits.

Nelson Township (Kent County) 2010 population 4,764 (up 14% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan** in 2017.
Primary Responsibility:	Nelson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**All Hazards**
Strategy:	At present, the Township is not connected to an audible emergency warning system that would alert residents. We plan to research to see if there is any grant funding available to help provide this service.
Primary Responsibility:	Nelson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Nelson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	- The Township will have a Damage Assessment Team trained in early 2017. - It has identified emergency shelters within the Township.

- It has attempted to identify residents that would need assistance in the case of an extreme weather event such those using oxygen generators. Residents have been reluctant to divulge this information.

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Nelson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption
2016 Status:	At present, the Township does not have any major infrastructure. It has no water or sewer system. The Village of Sand Lake does. There are no major bridges, dams or other structures that are located in the Township that need to be hardened.
#5 Low Priority	**Flooding**
Strategy:	The Township is aware of surface flooding caused by extreme rain events and works with the Kent County Drain and Road Commissions to ensure existing drains and ditching are maintained and improved as necessary
Primary Responsibility:	Nelson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption
2016 Status:	In 2016, a review of the flood prone areas in Kent County was conducted as part of the Kent County FEMA Resilience Study. At that time, Nelson Township did not rank as an area that warranted consideration to be included in the National Flood Insurance Program (NFIP). No flood maps were prepared for the Township as a result of the review.

Oakfield Township (Kent County) 2010 population 5,782 (up 14% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Wildfire Hazards**
Strategy:	Control of all burning through permits and increased enforcement
Primary Responsibility:	Oakfield Township Fire Department
Initiatives Needed:	Develop program
Implementation:	To be completed with existing staff and overtime during peak fire seasons
Cost(s):	Unknown
Benefit(s):	Reduce potential for fire damage
Anticipated Funding:	To be completed with existing staff resources
2011 Status:	No known request was made for funding beyond local funds
2016 Status:	No known progress

#2 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#3 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might

	benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time
#4 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#5 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No known progress at this time
#7 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities, Locating vulnerable areas** in the township, reducing these areas (with grant assistance) Investigation/**prevention plans for businesses**
Primary Responsibility:	Oakfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Plainfield Township (Kent County) NFIP, 2010 population 30,952 (up 3% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Riverine Flooding** Purchase property vulnerable to flooding as funds become available
Jurisdiction:	Plainfield Charter Township
Primary Responsibility:	Kent County
Initiatives Needed:	Funding Source
Implementation:	To be considered when funding is available
Cost(s):	$130,000 per residential lot @ 63 lots = $8,190,000 (Based on average property values)
Benefit(s):	Less potential for flood damage.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	Plainfield Township expects to purchase at least eight houses - possibly as many as 13 - whose proximity to the Grand River has left them plagued by seasonal flooding. After a delay of a year and a half, the Township Board voted to proceed with using a $1.1 million grant from the Federal Emergency Management Agency to buy and demolish up to 13 houses that are most in danger of damage from flooding. The cost to the township could be about $23,500 for title transfers and other work, after $15,000 was spent a few years ago on engineering and appraisals. The 13 homes that can be bought with the grant are on Konkle and Willow Drives, Abrigador Trail and Riverbank Street. In this voluntary program, homeowners will be offered 75 percent of their homes' appraised value, which is all the federal grant will pay. The township does not plan to provide the other 25 percent. Township Planner Peter Elam said that the offers, though short of full value, will be favorable to homeowners in many cases, allowing them to get rid of flood-prone, older homes without having to go to market. Banks are likely to jump at the chance to get rid of five homes that are in foreclosure. However, at least three residents have stated they are not

	interested in selling, according to Elam. When the grant program was nearly complete in July 2009, several homeowners said they liked their locations near the river despite repeated flooding. However they also said they might sell for the right price. After the township worked for years on the grant, the FEMA money was tied up in Congress and then in the state. Title work could further stretch the purchases out. Township officials especially want to buy four homes on Konkle Drive that are accessed by a dirt road through the former Grand Isle Golf Course. The township is trying to buy much of the course, which is in the river's flood plain, for a park. Elam is working on another FEMA grant for a similar program that would allow the purchase of 15 other homes in the flood plain.
2016 Status:	No known progress at this time
#2 High Priority	**Water System Failure**
Strategy:	We are focusing on **improving security** at the plant and remote locations. Our aim is to deter illegal activities at our sites and detect any attempts to interfere with our ability to deliver safe drinking water. We are also upgrading our fixed-base radio system to improve reliability of our primary communications system.
Primary Responsibility:	Plainfield Charter Township
Initiatives Needed:	Secure Funding
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Unknown $5,000-10,000 for radio system
Benefit(s):	Less potential for loss of system pressure.
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	In 2008, the West Michigan Water Security Consortium was formed. The purpose of this consortium is to identify risks and vulnerabilities in the water security arena. The consortium also focuses upon sharing information and communication among its members, which include both public and private stakeholders. Training, security software, networking, and best practices have been a focus of this group. Future hazard mitigation funds might be used to enhance and expand those efforts, as well as to explore new technologies.
2016 Status:	No known progress at this time
#3 High Priority	**Wildfire**
Strategy:	**Provide information** regarding fire safety to the homes that are most at risk
Primary Responsibility:	Plainfield Charter Township
Initiatives Needed:	Secure Funding
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Approximately $2000 for brochures
Benefit(s):	Reduce potential for fire damage.

Anticipated Funding:	Grants as well as other funding sources if available
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress at this time
#4 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.** The township did develop a Flood Mitigation plan in 2007 and has taken more steps toward the consideration of hazard mitigation needs and concepts in its planning processes than many other communities have. The township's most recent master plan was completed in 2008 and has included some consideration of local hazards. The next update of the community's master plan process should build upon this commendable start.
Primary Responsibility:	Plainfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#5 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Plainfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#6 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Plainfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#7 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Plainfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.

2016 Status:	No known progress at this time

#8 Low Priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities, Locating vulnerable areas** in the township, reducing these areas (with grant assistance) Investigation/**prevention plans for businesses**
Primary Responsibility:	Plainfield Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Additional hazard-related information and considerations:

Water System Failure:	In the "What We Have Now" category: a back-up generator with capacity to operate the plant and wells to meet the average day's demand on the system; back-up generators to operate several of our pump stations; the Well Head Protection program; interconnections with Grand Rapids and Rockford; equipment to perform emergency excavations including lights for night operations; back-up excavation equipment at the Building & Grounds Dept.; and hand-held communications units. We also have a comprehensive contingency plan in place. We are focusing on improving security at the plant and remote locations. Our aim is to deter illegal activities at our sites and detect any attempts to interfere with our ability to deliver safe drinking water. We are also upgrading our fixed-base radio system to improve the reliability of our primary communications system.
Riverine Flood Hazard:	Zoning. Possible purchase of structures within the floodway.
Dam Failure:	Possible purchase of structures within the floodway.

City of Rockford (Kent County) 2010 population 5,719 (up 24% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.** The city has a longer-term (2020) master plan. During an eventual update process for this plan, the Rockford City Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Rockford
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Village of Sand Lake (Kent County) 2010 population 500* (up 2% from 2000)

**Population included in Nelson Township*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Village of Sand Lake
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Solon Township (Kent County) 2010 population 5,974 (up 29% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner

Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Solon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Sparta Township (Kent County) NFIP, 2010 population 9,110* (up 2% from 2000)
**Population includes the Village of Sparta*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Sparta Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Sparta Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township.
Primary Responsibility:	Sparta Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Sparta Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Sparta Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Village of Sparta (Kent County) NFIP, 2010 population 4,140* (down 1% from 2000)
**Population included in Sparta Township*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Village of Sparta
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Village of Sparta
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township.
Primary Responsibility:	Village of Sparta
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Village of Sparta
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Village of Sparta
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Spencer Township (Kent County) 2010 population 3,960 (up 8% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner

Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Spencer Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Tyrone Township (Kent County) 2010 population 4,731* (up 10% from 2000)
**Population includes the Villages of Casnovia and Kent City*

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Tyrone Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Tyrone Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Tyrone Township

Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Tyrone Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Tyrone Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Tyrone Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Vergennes Township (Kent County) 2010 population 4,189 (up 16% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Vergennes Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**Flooding**
Strategy:	**Consideration will be given to participation** in the National Flood Insurance Program (**NFIP**). Not all residents are eager to participate, primarily due to concerns about the potential costs to those who might feel a mandate from mortgage providers to purchase insurance. Information about the actual costs of such policies and who they might benefit (or inconvenience) must be weighed against the community's risks from all types of potential flood problems.
Primary Responsibility:	Vergennes Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Vergennes Township

Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Vergennes Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#5 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Vergennes Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Vergennes Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

City of Walker (Kent County) NFIP, 2010 population 23,537 (up 8% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

City of Walker Fire Department Input, Concerns, and Strategies:

Extreme Temperatures:	Through our emergency plan we have planned for sheltering in the event of extreme temperatures. We can also check on the elderly with the help of the police department.
Thunderstorms:	We have an early warning system in Walker utilizing outdoor sirens. We have a protocol that determines when the sirens are to be activated in cooperation with the rest of Kent County. We also have an emergency operations plan for dealing with severe weather. We have established protocols based on National Weather Service information for public notification through the media.
Wildfire:	We try to keep our residents in wildfire risk areas informed of proper preventive measures. We have a fire department with equipment and operating procedures for handling wildfires. We also have mutual aid agreements with neighboring fire departments to assist us with their wildfire firefighting equipment.
Severe Winter Weather:	We have an early warning system in place utilizing outdoor warning sirens. We have established protocols based on National Weather Service information for public notification through the media.
Tornado:	We have an early warning system in place utilizing outdoor warning sirens. We also have an emergency operations plan for tornadoes, in conjunction with Kent County. We have established protocols based on National Weather Service information for public notification through the media.

Urban and Structural Fire: We have an established fire department with equipment and operating procedures to control a structural or urban fire incident. We also have an established fire prevention and public fire education program to educate business owners and homeowners in the prevention of fires. Our fire codes also help us reduce the risk of structure fires and so do our Construction Codes. Our building department issues building permits only on projects that are being constructed according to the codes and ordinances. Once construction begins the projects are periodically inspected by the building department and the fire department. When construction is complete and the building is occupied the fire department conducts annual maintenance inspections of our commercial and industrial occupancies to reduce the risk of fire and injuries from fires by proper storage and maintenance in the building.

Other Fire Hazards: We have codes and ordinances that prohibit these types of fires. The fire department also has the equipment and procedures to effectively handle these types of fires should they occur despite our efforts to prevent them. We do allow the burning of branches, twigs and other lawn materials during specific periods of time and under very strict guidelines.

Urban Flood: Our emergency operations plan does provide for a process for sandbagging if necessary along the banks of the Grand River. We have a very extensive storm water system. We also have ordinances and codes that address storm water issues, including retention and detention as well as the flow of water into streams and rivers. We are proposing some improvements to the York Creek Watershed to reduce the risk and impact of downstream flooding. We are looking at the possibility of reducing the flooding prospects in our York Creek watershed. The plan being proposed is still in development.

Electrical Failure: We would rely on Consumers Energy for any public electrical infrastructure failures. All of the City's buildings have back-up generators. The fire department has 10 portable generators available for emergency situations in our community. We also have an emergency operating plan to aid us in these situations. We are currently upgrading our backup system for our Public Safety Building that includes Fire Headquarters, Police Headquarters and Court. Currently only certain systems and areas of this building were supplied by the generator. After further evaluation we have been told the backup generator can handle the entire building so changes are being made to accomplish that.

Communications Failure: In the event of a failure of our communications system, both Kent County and Grand Rapids can assist us.

We are constructing a new fire station remote from our City Hall. We propose to equip this building as an Emergency Operations Center as well as having back up communications capabilities.

Intentional Acts: We have trained our personnel to the Operations level for Weapons of Mass Destruction. They also have been trained in Unified command, Incident Command and NIMS. Continue to address these risks in our training program

Sanitary Sewer Failure: Our sanitary sewer system is owned and maintained by Grand Rapids Water and Sewer Dept. Any failure or emergencies involving the sewer system would be handled by them.

Water System Failure: Our water system is owned and maintained by Grand Rapids Water Dept. Any loss of water would be dealt with by them.

Transportation Hazards: We have developed transportation plans for vehicular as well as railroad incidents. We know the most common routes used to transport hazardous materials. We also have been able to determine the 25 most common hazardous materials transported through our city and the MSDS sheets for those products. Continue to update our plans as we receive new information on hazardous materials being transported through our city .

Hazardous Material Hazard: The Walker Fire Department personnel are all trained to the Hazardous Materials Operations level. We also contract with the city of Wyoming to provide us with Hazardous Materials response at the technician and specialist level. We also can utilize Grand Rapids Haz Mat Response team as part of our mutual aid agreements. We have site plans written through LEPC as well as Firefighter Right To Know on many of our buildings that have hazardous materials on site. We also have a plan for transportation incidents and truck terminal incidents. We continue to upgrade our hazmat response plans and survey our city to find any new occupancies that have hazardous materials on their premises

City of Wyoming (Kent County) NFIP, 2010 population 72,125 (up 4% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Dam Failure, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Wyoming
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Walker
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Wyoming
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time
#4 Medium Priority	**Infrastructure Strengthening**

Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Wyoming
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Wyoming
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

City of Wyoming Fire Department Input, Concerns, and Strategies:

Wildfire:	Although the City of Wyoming does not have large areas of open space, the city does have a burning ordinance that prohibits any open burning.
Tornado:	The City of Wyoming currently has Emergency Management Warning Sirens which cover approximately 90% of the City. These sirens are controlled, via radio, through the Grand Rapids Fire Department dispatch center. To provide coverage with EM Warning sirens to the remainder (approximately 10%) of the city and to replace older units.
Severe Winter Weather:	The City of Wyoming has its own Public Works department which provides for all snow and ice removal in the City.
Urban and Structural Fire:	The City of Wyoming provides fire safety education and code enforcement inspections. The City is also served by a combination fire department.
Electrical Failure:	All the essential service buildings in the City of Wyoming are equipped with automatic backup generators.
Intentional Acts:	The Wyoming Fire Department Team is equipped and trained to handle CBRNE and WMD incidents. Team members are also part of the State Regional Response Team Network (RRTN).
Hazardous Material:	The Wyoming Fire Department also operates a Hazardous Materials Response team.
Water System Failure:	The City of Wyoming has its own water and public works facilities with emergency action plans in place.
Sanitary Sewer Failure:	The City of Wyoming has its own Sanitary Sewer department with emergency plans in place.
Thunderstorms:	The Red Cross currently has predetermined evacuation sites for any residents that may be displaced by a flood and/or severe storms.

CW 16

Ottawa County (Ottawa County) NFIP, 2010 population 263,801 (up 11% from 2000)

Hazard Priorities

High: Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather

Medium: Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard

Low: Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority — **Severe Weather - Thunderstorms, Tornados**

Strategy: **Assist in adding sirens to regions as requested by jurisdictions.**
Primary Responsibility: Ottawa County and relevant jurisdictions
Initiatives Needed: Funding source
Implementation: Update sirens by 2016 or sooner, add sirens as requested by jurisdictions
Benefit(s): Less potential for personal injury.
Anticipated Funding: Federal mitigation or other grants

2011 Status: Since the last edition of this plan, Ottawa County has added 13 warning sirens to its system totaling 73 sirens. Sirens were also upgraded to 2-way sirens so that all are now 2-way.

2016 Status: No additional sirens added change due to lack of funds.
Park Twp. applied for a hazard Mitigation grant for a siren but was not selected.

#2 High Priority — **Severe Weather - Emergency Notification**

Strategy: **Investigate and acquire new warning technology.**
Primary Responsibility: Ottawa County
Initiatives Needed: Funding source
Implementation: By 2016 or sooner if funding is available.
Cost(s): Reverse 911 system $100,000;
Benefit(s): Less potential for personal injury.

Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	A "reverse 911" system was purchased, named CityWatch. It is an automatic call handler that calls multiple phone lines per minute and is used for notification purposes, capable of covering the entire county. One AM transmitter was also purchased. Other grant funds have been used to purchase the satellite-based EM Net system for Ottawa County.
2016 Status:	Ottawa Emergency Management retired the antiquated CityWatch system and purchased RAVE's emergency notification system instead which includes IPAWS. Rave was chosen so that Emergency Management could work seamlessly with the countywide 911 system that already works with RAVE Smart 911 products.
#3 High Priority	**Flood - Riverine**
Strategy:	**Take measures to mitigate flood damage and reduce vulnerability to existing structures.**
Primary Responsibility:	Ottawa County
Initiatives Needed:	Funding Source
Implementation:	To be considered when funding is available.
Benefit(s):	Less Potential for flood damage.
Anticipated Funding:	Federal Mitigation grants as well as other funding sources if available.
2011 Status:	So far, homeowners have elevated 5 houses on Van Lopik and 1 house on Limberlost.
2016 Status:	One additional home has been elevated and one property is rebuilding a garage which will be equipped with floodgates per MDEQ and township zoning requirements. *(For further detail see Robinson Township in this section.)*
#4 High Priority	**Urban Flooding**
Strategy:	**Identify infrastructure vulnerabilities resulting in urban flooding.**
Primary Responsibility:	Ottawa County Road Commission
Initiatives Needed:	Funding Source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Less potential for urban flooding in several areas of the county.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
Potential Project Areas:	1. Coolidge Street west of 16th Avenue, Sec 26 **Chester Township**: Remove and replace dual 95x67 metal culverts with an adequately sized concrete box culvert. History : Upstream parcel floods, house and outbuilding at risk. Frequent Coolidge overtopping reported.

2. Riley from 136th Avenue to Butternut Drive, Sec 7 **Holland Township**: Relocate/enclose Drain #30 which is located along the north side of Riley either side of the West Ottawa Public School access drive. History: This open drain is close to the existing road and slopes are extremely steep, creating a hazard for riparian residential housing and the nearby West Ottawa Elementary School. This drain is often the recipient of dumped garbage, which slows storm water drainage for upstream flood-prone areas such as the Chesapeake Manor Subdivision.

3. Ottawa Beach Road at Anchorage Marina, Sec 27 **Park Township**: Install new culvert under Ottawa Beach Road and storm drain for the northwest quadrant of the new crossing. History: Frequent flooding of Anchorage Marina and high water levels on property upstream of a failing 36" metal culvert. The deteriorating culvert resulted in a sinkhole in the pedestrian path in 2004.

4. Main Street from Arch to Jackson. Marne, MI located in Sec 35 **Wright Township**: Install storm drainage outlet to Dayton Drain or other acceptable storm water drainage system. A county Drain should be established. History: Existing Main Street storm at this location has no outlet, which causes flooding of a public road and private property .

5. Leonard Road approx 570' west of 68th Ave., **Polkton Township**: Existing 10.3x6.2'steel beam type drainage structure located under Leonard has developed sinkholes after periods of high flow. The structure should be replaced with one that is adequately sized. Also, a storm sewer should be placed to the west along the north side of the road to ease the flooding problem at the intersection of Church Street. History: repeated patching of culvert approaches has been necessary, and ponding of water on the north side of Leonard at Church Street is a danger to the traveling public.

6. 104th and Perry. Sec 23,24,25,26 **Holland Township**: Remove and replace the drainage structures in Drain 4 and 43 located under Perry and 104th and rebuild as one structure with associated pedestrian path and intersection improvements. History: Drain 15 and 17 at this location has had a history of overtopping Perry Street. CMP type road crossings at this location are undersized and in questionable condition. A deep open drain between Perry and 104th is a safety concern for pedestrian path and public road users. Flood levels on developed private property are a concern to the east of 104th Avenue.

7. 64th Avenue north of Adams Street. Drenthe, Sec 26/27 **Zeeland Township**: Remove and replace the dual 96" diameter metal culverts located under 64th approximately ¼ mile north of Adams with a single concrete box culvert. History: 64th Ave is a primary road and a main corridor for north–south traffic. The condition of the culvert and high velocities in the stream are causing sinkholes in the asphalt road surface above. The metal culverts are perched, causing erosive scour at their downstream end. The culverts also catch debris at their upstream end, limiting capacity and raising upstream flood levels. The Zeeland Fire Station at the NW quad of 64th and Adams uses 64th as the primary corridor north for emergency services.

8. South Shore Drive 175' west of Park Street. Sec 34 **Park Township**: Remove and replace the drainage structure under South Shore Drive in the Kelly Lake Intercounty Drain. History: This concrete slab structure is deteriorated and has multiple openings. South Shore Drive is one of only 2 emergency access outlets for Macatawa, MI. Multiple openings have a history of catching debris, which reduces the capacity of the stream and raises upstream flood levels. A single span structure is proposed, with some sheeting work necessary along the banks, to tie into existing private sheet piling. Proposed work must take into account downstream sediment, and basin maintenance that is regularly performed by the Intercounty Drainage Board.

9. Riley Street ¼ mile west of 152nd Avenue. Sec 11/14 **Park Township**: Remove and replace the drainage structure under Riley Street in the Number 37 County Drain. History: The original structure was extended with 2-chamber timber box at each end, causing obstruction collection and an associated untimely rise in upstream flood levels. A single span structure is proposed. Riley Street is a main east–west corridor with growing demands due to residential development in Park and Holland Townships and the location of the new West Ottawa Middle School complex at 152nd and Riley.

10. State Street east of 130th Avenue. Sec 9/16 **Crockery Township**: Remove and replace the triple 81x59" metal culverts located under State Street with a single opening concrete box culvert. History: Sink holes are occurring on road shoulders at structure after periods of high flow. Culvert is perched at the south (downstream end), causing erosive scour of the stream bottom and contributing to culvert undermining.

#5 High Priority	**Communication/Cyber Failure**
Strategy:	**Identify infrastructure vulnerabilities.**
Primary Responsibility:	Ottawa County
Initiatives Needed:	Funding Source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Higher security through less potential for long term interruption of communications.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	In 2010, the West Michigan Cyber Security Consortium was formed. The purpose of this consortium is to identify risks and vulnerabilities in the cyber arena, which includes IT and communications. Training, security software, networking, and best practices have been a focus of this group. Future hazard mitigation grant funds can be used to enhance and expand these efforts, and to explore new technology.
2016 Status:	The in 2010 formed West Michigan Cyber Security consortium has grown to over 600 agencies in both the private and public sector. Meetings and held quarterly with presenters on cyber security related topics. In 2016 two exercises were done by the Department

of Homeland Security. In March of 2016 members of this committee met with US Senator Gary Peters to discuss our cyber-related activities.

#6 High Priority	**Communication Disruption**
Strategy:	**A communication tower is needed in some portions of the county** to assure coordination for public safety where signals aren't as strong as others.
Primary Responsibility:	Ottawa County Central Dispatch
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	Unknown
Benefit(s):	Higher security through less potential for long term interruption of communications.
Anticipated Funding:	Grants as well as other funding sources, if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	Ottawa County is adding communication tower capacity in 3 locations at the time of this writing, in part, to accommodate the 800MHz project. Ottawa County Central Dispatch uses an extended version of Smart 911.

#7 High Priority	**Electrical Failure**
Strategy:	**Work with local utility companies to develop a plan** for dealing with communication disruptions.
Primary Responsibility:	Ottawa County
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Benefit(s):	Higher security through less potential for long-term interruption of communication.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	The West Michigan Cyber Security Consortium was formed which provided opportunity to build relationships with especially the private sector in the region.
2016 Status:	Consumers Energy, the company that provides electricity and gas to most of the region, has implemented an outreach program for emergency managers and PSAPs that is working very well, especially prior to, and during inclement weather.

#8 High Priority	**Electrical Failure**
Strategy:	**A portable 75 kw generator to provide backup power** for OCRC Public Utilities operated sanitary sewer lift stations and water metering stations during

	power outages. OCRC Public Utilities currently operates approximately 30 lift/metering stations and has only one portable generator for backup power. 50 kw generators stations for OCRC Hudsonville and Coopersville garages are needed to assure timely emergency services for the public during power shortages. Existing 5000 watt portable generators are sufficient only to open doors and provide minimal lighting.
Primary Responsibility:	Ottawa County Road Commission
Initiatives Needed:	Secure Funding
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	$50,000
Benefit(s):	Safer operations with lower potential for security breach.
Anticipated Funding:	Federal Mitigation grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	Same
#9: Medium priority	**All Hazards - Master Plan Consideration**
Strategy:	**Give consideration to hazard mitigation needs and concepts in the next update of the master plan** and associated zoning maps throughout the county's jurisdictions. Since this strategy can only be implemented at the township, city, or village level, its mention here concerns the giving of information and encouragement by the county to support such local plan revisions.
Primary Responsibility:	Ottawa County
Initiatives Needed:	Speak with boards and planning managers to encourage consideration.
#10: Medium priority	All Hazards - **Infrastructure Strengthening**
Strategy:	Identify potential projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.
2016 Status:	A critical infrastructure project began in Ottawa County in 2013 and continues. This project connects surveillance cameras to a system that can be viewed on the floor of the PSAP center as well as the EOC.

Allendale Township (Ottawa County) NFIP, 2010 population 20,708

NOTE: The township's economy is predominantly oriented around Grand Valley State University (GVSU), which is also the predominant organization involved in local funding and implementation activities for hazard mitigation projects since most of that population is connected with the university.

University enrollment (2016-2017) included 25,460 students (both graduate and undergraduate) and nearly 3,500 support staff and faculty. The university enrollment exceeds the township's permanent (census) by several thousand. Because of the prominence of GVSU within the township and the fact that the university's activities affect most of the township's population, most of the hazard mitigation strategies listed here for the township are either, or also under the charge of the university.

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority	**All Hazards**
Strategy:	**Master Plan consideration.** The next update of this plan should include consideration of hazard mitigation concepts and strategies.
a Primary Responsibility:	Allendale Township although coordination with Ottawa County Emergency Management is likely.
Implementation:	Proceed through 2022
#2 High Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems** serving the township beyond the Grand Valley State University campus.
Primary Responsibility:	Allendale Township
Implementation:	Coordination with Ottawa County Emergency Management
2016 Status:	Ottawa County Central Dispatch and Emergency Management provide emergency notification via EM Net, sirens, and Rave notification system (capable of IPAWS). Project complete.

#3: Medium Priority	**Infrastructure Protection**
Strategy:	Identify potential improvements or projects to identify and strengthen the area's infrastructure (other than GVSU) to increase its hazard-resistance, in addition to those potential improvements already studied/proposed for the GVSU campus.
Primary Responsibility:	Allendale Township
2016 Status:	Focus has been on GVSU. No known progress.
#4 Low Priority	**Fire Preparedness**
Strategy:	Consideration of additional fire-related public awareness and training activities beyond those already covered by Grand Valley State University and its students and campus area.

Hazard Priorities

High: Utility Failure/Leak, Intentional Act, Fire - Structural, Riverine Flooding, Urban Flooding, Structural Fire

Medium: Hazardous Materials Release, Communication/Cyber Failure, Electrical Failure, Severe Winter Weather, Public Health Hazard, Tornado

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Landslides, Dam Failure, Transportation Accidents, Sanitary Sewer System Failure, Extreme Temperatures

- **GVSU Threat Hazard Identification and Risk Assessment (THIRA)**:

CO / Gas leaks
Explosives / Bomb Devices
Fires
Floods
Hazmat accident/spill
IT - Cyber Attack / Virus / Breach / Failure
Medical Emergencies / Death of Student or Staff
Person with a Gun / Active Shooter
Power Outage
Severe Weather - Tornadoes/ Lightning / Snow / Ice
Suicide
Vehicle Accidents

SOURCE: Grand Valley Emergency Management Advisory Committee (GV-EMAC) October 2015

GVSU Prioritized Hazard Mitigation Strategies

#1 High Priority	**All Hazards**
Strategy:	**Campus Emergency Coordination**
Primary Responsibility:	GVSU
Initiatives Needed:	Planning and training
Implementation:	By 2022 or sooner if funding is available
Benefit(s):	A team of trained individuals will be able to assist students to shelter locations during storms as a response, but more importantly, they will train individuals in what to do to either mitigate the hazard or teach them what to do prior to the arrival of first responders.
Anticipated Funding:	GVSU, grants

2016 Status:	GVSU has begun training a core group of full time staff to act as building coordinators to prepare for, mitigate, and respond to all hazards and various critical incidents. This team of 125 individuals is in need of equipment and identifying vests.
#2 Low Priority	**All Hazards**
Strategy:	**Assistance Center**
Primary Responsibility:	GVSU
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Protection of property
Anticipated Funding:	GVSU, grants
2016 Status:	GVSU has considered planning for an assistance center to house a short - term area that could be used for all hazards. This area, however, lacks the ability to operate during power outages.
#3 High Priority	**Intentional Acts**
Strategy:	**Countering violent extremism**
Primary Responsibility:	GVSU Police
Initiatives Needed:	Planning and training
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Protection of life and property
Anticipated Funding:	GVSU, grants
2016 Status:	GVSU has seen an uptick in on-campus protests. There is a lack of ability for persons to secure themselves during a critical incident due to classroom doors lacking any type of locking mechanism. The University operates a fully trained Police Department. This department has been training annually in active shooter prevention and provided seminars on active shooter defense. The department does lack protective gear to respond to such incidents.
#4 High Priority	**Severe Weather - Emergency Notification**
Strategy:	**Investigate and acquire new warning technology.**
Primary Responsibility:	Ottawa County
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.

2016 Status:	GVSU continues to develop actions to strengthen and maintain emergency notification systems serving both on and off campus residents. The university has worked to mitigate various gaps that previously existed. There remains an inability to control signs and marquees to announce an emergency. The university library's fire annunciation system is capable of announcing alerts, but is not yet set to do so.

#5 Medium Priority	**Intentional Acts / Infrastructure Protection**
Strategy:	**Surveillance/Detection**
Primary Responsibility:	GVSU Police
Initiatives Needed:	Surveillance cameras
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Protection of property
Anticipated Funding:	GVSU, grants
2016 Status:	GVSU has three campus entries. The ability to detect vehicles in pursuit of investigative leads is lacking because these three entries are not monitored or recorded. The university has several of its' cameras connected to the critical infrastructure protection system implemented by the county since the last update of this plan which is helpful. GVSU would like to install cameras at their stadium as well (houses approximately 30,000 people.)

#6 Medium Priority	**Fire - Urban and Structural**
Strategy:	**Rescue assistance for disabled people**
Primary Responsibility:	GVSU
Initiatives Needed:	Surveillance cameras
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Protection of property
Anticipated Funding:	GVSU, grants
2016 Status:	GVSU has continued to implement fire safety concepts. One area lacking at the university is the evacuation of persons with disabilities. Consideration has begun to create areas of rescue assistance so those persons have a safe means of sheltering during a fire.

GVSU Project Summary

Mitigation Action, Program, Project	Hazard	Priority	Benefit	Estimated Cost
#1 Campus Emergency Coordination	All Hazards	High	The team should have a simple go bag to help during various emergencies. Having a vest will help identify them to the public	$8,400
#2 Assistance Center	All Hazards	Low	Install generators for the pre-planned Assistance Center	$19,000
#3 Classroom Locks	Intentional Acts	High	Having the ability to secure classrooms during an active shooter incident increases survivability	$50,000
#4 Emergency Notification	Severe Weather	High	The front marquee would be a great place for emergency notifications to reach even visiting persons to campus	$8,000
#5 Install camera detection at all three entries to campus	Intentional Acts / Infrastructure Protection	Medium	Having the ability to monitor and record the three entries would be invaluable to investigative leads	$20,000
#6 Rescue Assistance	Fire - Structural	Medium	Create areas of rescue assistance for individuals with disabilities	$15,000

Blendon Township (Ottawa County) NFIP, 2010 population 5,772 (up 1% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Master Plan consideration.** During the next planning process, the Blendon Township Planning Commission should give consideration to hazard mitigation concepts and concerns and adjust the master plan to accommodate viable hazard-related strategies.
Primary Responsibility:	Blendon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

#2 Medium Priority	**All Hazards**
Strategy:	**Enhance emergency notification.** Develop actions to strengthen and maintain emergency notification systems.
Primary Responsibility:	Blendon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress within the township due to lack of funding, however the township depends on the county EOC and Dispatch Center for emergency notification which works quite well.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs in the township.**
Primary Responsibility:	Blendon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

2016 Status:	An updated outdoor warning siren is desirable, however there is no known progress due to lack of funding.
#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Blendon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No known progress.
#5 Low Priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	Blendon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress.

Chester Township (Ottawa County) NFIP, 2010 population 2,017 (down 13% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Extreme Temperature, Tornado, and Severe Winter Weather**
Strategy:	**Identify additional emergency shelter sites by adding back-up power** to these sites.
Primary Responsibility:	Chester Township
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	$40,000 for one generator.
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress due to lack of funding

#2 High Priority	**Winter Weather Hazard**
Strategy:	**Purchase a four wheel drive medical-rescue apparatus** for fire department. Keep listing of private individuals with snowmobiles available for use in emergency.
Primary Responsibility:	Chester Township Fire Department
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	4WD Rescue Vehicle $30,000
Benefit(s):	Reduce potential for personal injury
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#3 High Priority	**Communication Disruption**
Strategy:	**Secure funding for a low band radio system and Ham radio system.**
Primary Responsibility:	Chester Township Fire Department
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Unknown, $3,000-5,000.
Benefit(s):	Higher security through less potential for long term interruption of communication.
Anticipated Funding:	Grants as well as other funding sources if available.
2016 Status:	No known progress at this time due to lack of funding.

#4 High Priority	**Urban and Structural Fire Hazards**
Strategy:	**Continue upgrading of fire department equipment and apparatus.**
Primary Responsibility:	Chester Township Fire Department
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Unknown $50,000-$75,000.
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#5 High Priority	**Extreme Temperature Hazard**
Strategy:	**Educate township residents** on the risks of extreme temperature. Identify the at-risk residents and aid them in installing the equipment necessary to survive.
Primary Responsibility:	Chester Township
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	$3000-$5000
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Grants as well as other funding sources if available.
2016 Status:	Ottawa County purchased NOAA Weather radios for at-risk communities/residents.

#6 High Priority	**Sanitary Sewer Failure**

Strategy:	**Acquire permanent stand-by power for sewer system**.
Primary Responsibility:	Chester Township
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	Unknown $40,000-$50,000
Benefit(s):	Less potential for a wastewater spill.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#7 High Priority Strategy:	**Shoreline Flooding and Erosion Hazard** **A sewer system is needed** at Crockery Lake.
Primary Responsibility:	Chester Township
Initiatives Needed:	Secure funding
Implementation:	To be considered when funding is available.
Cost(s):	Unknown
Benefit(s):	Less erosion potential.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#8 High Priority Strategy:	**Wildfire Hazard** **1) Identify and develop additional rural water supplies.** **2) Purchase new four wheel drive brush truck for fire department**
Primary Responsibility:	Chester Township Fire Department
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	A brush truck was purchased in 2011 with local funds.

#9 High Priority Strategy:	**Drought** 1) **Drilling a** large diameter deep **well** at the fire station. 2) Identify and **acquire permission to use existing private deep wells** in the township for fire suppression and purchase fitting to adapt private wells.
Primary Responsibility:	Chester Township
Initiatives Needed:	Funding source

Implementation:	By 2022 or sooner if funding is available.
Cost(s):	$50,000 - $100,000
Benefit(s):	Reduce potential for fire damage
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available.
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

Chester Township Additional Input

Severe Weather:	We are educating our residents on the hazards of thunderstorms and wind with a safety trailer, flyer, and newsletter. We have a warning siren in one of our populated areas, with a county-wide siren test monthly from spring through fall. There is stand-by power at the fire station and township hall if emergency shelter is needed. We are involved in the weather watch program which trains spotters to identify and notify for early warning of a weather hazard. Actions: Warning sirens added to populated areas of the township. Identifying additional emergency shelter sites and adding backup power and infrastructure to these sites.
Extreme Temperatures:	Two emergency shelter sites are available for extreme temperature hazards. The fire station and township hall have stand-by power, air conditioning, heat, water and sewage. Actions: Educate the township residents on the risks of extreme temperature. Identify the at risk residents and aid them in installing the equipment necessary to survive in extreme temperature hazards.
Drought:	Burning permits for outside burning are not issued. Fire Department tanker trucks used to transport water for livestock. Fresh water is available at the fire station and township hall. Actions: Drilling a large diameter deep well at the fire station. Identify and acquire permission to use existing private deep wells in the township. Purchase fitting to adapt private wells for fire department use. Purchase new tanker-pumper apparatus and brush truck for fire department.
Severe Winter Weather:	Two emergency shelters with stand-by power and infrastructure are at the fire station and township hall. Medical emergencies are responded to by the fire department on a first responder level of care. Ottawa County Road Commission will clear our roads. Actions: Identify additional emergency shelter sites and purchase equipment for stand-by power for these sites. Purchase a four wheel drive medical-rescue apparatus for the fire department. Keep a listing of private individuals with snowmobiles available for use in emergencies.
Shoreline Flooding:	We have an inland lake with high density residential in low lying areas. We would provide emergency shelters for persons whose homes were flooded or whose septic systems failed.

Wildfire:	Burn permits are required for outside burning. Permits are not issued during high risk conditions. Fire department responds to wildfires. DNR can be called to assist if needed. Education through newsletter. Some rural water supplies have been developed. Actions: Identify and develop additional rural water supplies.
Urban and Structural Fire:	Zoning requirements for spacing of structures are enforced. Building codes enforced. Multiple building complexes are reviewed by building inspector and fire chief. Intervention by fire department through 911 notification. Mutual aid agreements to bring in extra help as needed. Fire prevention training through safety trailer. Actions: Continue upgrading fire department equipment and apparatus.
Other Fire Hazards:	Burn permits are not issued for these types of items. Zoning is in place to limit this hazard. Intervention by fire department. Hazmat team response to help identify unknown materials. Actions: Continuing to upgrade the fire department equipment and apparatus.
Riverine Flood:	Chester Township works with the Ottawa County Drain Commission and Road Commission to address the need for maintaining the drains in the township. The drains are kept open and cleared. Actions: Work with other jurisdictions to maintain multijurisdictional drains and waterways. Enforce flood plain restrictions. Secure funding for the clearing of multijurisdictional waterways. Secure funding to raise or remove buildings in a riverine flooding area.
Urban Flooding:	Zoning requires high density development to install storm drains and retention areas. Actions: Secure funding to replace and upgrade existing storm drains in areas of existing high density structures.
Electrical Failure:	The fire station and township hall both have stand-by power and can serve as emergency shelters. The sewer system has portable stand-by power. Many individuals in the township have their own stand-by power. Actions: Identify and develop additional emergency shelters in the township. Install stand-by power and infrastructure at these sites. Install permanent stand-by power for the sewer system.
Communications Failure:	The telephone company in our area has battery back-up in case of a power outage. In the event of an extended outage a generator is used on their system. Cell phones are available but may not be reliable. Ottawa County Central Dispatch has back-up systems in place for emergency communication. Actions: Secure funding for a low band or Ham radio system.
Sanitary Sewer Failure:	Notify Ottawa County Road Commission for service. Township hall is available and is not on the system. Actions: Permanent stand-by power for sewer system.

Public Health Hazard:	Response by Fire Department and by Hazmat team, if needed. Response by the Ottawa County Health Department. Evacuation if needed. Emergency shelters with appropriate infrastructure. Response by EPA and DEQ if needed. Actions: Ensure that the public is aware of the emergency and what to do. Continue to maintain and increase training of fire department personnel.
Hazardous Material:	Response by the fire department and by the Hazmat team, if needed. Response by a clean-up contractor. Most sites have an existing plan. Actions: Evacuate people in danger. Response by EPA and DEQ. Identify all sites and develop a plan for each of them. Continue training for all first responders. Secure funding for fire department safety equipment and apparatus.
Transportation Hazard:	Response by fire department through 911 activation. Response by Sparta/Rockford ambulance. Mutual aid from surrounding fire departments and ambulance services. Response from Ottawa County Sheriff's Department and Michigan State Police. Actions: Secure funding for fire department equipment and apparatus.

City of Coopersville (Ottawa County) NFIP, 2010 population 4,275 (up 9% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Coopersville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

#2 Medium Priority	**All Hazards**
Strategy:	**Enhance emergency notification.** Develop actions to strengthen and maintain emergency notification systems.
Primary Responsibility:	City of Coopersville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs in the township.**
Primary Responsibility:	City of Coopersville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Coopersville lost its' ability to sound the sirens themselves for the city only, however they work well with the county EOC and Dispatch Center for emergency notification. Coopersville did replace one siren since the last HMP update.

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify potential improvements** or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Coopersville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No known progress.

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	City of Coopersville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Crockery Township (Ottawa County) NFIP, 2010 population 3,960 (up 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1: Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts **in the next update of the community's master plan** and associated zoning maps. During the next master plan development process, Crockery Township should adjust the master plan to accommodate viable hazard-related strategies.
Primary Responsibility:	Crockery Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**.
Primary Responsibility:	Crockery Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Crockery Township

Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Crockery Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	Crockery Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Ferrysburg (Ottawa County) NFIP, 2010 population 2,892 (down 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Winter Weather Hazards**
Strategy:	Education, **advanced snow removing equipment**, and shelters with generators.
Primary Responsibility:	City of Ferrysburg
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	Unknown, cost range of $50,000-$100,000.
Benefit(s):	Reduce potential for personal injury
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	A snow plow truck was purchased in 2015 by Ferrysburg Board of Public Works.

#2 High Priority	**Fire - Urban and Structural**
Strategy:	**Specialized firefighting equipment,** new radios, additional inspections
Primary Responsibility:	City of Ferrysburg
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	Unknown $75-$100,000
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Grants as well as other funding sources if available
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

2016 Status:	A first responder truck was purchased in 2016.

#3 High Priority	**Sanitary Sewer Failure**
Strategy:	**Additional pump stations alarms and generators.**
Primary Responsibility:	City of Ferrysburg
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	Alarms $10,000, Generators $40,000
Benefit(s):	Less potential for a wastewater spill
Anticipated Funding:	Grants as well as other funding sources if available
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	Generators have been installed at all lift station locations. Project complete.

#4 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Ferrysburg
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

#5 Medium Priority	**All Hazards**
Strategy:	**Enhance emergency notification.** Develop actions to strengthen and maintain emergency notification systems.
Primary Responsibility:	City of Ferrysburg
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress due to lack of funding.

#6 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs in the township.**
Primary Responsibility:	City of Ferrysburg
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress

#7 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	City of Ferrysburg
Implementation:	By 2016 or sooner
Cost(s):	$10,000,000
Benefit(s):	Less potential for destruction and disruption.
2011 Status:	No progress at this time due to lack of funding.
2016 Status:	Engineering inspection was done on Smith's Bridge. Conclusion was that it needs replacement. Inspection needed for Ridge Avenue bridge.

#8 Low Priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	City of Ferrysburg
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	School education and open houses have helped to educate the public. Mutual Aid agreements are in place.

Ferrysburg Additional Input (in conjunction with Spring Lake Twp.)

Sanitary Sewer Failure:	Additional pump station alarms
Transportation Hazard:	Media, education, hazmat, mobile medical teams. Additional medical equipment.
Intentional Acts:	2016: CRASE education in the schools has taken place since the last update.
Electrical Failure:	Generators. Additional grid protectors.
Water System Failure:	Tied into Grand Rapids water system, media and education. More security, alarms, and surveillance equipment.
Shoreline Flooding:	Sea walls, education, media. Generators, pumping stations.

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Georgetown Township (Ottawa County) NFIP, 2010 population 46,985 (up 13% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**All Hazards** **Additional training** with our emergency service people.
Primary Responsibility:	Georgetown Charter Township
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	Staff overtime
Benefit(s):	Lessened potential for personal injury.
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress
2016 Status:	No known progress
#2 High Priority Strategy:	**Fire - Wildfire** Control of all burning through **permits and increased enforcement**.
Primary Responsibility:	Georgetown Township
Initiatives Needed:	Develop program
Implementation:	To be completed with existing staff and overtime during peak fire seasons.
Cost(s):	Unknown
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	To be completed with existing staff resources.
2016 Status:	No known request was made for funding beyond local funds.
#3 Medium priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**

Primary Responsibility:	Georgetown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress

#4 Medium priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**.
Primary Responsibility:	Georgetown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#5 Medium priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Georgetown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time

#6 Medium priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Georgetown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time

#7 Low priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	Georgetown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Georgetown Township Additional Input

Flood Mitigation: Study potential flood areas for consideration of future flood mitigation field projects.

Drought: No preventive measures are in place.

Tornado: Updating and improving the siren program in Georgetown Twp.

Winter Weather: Measures that are in place include good communication between emergency management and all of the area's utility providers.

Wildfire: A large fire of this type is not likely to happen, since development patterns promote early detection and limit a fire's spread. Control of all burning can be handled by permits. All state DNR burning bans should be followed.

Urban/Structural Fire: Inspections during the construction of any structure. Following all guidelines, whether state codes or local codes. Continued training on residential firefighting.

Other Fire Hazards: No burning of trash, leaves, garbage, or dirty burning materials. Enforcement of all burning ordinances.

Thunderstorms: Emergency Services are provided at the county level as well as township level. Quick notification of any severe weather is a priority throughout the year. One example is the siren program, both county-wide and township-wide. Additional training for emergency services personnel. Upgrading siren coverage, where not in place.

Electrical Failure: Generator backup at the Grandville sewage plant. Flooding problems: sandbagging or possible diversion of water.

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City of Grand Haven (Ottawa County) NFIP, 2010 population 10,412 (down 7% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

#2 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.

Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority	**Sanitary Sewer Failure**
Strategy:	**Continuing evaluation** of providing emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.
Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#6 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Grand Haven
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Grand Haven Township (Ottawa County) NFIP, 2010 population 15,178 (up 14% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Sanitary Sewer Failure** **Continuing evaluation** of the provision of emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.
Primary Responsibility:	Grand Haven Township
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner
Cost(s):	Unknown $40,000-$50,000
Anticipated Funding:	Federal mitigation grants as well as other funding sources if available
Benefit(s):	Less potential for wastewater spill
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No progress at this time

#2 Medium Priority Strategy:	**Water System Failure** **Continue to evaluate capacity and demand.**
Primary Responsibility:	Grand Haven Township
2016 Status:	Grand Haven Township is part of the Northwest Ottawa Water System. There is an interconnect between the Northwest Ottawa Water System and the Grand Rapids Water Plant (which is located in Grand Haven Township).

#3 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs and concepts** in the next update **of the community's master plan.**

Primary Responsibility:	Grand Haven Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.

#4 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**.
Primary Responsibility:	Grand Haven Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township.
Primary Responsibility:	Grand Haven Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance.
Primary Responsibility:	Grand Haven Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#7 Low priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities.**
Primary Responsibility:	Grand Haven Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Grand Haven Township Additional Input

Shoreline Flooding:	The lake level and lakeshore dune erosion activity are monitored.
Wildfire:	Grand Haven Township is cooperates with the Michigan Department of Natural Resources - Fire Division in a program known as "Firewise." This educational and prevention program seeks to educate residents on the dangers of wildfires and what homeowners can do to prevent wildfires and to mitigate and limit the dangers to structures located in remote or hard-to-reach areas.
Sanitary Sewer Failure:	Currently, the Grand Haven Township regional sewer authority handles prevention activities. In the event of a power failure, the Department of Public Works (DPW) has a couple of emergency generators that can be utilized to maintain operational capabilities of sewer lifts. Potential actions: Continuing evaluation of providing emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.

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City of Holland (Ottawa County) NFIP, 2010 population (Ottawa only) 26,035 (down 7% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	City of Holland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	The city is updating its Community Master plan and has added the construct of resiliency. This is in process.

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification & warning**
Primary Responsibility:	City of Holland
Implementation:	A. Identify any warning system needs in the township. B. Identify seniors and other vulnerable households; educate on risks and responsibilities in conditions with extreme high and low temperatures. Employ neighborhood watch programs to check on at-risk populations. C. Provide enhancements to emergency shelters to include generators and access to supplies in case of brownouts or widespread power outages.
Benefit(s):	Less potential for personal injury.
2016 Status:	Warning needs have been identified. The city is attempting to secure funding for a PA system in addition to their sirens, especially for the annual Tulip Time Festival that raises the population in Holland significantly for a week each year. Consideration and planning is being invested in providing additional outdoor warning sirens with voice capabilities in core areas of the City

around Hope College, the principle shopping district and Civic Center Corridor. Further investment will be funding based.

#3 Medium Priority

Severe Weather

Strategy:

A. Provide information on actions the public can take to prevent or reduce wind damage.
B. Educate the public about emergency shelters and how to seek appropriate shelter.
C. Provide information and support for the installation of lightning strike prevention systems for structures.
D. Identify flood prone areas and vulnerable populations.

Primary Responsibility: City of Holland
Implementation: Ongoing
Benefit(s): Less potential for personal injury.

2016 Status:

A.-C. Much public awareness and education is done throughout the year and particularly during the annual fire safety open house in the fall. Other progress at this time is unknown.

D. Flood prone areas have been identified and are watched closely during times of intense rainfall and high water tables in the lake, drains and river.

#4 Medium Priority

Tornado

Strategy:

A. Continue to test emergency warning sirens and supplement current system with other means of notification.
B. Implement NIXEL or other form of all hazard electronic notification system in addition to outdoor warning sirens.
C. Identify and supply emergency shelters for post event needs of the public.
D. Educate and prepare all City of Holland Public Safety, Transportation Services and Parks personnel to respond safely and effectively to areas impacted by a tornado.
E. Educate and prepare damage assessment personnel.

Primary Responsibility: City of Holland
Implementation: Ongoing
Benefit(s): Less potential for destruction

2016 Status:

This is an ongoing strategy. Emergency Management plans that incorporate these strategies are reviewed on an annual basis. Improvements to the Holland Civic Center will incorporate capacity to shelter displaced residents.

#5 Medium Priority	**Severe Winter Weather**
Strategy:	A. Provide advanced warning and public service announcements on how to prepare for a forecasted event. B. Create a network or watch program that provides for checks on vulnerable populations. C. Continue to maintain and prepare Transportation Services personnel to respond to such events with enhancements and technology that keep roads and streets accessible for emergency access. D. Prepare to mobilize transportation services in periods of extreme cold.
Primary Responsibility:	City of Holland
Implementation:	Ongoing
Benefit(s):	Improve the response of the community members to potential severe winter events. Furthermore, enhance transportation abilities of emergency responders during weather events.
2016 Status:	This process is ongoing. Public warning enhancements such as NIXEL or RAVE Alert will enhance this when available.

#6 Medium Priority	**Urban Flooding**
Strategy:	A. Relocate the portion of the storm sewer that is currently located under buildings (Holland USA, commercial building on the north side of West 17th Street between Homestead and Diekema). B. 18th and 19th Between Central and Columbia Ave Area is prone to flooding; a mitigation strategy needs to be developed. C. Improve or replace crossing to improve drainage crossing on Azalea at South Shore Drive. Improvements to drain to prevent flooding and structural failure. D. Improve the Holland Heights Drain, from approximately East 12th and Cambridge and running westerly to US-31. 5. Hope Avenue between East 8th and East 16th: Tie this portion of Hope Ave storm sewer into Paw Paw Relief Drain. E. Reduce or prevent flooding in the area of Lela Intercounty Drain, from its north outlet into Lake Macatawa (north of Graafschap Road) to the south terminus at 40th and Columbia. Maplewood Intercounty Drain, South of East 24th Street. F. Add detention capacity in several locations from East 24th Street south to the M-40 Midway Drain, located between Myrtle and Old Orchard (on the east and west), on streets such as Bay, Blackbass, Midway, Central Bay and South Shore Drive. Reduce or prevent flooding potential in these areas. G. Pine Avenue North of West 7th Street: Address flooding problems and critical infrastructure threats as a result to the HBPW Power Generating Station.

	H. The Tulip Intercounty Drain from the southern city limits (Ottawa Avenue, south of US-31) to the northern city limits (Country Club between East 16th and East 24th Streets); and "old" drainage course north of US-31 between Ottawa Avenue and US-31 (Rolling Meadows): Reduce or prevent flooding in these areas as a result of current conditions in the drains. I. East branch of the Weller Drain—beginning south of West 32nd Street on the either side of the Clarewood Condominiums between Graafschap and Lugers, to a point north of 32nd Street where it joins the west branch of the Weller Drain: Reduce or prevent flooding in this area and associated sections because of the current. J. There are additional projects referenced in the City's updated storm sewer master plan. These will be completed based on available funding.
Primary Responsibility:	City of Holland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for damage to infrastructure (roads) and property.
2016 Status:	Item C has been completed. Other items are pending and still valid. Further progress on these projects could be enhanced through additional funding and grants.
#7 Medium Priority Strategy:	**Hazardous Material Release** A. Develop and implement an effective leak detection program which includes education and monitoring. B. Continue to educate public safety responders about pipeline safety and response on an annual basis
Primary Responsibility:	City of Holland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for injuries or loss of life
2016 Status:	No known progress at this time
#8 Medium Priority Strategy:	**Water System Failure** A. Install valves and piping on the beach near the low lift station at the water plant to utilize a 36" concrete drain line as an emergency intake. B. Install emergency generator to provide backup power to plant and pumps. 1. Install two backup generators at two major water pumping stations at approximately $75,000. 2. Install a water supply interconnect with Wyoming Water Supply to provide emergency water supply to each entity
Primary Responsibility:	City of Holland - HBPW
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for injuries or loss of life
2016 Status:	No known progress at this time

#9 Medium Priority Strategy:	**Sanitary Sewer Failure** A. Provide 15 backup generators at sewage lift stations. Projected cost is $40,000 per station. B. Extend and replace a force main from the west end (Old Orchard to Myrtle), to alleviate wet weather issues. C. Provide and implement a grant program to assist residents in removing footing drains and sump pumps from the sanitary sewer. D. Install second bypass pump at the head of treatment plant to assist with water flows during wet weather events and as an emergency backup pump.
Primary Responsibility:	City of Holland - HBPW
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for property damage
2016 Status:	No known progress at this time

#10 Medium Priority Strategy:	**Shoreline Erosion/flooding** A. Provide early warning assistance as needed. B. Develop automatic community wide flood assistance program to assist residents after an event. C. Provide maintenance and improvements on all drains to Lake Macatawa. D. Educate residents on basement flood prevention strategies and improvements that can be made to prevent or minimize basement flooding
Primary Responsibility:	City of Holland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for property damage, injuries or loss of life
2016 Status:	No known progress at this time

#11 Medium Priority Strategy:	**Wildfire** A.Implement FireWise program where appropriate. B. Manage burn practices and fuel load management. C. Consideration of additional fire-related public awareness and training activities. D. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.
2016 Status:	There has been no action on this however it remains a valid concern. The city will continue to monitor the rural/urban interface and implement these strategies were appropriate and economically feasible. The City has worked with public and private entities to manage controlled burning of invasive plant life in the Macatawa Marsh. Such practices reduce fire load in the marsh near populated areas.

#12 Low Priority	**Fire - Urban and Structural**
Strategy:	A. Continue to deliver and enhance fire prevention inspections and fire and life safety education programs. B. Inspect and maintain all fire alarm and sprinkler systems as required by code. C. Advocate, incentive and promote the installation of automatic sprinkler systems in public and private occupancies. D. Continue to provide and maintain an adequate and effective public safety response to fires.
Primary Responsibility:	City of Holland
Implementation:	Ongoing
Benefit(s):	Less potential for property damage and personal injury.
2016 Status:	This process is ongoing. The city could benefit from funding for installation of residential sprinkler systems in rental properties.

#13 Low Priority	**Drought**
Strategy:	A. Educate and prepare residents to implement no-burn policies. B. Develop water conservation policies in preparation for drought events.
Primary Responsibility:	City of Holland
Implementation:	Ongoing
Benefit(s):	Less potential for property damage and personal injury.
2016 Status:	No known progress at this time

Holland Township (Ottawa County) NFIP, 2010 population 35,636 (up 23% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority	**Electrical Failure**
Strategy:	**Standby generators for the fire department.**
Primary Responsibility:	Holland Township
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	$40,000
Benefit(s):	Safer operations with lower potential for security breach
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress

#2 High Priority	**Sanitary Sewer Failure**
Strategy:	**Standby generators for lift stations**
Primary Responsibility:	Holland Township
Initiatives Needed:	Secure funding
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	Unknown $40,000-$50,000
Benefit(s):	Less potential for a wastewater spill.
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress

#3 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility: Implementation: Benefit(s):	Holland Township By 2022 or sooner Less potential for personal injury
2016 Status:	No progress at this time. Last known plan update was 2006.
#4 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**.
Primary Responsibility: Implementation: Benefit(s):	Holland Township By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#5 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility: Implementation: Benefit(s):	Holland Township Installation of outdoor warning sirens. Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#6 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** of all kinds) to increase its hazard-resistance.
Primary Responsibility: Implementation: Benefit(s):	Holland Township By 2022 or sooner Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.
#7 Low Priority Strategy:	**Flood Mitigation** Study potential flood areas to generate future flood mitigation field projects.
Primary Responsibility: Implementation: Benefit(s):	Holland Township By 2022 or sooner Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

City of Hudsonville (Ottawa County) NFIP, 2010 population 7,116 (down 1% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs and concepts** in the next update **of the community's master plan**
Primary Responsibility:	City of Hudsonville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Hudsonville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	City of Hudsonville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.
#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	City of Hudsonville

Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.
#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Hudsonville
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Jamestown Township (Ottawa County) NFIP, 2010 population 7,034 (up 39% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Jamestown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Jamestown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Jamestown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Jamestown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Jamestown Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Olive Township (Ottawa County) NFIP, 2010 population 4,735 (down 1% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Olive Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Olive Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Olive Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Olive Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Olive Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Park Township (Ottawa County) NFIP, 2010 population 17,802 (up 1% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Park Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time
#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Park Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Park Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Park Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Park Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Polkton Township (Ottawa County) NFIP, 2010 population 2,423 (up 4% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Polkton Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Polkton Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Polkton Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Polkton Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Polkton Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Port Sheldon Township (Ottawa County) NFIP, 2010 population 4,240 (down 4% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Port Sheldon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time
#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Port Sheldon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.
#3 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs** in the township
Primary Responsibility:	Port Sheldon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Port Sheldon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#5 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Port Sheldon Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

Robinson Township (Ottawa County) NFIP, 2010 population 6,084 (up 9% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Riverine Flooding** A. **Purchase property** vulnerable to flooding as funds become available B. **Elevate homes** prone to flooding when loans for homeowners become available C. **Further study** potential flood areas and develop specific future flood mitigation field projects.
Primary Responsibility:	Robinson Township
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	$130,000 per residential lot @ 54 lots = $7,020,000 (Based on average property values)
Benefit(s):	Less Potential for flood damage.
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	A. Six flood-prone parcels were purchased by the Michigan Department of Transportation. Grant funding enabled the township to further purchase 1 home and 1 parcel on Limberlost Lane and 8 homes and 8 parcels parcels on Van lopik Ave. B. Six homes were been elevated There are 20 homes remaining on Limberlost Lane and 15 on Van Lopik Ave.
2016 Status:	One additional home has been elevated and currently one property on Limberlost Lane is rebuilding a garage which will be equipped with flood gates per MDEQ and Township zoning requirements.
#2 High Priority Strategy:	**Urban Flooding** A. **Blacktop and raise Buchanan St.** near and east of 112th Ave above the high water level. B. **Blacktop and raise Johnson St.** east of the 11500 block to 104th Ave and Pierce St. between 120th and 112th Ave. The roads east and west of these locations are higher than high water levels.

C. **Install new drain** to reroute water from properties located in the Southwest corner of Lincoln and 136th area.

D. Resolve flooding and road damage where the Bass Creek crosses Winans St.

Primary Responsibility:	Robinson Township
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	Unknown
Benefit(s):	Less potential for flood damage.
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	A. Buchanan Street near and east of 112th Ave was raised and blacktopped in 2013. B. No known progress due to lack of funding C. No known progress due to lack of funding D. This has been corrected with new culvert placement, raising of roadbed and blacktopping in 2014.

#3 Medium priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan** and associated zoning maps.
Primary Responsibility:	Robinson Township
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Benefit(s):	Less potential for flood damage.
2011 Status:	The township produced and adopted a FEMA-approved flood mitigation plan and subsequently adopted the Ottawa County Hazard Mitigation plan. During any future master plan update process, the Robinson Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.
2016 Status:	This is not part of the current master plan but is included in the materials for the next update.

#4 Medium Priority Strategy:	**Severe Weather** **Identify any warning and/or notification system needs** in the township.
Primary Responsibility:	Robinson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority	**Infrastructure Strengthening and the Public Health Hazard**

Strategy:	**Install public water and sewage system along two river roads** on Van Lopik and Limberlost Lanes. Identify potential improvements or projects to strengthen the area's infrastructure to increase its hazard-resistance
Primary Responsibility:	Robinson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#6 Medium Priority Strategy:	**Communication Failure** Develop actions to strengthen and maintain emergency notification systems. Coordinate as needed to bolster the dependability of emergency communication systems.
Primary Responsibility:	Robinson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#7 Low Priority Strategy:	**Fire - Wildfire** Consideration of **additional fire-related public awareness** and training activities.
Primary Responsibility:	Robinson Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	Robinson Township purchased new brush truck to better combat wildfires

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Spring Lake Township (Ottawa County) NFIP, 2010 population 11,977 (up 9% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Severe Winter Weather** **Education,** advanced **snow removing equipment**, and **shelters** with generators.
Primary Responsibility:	Spring Lake Township
Initiatives Needed:	Funding source
Implementation:	To be considered when funding is available.
Cost(s):	Range of $50,000-$100,000.
Benefit(s):	Reduce potential for personal injury
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	Education is ongoing, otherwise no known progress

#2 High Priority Strategy:	**Electrical Failure** **Provide emergency stand-by power to Station 1 & 2** to provide communication between Spring Lake fire department stations and the Sheriff Department.
Primary Responsibility:	Spring Lake Township
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	$40,000
Benefit(s):	Safer operations with lower potential for security breach
Anticipated Funding:	Grants as well as other funding sources if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	Spring Lake currently has three portable generators that have to be re-located from lift station to lift station. We need to provide on-site stand-by power at these addresses (listed in order of general priority):

Fruitport Rd.	Priority 1: 17854 174th, 18290 Swiss Drive, 18125 West Spring Lake Road, 17724 Fruitport Road, 339 North Lake, 15844 Leonard Road, 18550 Priority 2: 17000 West Spring Lake Road, 16074 Highland, 18000 Trudy, 15394 Kelly Street, 16531 152nd, 17312 148th, 15968 Baird Drive, 15473 Cleveland, 18983 Fruitport Road. Priority 3: 17960 Hiawatha, 18137 Lovell, 17824 Oakwood, 17632 Oakwood, 17580 Fruitport Road, 15314 Krueger, 18349 Fruitport Road, 18199 Fruitport Road, 18061 Fruitport Road, 18059 Hammond Bay, 14991 Saddlebrook.
#3 High Priority Strategy:	**Sanitary Sewer Failure** A. **Sewer lift station bypass valves** installed in various locations to prevent further damage from power outages or other events. Lower sewer line across the Lloyds Bayou channel where low water and dredging has expose line and make it subject to boat damage with sewer flowing into the waterways. Dry hydrants installed into the dune land part are to control and extinguish possible dune land fire and to prevent damage to residential areas and erosion from burnt dune grass. B. Additional pump stations alarms and generators
Primary Responsibility:	Spring Lake Township
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available.
Cost(s):	A. $10,000 for hydrant, $30,000 for line adjustment B. Alarms $10,000, Generators $40,000
Benefit(s):	Less potential for a wastewater spill.
Anticipated Funding:	Grants as well as other funding sources, if available.
2011 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.
2016 Status:	No known progress.
#4 Medium Priority Strategy:	**Fire Hazards** The **extension of water lines to the US-31 highway** right-of-way for large scale incident where hazmat and gas tanker accidents are possible
Primary Responsibility:	Spring Lake Township Fire Department
Initiatives Needed:	Secure funding
Implementation:	To be considered when funding is available
Cost(s):	Unknown
Benefit(s):	Reduce potential for fire damage.
Anticipated Funding:	Grants as well as other funding sources if available
2011 Status:	No known request was made for funding beyond local funds.
2016 Status:	No known progress

#5 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan.**
Primary Responsibility:	Spring Lake Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2011 Status:	A township master plan was developed in 2008. During the next plan update process, the Spring Lake Township Planning Commission should adjust the master plan to accommodate viable hazard-related strategies.
2016 Status:	No known progress at this time.

#6 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Spring Lake Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#7 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs** in the township
Primary Responsibility:	Spring Lake Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#8 Medium Priority	**Infrastructure Strengthening**
Strategy:	**Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Spring Lake Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#9 Low Priority	**Fire - Urban and Structural**
Strategy:	**Consideration of additional fire-related public awareness activities**.
Primary Responsibility:	Spring Lake Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Open house given each year during Fire Prevention Week.

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Village of Spring Lake (Ottawa County) NFIP, 2010 population 2,323 (down 8% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority	**Riverine Flooding**
Strategy:	**Dredge the river** from the railroad bridge east to 104th.
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Cost(s):	Unknown
Benefit(s):	Less potential for flooding and injury due to boating on the river and debris at a shallow depth.
2016 Status:	No progress at this time due to lack of funding.

#2 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#3 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs**
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#6 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Spring Lake Village
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Fire Open House given each year for the public.

Tallmadge Township (Ottawa County) NFIP, 2010 population 7,575 (up 10% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Tallmadge Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Tallmadge Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs**
Primary Responsibility:	Tallmadge Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Tallmadge Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#6 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Tallmadge Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Fire Open House given each year for the public.

Wright Township (Ottawa County) NFIP, 2010 population 3,147 (down 4% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Wright Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#2 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Wright Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#4 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs**
Primary Responsibility:	Wright Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#5 Medium Priority Strategy:	**Infrastructure Strengthening** **Identify** potential improvements or **projects to strengthen** the area's **infrastructure** (of all kinds) to increase its hazard-resistance
Primary Responsibility:	Wright Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for destruction and disruption.
2016 Status:	No progress at this time due to lack of funding.

#6 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	Wright Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	Fire Open House given each year for the public.

City of Zeeland (Ottawa County) NFIP, 2010 population 5,504 (down 5% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Severe Weather (temporary power outage)** **Add generators** for City Hall and Public Safety Buildings
Primary Responsibility:	City of Zeeland
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	2 Generators @ $40,000 = $80,000
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	Generator was installed at the Police/Fire/Rescue building in 2012. The City Hall building still needs to be done. The city requested the state for hazard mitigation funding but were told that this grant was not available for generators unless it was for police, fire, hospitals, potable water systems or sanitary sewer systems. The city will have to fund the generator so this project is considered complete.

#2 High Priority Strategy:	**Urban Flooding** We would like to **replace the culvert at 104th Street**. Our experience shows that the cross-sectional area of the culverts would have to be increased. A bridge span would be appropriate in this project using a prefabricated bridge section. This should help eliminate some "upstream" flooding that we have experienced in the past.
Primary Responsibility:	City of Zeeland
Initiatives Needed:	Funding source
Implementation:	By 2016 or sooner if funding is available.
Cost(s):	Bridge Span - $500,000
Benefit(s):	Less potential for flood damage.
Anticipated Funding:	Grants as well as other funding sources if available.
2016 Status:	104th Avenue culvert replacement project is completed.

#3 Medium priority	**Electrical Failure (major)**
Strategy:	A. **Develop a plan to recover from a major power failure** in the city of Zeeland. Determine critical power needs to support hospital, home medical needs, waste water treatment plant, and others. B. Install an emergency power generator as a secondary power source when a power failure occurs to provide standby power at lift stations with a generator 295 Royal Park Drive. C. Install an emergency power generator as a secondary power source when a power failure occurs to provide standby power at lift stations 644 Rich Avenue. D. Install an emergency power generator as a secondary power source when a power failure occurs, 115 Carlton Avenue. E. Obtain a portable generator for Street Maintenance Facility, 600 East Roosevelt.
Primary Responsibility:	City of Zeeland
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Less potential for personal injury.
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	B. 295 Royal Park Drive: Emergency power generator has been installed at lift station C. 644 Rich Avenue: Emergency power generator has been installed at lift station D. 155 Carlton Avenue: Emergency power generator has been installed at lift station
#4 Medium Priority	**Urban Flooding**
Strategy:	A. **Cleaning ditch banks and ditching**: a) 215 N. Centennial to 373 N. State b) 245 S. Woodlawn Ct. to 279 So. Division c) 250 South Jefferson d) 277-104th Avenue e) 420 East Riley f) 475 No. Centennial to 555 No. State g) 509 E. Washington to 215 N. Centennial B. Water Resources Commissioner & engineers to review and **update the flood plain maps**: Huizenga subdivision. C. **Floodplain benching** in vacant lot. Provide more storm water storage to avoid flooding, Parcels #70-16-24-400-008, #70-17-18-300-047, #70-17-18-400-047, and #70-17-17-300-026. Enlarge ex pond to provide more storm water storage to avoid flooding, Parcel #70-16-24-400-050. Regional pond to provide more storm water storage to avoid flooding, Parcel #70-17-17-101-023. Floodplain benching along ditch 1,500 ft.

Primary Responsibility:	City of Zeeland
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Less potential for flood damage.
Anticipated Funding:	Grants as well as other funding sources if available.
2016 Status:	No known progress at this time

#5 Medium Priority Strategy:

Intentional Acts

A. 8943 Riley (generating facility): **Install cameras, door and gate alarms** and connect this to the 24/7 city dispatch center. Zeeland BPW needs security at the substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

B. 9984 Perry (electric substation): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center.

C. 320 North Fairview (electric substation): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center.

D. 347 East Washington (generating facility and electric substation): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center.

E. 3697 80th Avenue (water tank): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks, substations, and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

F. 495 West Washington Avenue (pumping facility and water storage tanks): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center.

G. 115 North Carlton (water tank): Install cameras, door and gate alarms and connect this to the 24/7 city dispatch center.

Primary Responsibility:	City of Zeeland
Initiatives Needed:	Funding source
Implementation:	By 2022 or sooner if funding is available.
Benefit(s):	Security for critical infrastructure
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	A. Cameras and connections completed in 2015

B. Cameras and connections added in 2016

C. Cameras and connections added in 2016

D. Cameras and connections added in 2015. Fencing to be expanded in 2017. Security gates to be added by 2022.

E. Cameras and connections to be added by 2022.

F. Cameras and connections added in 2016

G. Cameras and connections added in 2016

#6 Medium Priority Strategy:	**All Hazards** **Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	City of Zeeland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time. Last known update was in 2011.

#7 Medium Priority Strategy:	**All Hazards** Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	City of Zeeland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time due to lack of funding.

#8 Medium Priority Strategy:	**Severe Weather** **Identify any warning system needs**
Primary Responsibility:	City of Zeeland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time due to lack of funding.

#9 Low priority Strategy:	**Fire - Urban and Structural** **Consideration of additional fire-related public awareness activities**
Primary Responsibility:	City of Zeeland
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No known progress at this time

Zeeland Township (Ottawa County) NFIP, 2010 population 9,971 (up 31% from 2000)

Hazard Priorities

High:	Communication/Cyber Failure, Electrical Failure, Tornado, Riverine Flooding, Thunderstorm Hazards, Urban Flooding, Severe Winter Weather
Medium:	Climate Change, Extreme Temperatures, Urban/Structural Fire, Intentional Act, Transportation Accident, Hazardous Materials Release, Water System Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Public Health Hazard
Low:	Drought, Earthquake, Fire/General, Wildfires, Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Landslide, Dam Failure

Prioritized Hazard Mitigation Strategies

#1 High Priority Strategy:	**Severe Weather, Extreme Temperatures** A. **Tabletop exercises and communication planning** B. **Continued training in ICS and mass casualty**
Primary Responsibility:	Zeeland Charter Township
Initiatives Needed:	A. Establish a protocol for exercises and annual review of communications planning B. Funding source ($3000-$5000)
Implementation:	Ongoing with annual review
Benefit(s):	Less potential for personal injury
Anticipated Funding:	A. This will be done during regular business hours with current staff B. Grants as well as other funding sources if available
2016 Status:	A. Zeeland Charter Township conducts a tabletop exercise in April each year. In the exercise, evacuation planning, hazardous material sites, means of communication, routes of travel, and related topics are discussed. B. This strategy depends upon funding during times of very tight budgets. No known progress.

#2 High Priority Strategy:	Public Health Emergency Upgrade of the public health and hospital emergency communication systems
Primary Responsibility:	Zeeland Charter Township
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available
Cost(s):	Unknown $10,000-$15,000
Benefit(s):	Less potential for the spread of disease
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#3 High Priority	**Sanitary Sewer Failure**
Strategy:	**Additional standby power, generators and portable pumps**
Primary Responsibility:	Zeeland Charter Township Fire Department
Initiatives Needed:	Secure funding
Implementation:	By 2022 or sooner if funding is available
Cost(s):	Unknown $40,000-$50,000.
Benefit(s):	Less potential for a wastewater spill.
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	This strategy depends upon funding during times of very tight budgets. No known progress.

#4 Medium Priority	**All Hazards**
Strategy:	**Give consideration to hazard mitigation needs** and concepts in the next update **of the community's master plan**
Primary Responsibility:	Zeeland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No known progress at this time

#5 Medium Priority	**All Hazards**
Strategy:	Develop actions to **strengthen and maintain emergency notification systems**
Primary Responsibility:	Zeeland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
2016 Status:	No progress at this time due to lack of funding.

#6 Medium Priority	**Severe Weather**
Strategy:	**Identify any warning system needs**
Primary Responsibility:	Zeeland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury.
2016 Status:	No progress at this time due to lack of funding.

#7 Medium Priority	**Infrastructure Failure**
Strategy:	**Additional stand-by power, generators, and portable pumps**
Primary Responsibility:	Zeeland Township
Implementation:	By 2022 or sooner

Cost(s):	$40,000-$50,000
Benefit(s):	Less potential for disruption of essential services
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	No progress at this time due to lack of funding.

#8 Low priority	**Fire - Urban and Structural**
Strategy:	Fire **training in the use of foam** and other water enhancing operations. Continuing education
Primary Responsibility:	Zeeland Township
Implementation:	By 2022 or sooner
Benefit(s):	Less potential for personal injury
Anticipated Funding:	Grants as well as other funding sources if available
2016 Status:	No known progress at this time

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Hazard Mitigation Plan Implementation

Implementation of this action plan, pending funding for appropriate items, could either involve coordination by one or more of the involved emergency management departments, or individual action by agents/representatives within an appropriate local jurisdiction within the region. Each action item and mitigation strategy states the lead agency and the possible or likely partnering agencies that could be involved. Execution of the actions should be timely and efficient once funding is approved (for items that require funding). Ideally, this would occur within a three-year window after the approval of funding.

Acquisition of flood-prone properties would be coordinated through appropriate local governments as specified in existing FEMA mitigation requirements. There are no clear instances identified that would involve involuntary property acquisitions (eminent domain) within the region. Rather, any acquisitions would occur through a voluntary, negotiated process involving the mutual consent of the involved parties.

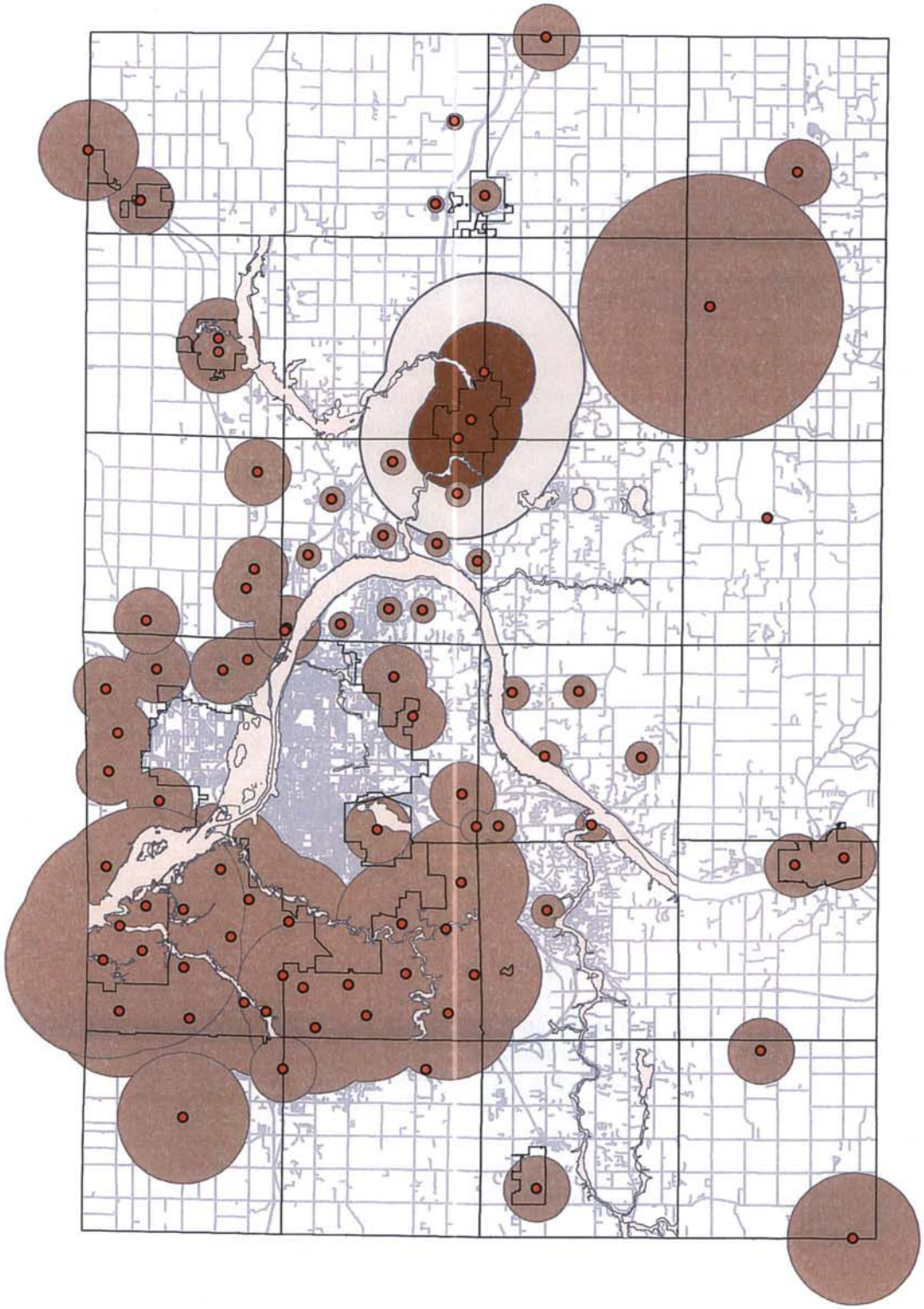
Deployment of warning systems would be coordinated through the local emergency management directors with the cooperation of local jurisdictions. Installation of these systems would be contracted to a vendor with a timeline to be negotiated in order to provide prompt improvement of the warning infrastructure.

Studies of communication infrastructure reliability would be coordinated by local EMDs, but input from any relevant agencies and local officials are welcomed, to facilitate the ability of EM coordinators to track this information. Specific and detailed responsibilities and timelines would only be assigned in the specific request for proposal forms developed as funding opportunities arise. A formal cost-benefit analysis would probably only be required for certain types of project applications that appear to be successfully qualifying for federal grant funds.

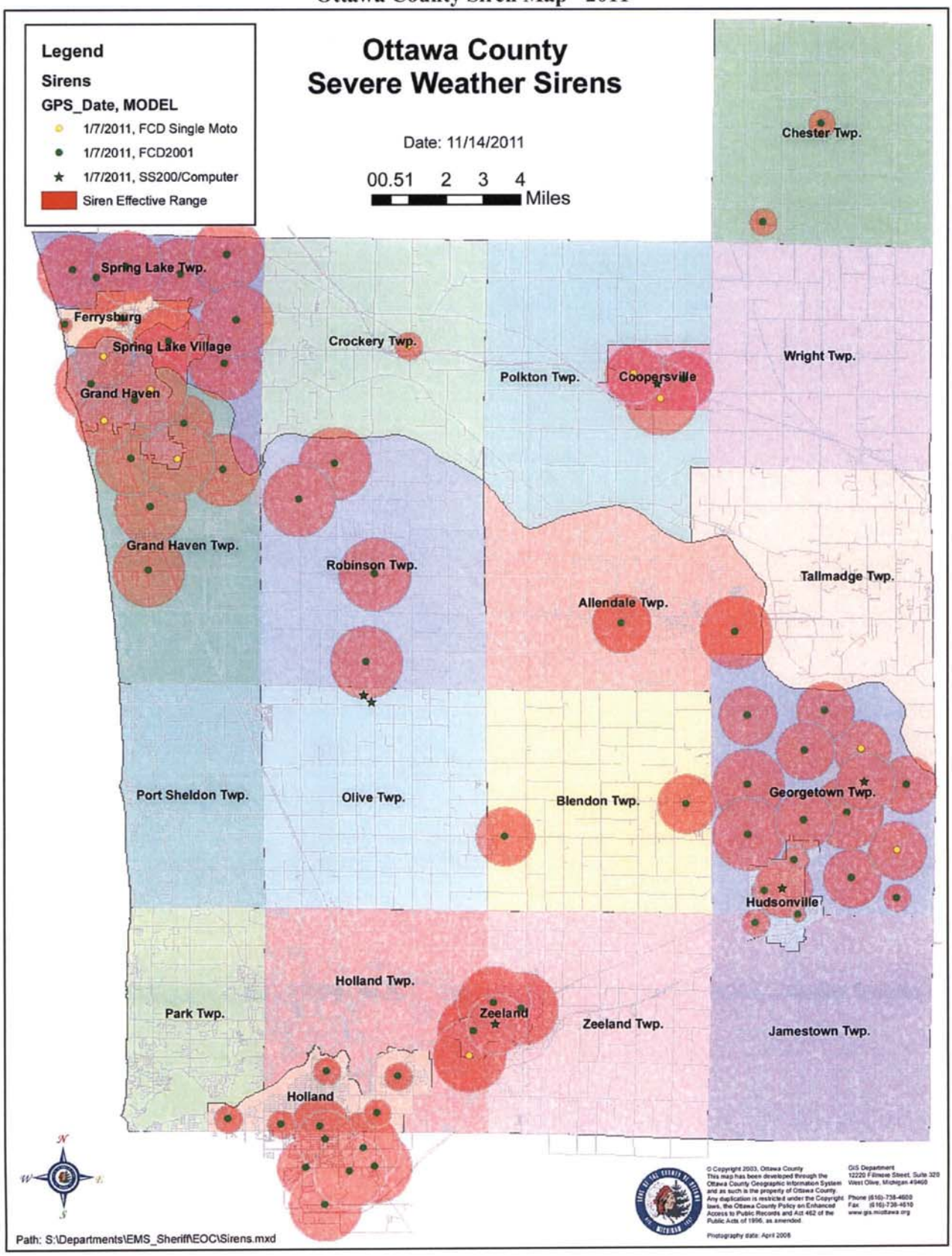
Hazard Mitigation Plan Maintenance

This document will be reviewed by the emergency management directors for Kent County, Ottawa County, and the City of Grand Rapids within two years after its adoption, again within four years, and updated at least every five years per FEMA guidance. The plan may be updated more frequently if this is determined necessary or appropriate by the emergency management directors. The EMDs shall develop reports and share information with each other each year. Responsibility for leading the coordination of hazard mitigation planning shall rest with Kent County. Local jurisdictions, by agreeing to adopt this regional hazard mitigation plan (and thus gain or maintain their eligibility to apply for or directly benefit from federal grant funds for hazard mitigation projects), will cooperate in the maintenance of this plan according to FEMA guidance. Local jurisdictions will also provide sufficient resources in order to maintain/update this plan as needed, to meet FEMA guidance, for as long as they choose to participate in the regional hazard mitigation planning process. The EMDs, as part of their job responsibilities, will take action appropriate to the needs of the public, based on this plan and any additional needs that may subsequently be identified.

Kent County Siren Map



Ottawa County Siren Map - 2011



Kent County Siren Information

Jurisdiction	# of Sirens	Area Potentially Covered (varies with weather conditions, etc.)
Ada Twp.	7	½ of Twp.
Alpine Twp.	5	1 mile radius
Alto/Bowne	1	2 sq. miles
Byron Center	1	2 mile radius
Caledonia	1	1 mile
Cannon Twp.	0	NA
Cascade Twp.	1	½ mile
Casnovia Twp.	1	Village
Cedar Springs	1	Within city limits
Courtland Twp	0	NA
Cutlerville	1	1 mile radius
Dutton/Gaines Twp.	1	Less than 1/8 mile
East G.R.	1	1 mile
Freeport	1	2 miles
G.R. Twp.	3	5,200 ft.
Grandville	4	9 sq. miles
Grattan	0	De-activated by Twp.
Kent City	1	1 mile radius
Kentwood	10	2 miles
City of Lowell	2	5,000 ft. radius
Oakfield Twp	1	4 miles
Plainfield Twp	11	3/8 mile
Rockford	3	2-3 sq. miles
Sand Lake	1	1 mile radius
Solon Twp.	1	½ sq. mile
Sparta Twp.	2	14-Mile Rd, to White Pine, Phelps to Alpine
Spencer Twp.	1	1 mile radius
Walker, City of	8	1 mile radius
Wyoming, City of	11	4 sq. miles (varies by location)

Ottawa County Siren Information (these sirens are all two-way)

Jurisdiction	# of Sirens	Area Potentially Covered (varies with weather conditions, etc.)
Conklin Twp.	1	4 sq miles
Coopersville City	5	20 sq miles
Georgetown Twp.	10	40 sq miles
Grand Haven City	7	28 sq miles
Holland City	8	32 sq miles
Hudsonville City	4	16 sq miles
Spring Lake Twp.	6	24 sq miles
Zeeland City	4	16 sq miles
GVSU	1	4 sq miles
Spring Lake Village	1	4 sq miles
Grand Haven Twp.	5	20 sq miles
Robinson Twp.	2	3 sq miles
Zeeland EOC	1	4 sq miles

HAZARD MITIGATION PLAN 2017

APPENDIX A – PUBLIC OUTREACH

Hazard Mitigation Plan Public Outreach

Prior to and during the 2017 written update of the Hazard Mitigation Plan, both Kent and Ottawa County requested input from the public and the jurisdictions within the counties through various channels and by various methods. Some of these included:

- written media
- committee meetings
- television interviews
- written communication to the cities, townships and villages
- public speaking engagements
- website postings
- phone calls
- personal conversations with government officials and members of the general public

The outreach to the jurisdictions proved particularly beneficial as they shared their accomplishments and the obstacles they faced over the past 5 years. Some also provided information regarding new projects they either are, or hope to undertake in the next 5 years. The following pages indicate some of the means used by Emergency Management to acquire input.

Kent County Disaster Resilience Grant

It should be mentioned that during the update of this plan, Kent County applied for a HUD grant entitled "Disaster Resilience – The Grand Strategy" which included Ottawa County in its strategy to mitigate flooding on the Grand River. During this process the Hazard Mitigation Plan was discussed often as is evident in the copies of meeting agendas included in this section.

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The following email was sent to each jurisdiction in Kent County.

Stewart,Jack

From:	LaPlante,Lisa
Sent:	Friday, October 21, 2016 12:08 PM
To:	'ghaga@adatownshipmi.com'
Subject:	Greater Grand Rapids Hazard Mitigation Plan
Attachments:	Ada Township.docx

Good afternoon,

Kent County Emergency Management is reviewing and updating the Greater Grand Rapids Hazard Mitigation Plan, as required by FEMA every five years. Having a current plan is a requirement by FEMA to allow jurisdictions to participate in mitigation funding. Attached is a document from your community that was submitted for the 2012 revision. Please review the document for the following information and return an updated document to me by November 1:

- Review the information and update census information
- Identify overall hazards
  - Rank identified overall hazards as:
    - High risk
    - Medium risk
    - Low risk
    - Not applicable
  - Identify hazards not indicated in the current plan (i.e. cyber).

- Identify hazards that may cause potential future damage to their jurisdiction
- Does your community participate in the National Flood Insurance Program? If not, why not?
  - Please provide updates on mitigation strategies since 2012 that were identified by your jurisdiction.

If there are no changes, please indicate that in your document.
Thank you in advance for your time and assistance!
Lisa

Lisa LaPlante
Kent County Community Liaison and Communications Director
Lisa.LaPlante@kentcountymi.gov
(616) 632-7567
accessKent.com

Follow us on Social Media:

Kent County...Where Diversity & Inclusion Matter

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PLAINFIELD CHARTER TOWNSHIP
COMMUNITY DEVELOPMENT DEPARTMENT
PLANNING, ZONING & BUILDING SERVICES

6161 BELMONT AVENUE N.E. • BELMONT, MI 49306 • PHONE 616-364-1190 •FAX: 616-364-1170
www.plainfieldchartertwp.org

MEMORANDUM

TO: **Cameron Van Wyngarden, Township Superintendent**

FROM: **Peter Elam**

DATE: **March 11, 2015**

RE: **National Disaster Resilience Competition**

This memo is in regard to an opportunity to participate in a competitive program to receive federal funds for flood and other disaster mitigation efforts.

The U.S. Department of Housing and Urban Development (HUD) and the Rockefeller Institute are providing significant amount of funding and resources in the National Disaster Resilience Competition (NDRC) to communities who have received disaster declarations in recent years. Kent County is submitting an application for this competition on behalf of the Township and other communities in the County. In order do so and to meet the initial application requirements, Kent County is requesting that the Township Board authorize the Township Superintendent to sign the attached Letter of Intent. This request will be a regular agenda item which will allow for public input. Wayman Britt, Kent County Assistant Administrator, will be in attendance at the Township Board meeting to discuss the Competition and application process in greater detail.

Why participate? Specifically, Plainfield Township was directly impacted by the April 2013 flood and as a result our participation is important to overall scoring in the application. We should note that this is a two-phase application process and participating in phase 1 permits Kent County and the township to be in the mix to be awarded a portion of nearly 1 billion dollars. This money is available for mitigation projects such as long range planning, infrastructure improvements, recreational projects, and property acquisition. There are a total of 67 eligible communities nationally and we understand that not all of them are participating, which improves our odds and it is our understanding that our chances of making it through phase 1 very good. **Important to note: participation in phase 1 of the**

application is non-binding and other than staff time requires and no financial commitment.

Phase 2, is also non-binding and requires no financial outlays by the Township per the program. However, the Township Board may voluntarily elect to have a financial outlay to participate in match funding or an intergovernmental recreational plan for the Grand River as examples.

There is a lot to digest here, but the key issue here is the deadline for participating in the Competition was March 16, 2015, but extra time has been given for the submittal. The township's eligibility is contingent upon authorizing signing of the Letter of Intent. The Township Board should also know that we can back out of this application process/program at any time without penalty.

Assuming the county's application scores well enough to get into phase 2, then the Township can move forward with doing a thorough hazard mitigation assessment which may include updating the Master Plan, Hazard Mitigation Plan, Parks Plan, capital improvements assessment and/or participation in a comprehensive plan with adjacent communities and the county. I should also note, that HUD will also award 30 million dollars to those communities that are not invited into phase 2 but meet all the requirements. Pragmatically speaking, by just participating, even if the application failed, the county and the township still would have a good chance at some financial assistance.

Recommendation: Staff recommends that the Township Board authorize signature of the attached Letter of Intent to participate in the National Disaster Resilience Competition.

Attachment

CHARTER TOWNSHIP OF PLAINFIELD
KENT COUNTY, MICHIGAN
6161 BELMONT AVENUE NE; BELMONT, MICHIGAN 49306

REGULAR BOARD MEETING
MONDAY - MARCH 16, 2015

Regular Board Meeting - 7:00 P.M.

1. Call to Order
2. Invocation
3. Pledge of Allegiance – Jay Spencer
4. Public comments*
5. Review Consent Agenda
   a. Approve the March 2, 2015 closed meeting minutes
   b. Approve the March 2, 2015 regular meeting minutes
   c. Approve a resolution authorizing the Application for a Special Liquor License for the American Legion Post 47 for a outdoor events from May 16 through September 19
   d. Receive the Fire, Passport, Water, Building Permit, Ordinance Enforcement, Financial and Investment reports for February 2015
   e. Receive North Kent Sewer Authority annual report
   f. Approve replacement of two heater units in the Buildings and Grounds garage by Mall City Mechanical for $2,483.60.
   g. Approve installation of water heater at DW Richardson Park by Mall City Mechanics for $1,185.00.
   h. Approve 3-year lawn contract with All Season Lawn Care
   i. Approve purchase of 3 replacement trailers for B&G, in the amount of $12,000
   j. Approve warranty inspections on 5 Mile and Kroes elevated water tanks to Dixon Engineering in the amount of $2,400.00
   k. Approve the Contractor's Application for Payment No. 1 from Velting Contractors, Inc. for the 5/3 Ballpark water main extension project totaling $307,467.00
   l. Approve Change Order No. 1 from Velting Contractors, Inc. for the 5/3 Ballpark water main extension project
   m. Approve payment request for water system improvements, West Michigan Baseball, in the amount of $35,475.07
   n. Approve the Accounts Payable in the amount of $1,258,037.66
6. Approval of Agenda, including the Consent Agenda and Accounts Payable
7. Public Hearing
8. Presentations
9. Old Business
10. New Business
    a. Consider authorizing Superintendent Cameron Van Wyngarden to sign letter of intent to participate in the National Disaster Resilience Competition

10a. attached. No other agenda items attached.

b. Consider contract with Kamminga & Roodvoets, Inc., in the amount of $2,697,678.50 for Plainfield Ave., Suburban Shores, Lakehurst and Northville Drives, and Easements project.

c. Consider contract with Bultsma Excavators, Inc., in the amount of $824,999.80, for the Ambrose, Hillsdale and Benjamin Avenues, Northview Public School Easements water and wastewater improvements

d. Consider Northville Drive Easement Acquisition

11. Board discussions
12. Superintendent's comments
13. Board members' comments
14. Adjournment

***Citizens' comments** – In addition to providing the public with an opportunity to address the Township Board at the beginning of the meeting, an opportunity to comment on individual agenda items will be offered by the Chairman as they are presented.

HUD CDBG Resilience Grant
June 30, 2015 – 10:00 a.m.

AGENDA

1. State/City/DGRI/County Meeting Debrief

2. County Goals

3. Key Projects for Consideration

4. County Grant Staffing

Disaster Resilience Grant

Kent County Administration Building – Room 311
Monday, July 27, 2015 – 10:00 a.m.

AGENDA

1. Denver Debrief
2. Governance
3. MEDC Relationship/Collaboration
4. Project Discussion
   - Budgets
   - Leverage
   - Opportunity List
5. Outreach Efforts
   - Public – Vulnerable Populations
   - Philanthropy
   - Governor's Office
   - Native American Tribes
   - Consumers Energy
   - Insurance Companies

Disaster Resilience Grant

Kent County Administration Building – Room 2E
Monday, August 3, 2015 – 8:00 a.m.

AGENDA

1. Welcome & Introductions – Wayman
2. Resiliency Grant Overview & Opportunity – Wayman
3. Grant Leverage Issue – Wayman, Haris, Kim & Linda
4. State Outreach – Wayman
5. Next Steps – All

Disaster Resilience Grant
Kent County Administration Building
Friday, August 21, 2015 – 10:00 a.m.

AGENDA

1. Welcome & Introductions – Wayman & Eric

2. Proposal Debrief – MEDC Staff

3. Working Together

    - Cost/Benefit Study
    - Community Feedback & Outreach
    - Project Descriptions
    - Leverage
    - Permitting
    - Partnership Letters
    - Contracting Process

4. Timeline Discussion

5. Meeting Schedule

6. Next Steps

Disaster Resilience Grant

Kent County Administration Building – Room 311
Friday, August 28, 2015 – 10:00 a.m.

AGENDA

1. **Agenda Overview/Introductions** 10:00 – 10:05

2. **Washington DC Lobbying Effort** 10:05 – 10:30
   To discuss and coordinate DC lobbying effort with HUD & Other Officials (Deb)

3. **Outreach Plan** 10:30 – 11:00
   To review, amend, and approve DRAFT Outreach Plan (Andy &/or Kim)

4. **Cost Benefit & Project Budget Information** 11:00 – 11:30
   To inform local partners of additional necessary information needed to conduct the cost/benefit component, and share what additional project budget information is needed (Stan & Lindsey)
   Phone Call Information: 605-475-6006, Access code: 9357980

5. **Project Grouping** 11:30 – 12:45
   To determine a strategic, practical, and consistent manner in which to group projects in order to secure maximum funding from HUD. (All)

6. **Next Steps** 12:45 – 1:00
   Review Updated Schedule & Assigned Next Steps

Q: Reach out to tribes.
Q: Holcim foundation —

DATE	TIME	EVENT	LOCATION	CONTACT	PHONE	RESPONSIBLE
8/27/2015		Heartside Bus Assoc update				Tim Kelly
9/23/2015	7:00 PM	Cascade Township Board	2865 Thornhills Ave	Ben Swayze	949-1500	
10/22/2015		Community Inclusion Group Event				Tim Kelly
9/9/2015	8:30 AM	ENTF - Food/Nutrition	Health Dept			
9/22/2015	8:30 AM	ENTF - Transportation	Red Cross			
Bi-Monthly	2:00 PM	ENTR - Energy Efficiency	ACSET/DHS			
Bi-Monthly	9:30 AM	ENTF - CoC	Kroc Center			
9/3 OR 10/1	8:30 AM	ENTF - Econ/Workforce	Westside Complex			

Ada Twp mtg. / Cascade

"Meet the Planners" Events
Chamber of Commerce: Outpro, Black Women Connect
Hispanic Chamber of Commerce
BLEND
GRPS
LINC
Urban League
Disability Advocates of Kent County
Hello West Michigan
Belknap Lookout
Black Hills
Creston
Grandville Arts Academy/Cook Library
Heritage Hill
JBAN-SWAN
Roosevelt Park
West Grand

Disaster Resilience Grant

Kent County Administration Building – Room 311
Friday, September 4, 2015 – 10:00 a.m.
Phone 888 251 2909; #2379804

AGENDA

1. **Agenda Overview/Introductions**	10:00 – 10:05
2. **Cost Benefit Update** Update on Cost Benefit Progress & Necessary Information Stan/Lindsey	10:05 – 10:15
3. **Outreach Plan** Update on Community Outreach - Andy Infographic piece - Andy Survey – Kim Legislative/State Agency Outreach- Deb	10:15 – 10:30
4. **Prioritization & Grouping of Projects** Further Discussion -- Deb	10:30 – 11:00
5. **Leverage Update** Discussion of Current Status/Needs – Deb/Stan/Lindsey	11:00 – 11:15
6. **Partnership Agreements** Discussion – Deb/Stan/Lindsey	11:15 – 11:30
7. **Project Compliance** Initial Discussion/ DBRA, ER, URA, Procurement – Deb	11:30 – 11:45
8. **Next Steps** Review Updated Schedule & Assigned Next Steps	11:45 – 12:00

Disaster Resilience Grant

Kent County Administration Building – Room 311
Friday, September 11, 2015 – 10:00 a.m.
Phone 888 251 2909; #2379804

AGENDA

1. **Agenda Overview/Introductions**	10:00 – 10:05
2. **Washington DC Trip Details**	10:05 – 10:10
3. **Outreach Plan Update**	10:10 – 10:15
4. **Legislative Meeting Agenda**	10:15 – 10:20
5. **Prioritization & Grouping of Projects**	10:20 – 12:30
6. **'To Do's' Still**	12:30 – 1:00

- Leverage Update
- Partnership Agreements
- Project Compliance Meetings

HUD Disaster Resilience Grant
Legislative Update
GVSU Seidman Center
Monday, September 14, 2015 – 10:00 a.m.

AGENDA

1. **Welcome** — Wayman Britt, Rick Chapla, Eric DeLong, Kris Larsen

2. **The Grand Strategy Overview** — Haris Alibasic, Andy Guy, Matthew VanZetten
   - The History – What brought us to this point?
   - The Opportunity – What is the opportunity for the community?
   - The Need – What is our request?

3. **Key Dates & Next Steps** — Wayman Britt, Eric DeLong

The Grand Strategy
Collaborative Communications Planning
Tuesday, January 12, 2016

Kent County Administration Building – Room 311
Phone In: 1-605-475-6006 Passcode: 9357980

AGENDA

4:00 PM Introductions/Agenda Overview

4:10 Process Update: US HUD National Disaster Resiliency Competition

4:20 Review: *The Grand Strategy* Project Framework

4:30 Discussion: Collaborative Communications Program Design

- Shared Principles ie...
  - Speak with 1 voice
  - Communicate w/ key stakeholders first
  - Other?
- Priority Audiences ie ...
  - Project partners
  - Funders
  - Regulators
  - Media
  - Other?
- Protocols ie...
  - Key message(s)
  - Media – proactive and/or unsolicited inquiries/interviews?
  - Tools – media advisory, statements, media release, press conference?
  - Social media?
- People
  - Primary messengers/sources?

5:00 Adjourn

RECEIVED
AUG 10 2015
ADMINISTRATOR

August 7, 2015

Wayman Britt
Assistant County Administrator
Kent County Administrator's Office
300 Monroe NW
Grand Rapids MI 49503

Eric DeLong
Deputy City Manager
Grand Rapids City Manager's Office
300 Monroe NW
Grand Rapids MI 49503

Dear Wayman & Eric:

Ada Township is excited to partner with the State of Michigan, Kent County and Grand Rapids re: the National Disaster Resiliency Grant Competition.

Specifically, we are proposing to complete the following resiliency projects with federal funding:

PROJECT NAME	FEDERAL FUNDING REQUESTED
THORNAPPLE RIVER CORRIDOR GREENWAY DEVELOPMENT	$1,300,000
ADA DRIVE ELEVATION ABOVE FLOODPLAIN	$1,000,000
FLOODPROOFING FULTON STREET LIFT STATION	$ 600,000

Further, Ada Township is working diligently to secure leverage fund commitments. To date, we have identified $3,050,000 of leverage funding for consideration. Between now and the federal grant deadline, we will work to secure firm commitment letters that support the broader community resiliency plan.

Thank you so much for the opportunity to be part of this important work.

Sincerely,

George Haga
Ada Township Supervisor

7330 Thornapple River Drive, P.O. Box 370, Ada, MI 49301 Phone 616-676-9191 Fax 616-676-5870 www.adatownshipmi.com

DAVE HILDENBRAND
29TH DISTRICT
P.O. BOX 30036
LANSING, MI 48909-7536

THE SENATE
STATE OF MICHIGAN
APPROPRIATIONS CHAIRMAN

PHONE: (517) 373-1801
FAX: (517) 373-5801
senhildenbrand@senate.michigan.gov

October 20, 2015

The Honorable Julián Castro
Secretary of Housing and Urban Development
U.S. Department of Housing and Urban Development
451 7th Street S.W.
Washington, DC 20410

Dear Mr. Secretary:

As members of the Michigan Senate who serve the residents of Kent and Ottawa counties, we are excited to work with Governor Snyder, as well as, our local partners in Grand Rapids, Kent County, Ada, Cascade, Plainfield and Wyoming to implement the ***Grand Strategy.***

We saw first-hand the damage of the 2013 Flood and its impact on the region. With this in mind, we are eager to be part of a solution whereby we identify existing State funds – whether they be for endangered species, dam removals, land acquisition or other needs – that can be utilized to support this holistic approach to build economic, environmental and social resilience.

We also know the importance of supporting a stream-lined permitting process as it relates to the Grand Rapids Whitewater vision. We are well briefed and will be advocating for effective ways to consolidate the permitting process and expediting reviews by state officials.

Ultimately, we believe that by working with HUD and the Michigan Economic Development Corporation to implement the ***Grand Strategy***, Grand Rapids, Kent County and greater West Michigan will continue its pattern of sustainable growth in the future. Please do not hesitate to contact our offices if you would like to discuss this proposal in greater detail.

Sincerely,

Dave Hildenbrand
State Senator
29th District

Tonya Schuitmaker
State Senator
26th District

Peter MacGregor
State Senator
28th District

Arlan Meekhof
Senate Majority Leader
30th District

Recycled Paper

HOUSE OF REPRESENTATIVES
STATE OF MICHIGAN
P.O. BOX 30014
LANSING, MI 48900-7514

October 20, 2015

The Honorable Julian Castro
Secretary of Housing and Urban Development
U.S. Department of Housing and Urban Development
451 7th Street S.W.
Washington, D.C. 20410

Dear Mr. Secretary,

We write today, as leaders and members of the Michigan House of Representative representing Kent County, Michigan, in support of the *Grand Strategy* - a partnership with the state of Michigan, the city of Grand Rapids and the communities of Ada, Cascade, Plainfield and Wyoming seeking assistance as part of the National Disaster Resilience Competition.

In 2013, we witnessed the damage of flooding of the Grand River and the effect that it had on the city of Grand Rapids and surrounding areas. In response, the state of Michigan and our local communities have come together to craft a strategy that incorporates several initiatives with the common goal of reducing the risk of future flooding along the Grand River, improving the quality of life in West Michigan.

On behalf of all partners involved, we now ask for assistance to exponentially increase the reach and positive effects of local efforts already underway in response to the 2013 flood. By working with the Department of Housing and Urban Development and the Michigan Economic Development Corporation to implement the *Grand Strategy*, the greater west Michigan community will be able to continue its pattern of sustainable growth.

Thank you for your consideration of the Grand Strategy proposal, of which we offer our support enthusiastically.

Sincerely,

Kevin Cotter
Speaker of the House
99th District

Aric Nesbitt
Majority Floor Leader
66th District

Ken Yonker
State Representative
72nd District

Chris Afendoulis
State Representative
73rd District

Rob VerHeulen
State Representative
74th District

Winnie Brinks
State Representative
76th District

Tom Hooker
State Representative
77th District

Lisa Posthumus Lyons
State Representative
86th District

Recycled Paper

Sheriff's Office

Emergency Management

Mitigation

Disaster Mitigation is a term to describe the steps to contain or reduce the effects of an anticipated or already occurred disastrous event. Ottawa County has joined efforts with Kent County in developing a comprehensive Hazard Mitigation Plan.

Review Hazard Mitigation Plan - Ottawa & Kent County

County of Ottawa
Sheriff's Office

Gary A. Rosema
Sheriff
Gregory A. Steigenga
Undersheriff

Beth Thomas, EMD Director
12220 Fillmore Street
West Olive, MI 49460
(616) 738-4050
(888) 731-1001
Fax: (616) 738-4053

LOCAL EMERGENCY PLANNING COMMITTEE
LEPC ...safety in knowledge

LEPC Meeting Minutes
November 18, 2015

Members in attendance: Andrée Garner, Mike Hintz, Elisa Hoekwater, Dave Hudson, Lynette Kemme, Randy Mergener, William O'Donnell, Jason Poll, Chris Saddler, Earl Schaub, Sandra Scoeb, Derek Schroeder, Jennifer Sorek, Kendra Spanjer, Craig Sterley, Rich Szczepanek, Beth Thomas, Stu Visser, Erin VonTom, Paul Ziegler

Members excused: Tom Bosscher, Don Hutchens, Carl Jager, LeeAnn Karabelski, Larry Logsdon, Sindee Maxwell, Susan Paauwe

Members unexcused: Blain Becktold, Alex Cahan, Jaime Halm, René Kalkman, Eric Klingensmith, Dave Krevda, Carmen Kucinich, Jon Kuyten, Sean Miller, Mike Mitchell, Judy Visscher, Stewart Whitney

Guests: None

Handouts: Agenda, September minutes, Winter Weather Hazards Preparedness class flyer

In the absence of Chair Judy Visscher, Derek Schroeder called the meeting to order at 10:07

Minutes: Paul Ziegler made a motion seconded by Jay Poll to approve the September 16, 2015 minutes with corrections. Motion carried. The speaker from the September meeting, Scott Karcher from CSX was praised for a good presentation.

Introductions were made around the room.

Executive Subcommittee
No report

Public Relations & Promotions
Randy Mergener reported that the LEPC conference will be held on March 16, 2016 from 8-12 "Building a Plan". Plans are coming along well, confirming speakers. There will be a planning meeting before the January LEPC meeting at 9:00. Anyone is welcome to join. We will also need volunteers to help the day of the conference with setup and registration.

Training & Exercising
Sandra Schoeb reported that the HazMat team will be coming to Hillshire to exercise.

Old Business

Beth Thomas reported that:

The review of the LEPC bylaws will be continued.

New Business

Beth Thomas also reported that:

The update to the County EAG is in process. Checklists for positions in the EOC have been developed. The new plan merges and intersects Incident Command with the operation of the EOC.

Homeland Security Grants are continuing, the LPT will be meeting in December to solidify selections for the next grant year. Allocation has shrunk to $190,000 for FY15.

The Mitigation Plan for Ottawa County is due for updating by the end of 2016. We will be working with local jurisdictions to update the plan which then has to be approved by the State and FEMA.

Election of new officers for the LEPC: Randy Mergener and Jay Poll accepted the nomination of Chair and Vice Chair respectively. The floor was opened for any other nominations. Being none, a unanimous vote was cast for the slate presented.

HazMat/Tech Rescue Team

Craig Sterely reported that the integration of the teams is going well. They are working well together. There have been some additions to the team and now have 20 members. They were called out to conduct air monitoring at a fire/explosion in Holland.

Roundtable

Jay Poll suggested that a representative from our LEPC attend the Allegan County LEPC meetings and relay back information. He is willing to attend.

Jennifer Sorek reported:

Public Health has been working on out Budget Period 4 work plan from the State of Michigan, this year can be classified as exercise heavy with 5-7 exercises to be conducted with some being combined. There will be a full scale MCM/SNS exercise tentatively scheduled for June of 2016.

Currently working on redevelopment of isolation and quarantine policy

Conducting training with Emergency Management on December 10 on MICIMS

Community Grant for EBOLA is continuing. No longer have to monitor people coming from Sierra Leone or Liberia

They will be hosting a Special Pathogens Conference June 8-10 at the Eberhard Center. They are working on securing several noteworthy speakers. As of to date, there is no charge for attending.

Elisa Hoekwater stated that they are developing communication strategies for the construction on US 31 in Holland from Lakewood to Quincy that will be happening from April to November in 2016. They are developing a website that can be used to access current information regarding construction.

André Garner relayed that the Red Cross assisted at the apartment fire in Holland and had set up a shelter.

Randy Mergener stated that they will be working on goals for the next year for the LEPC. If you have any input/ideas/suggestions please feel free to contact Derek Schroeder at dschroeder@miottawa.org or Chris Saddler at csaddler@miottawa.org.

2016 Community Outreach Schedule

Location	Address	Date	Day	Time	Equipment
Hudsonville Public Safety Open House	3275 Central Blvd. Hudsonville	8/30/16	Tues	6:00-9:00	Mobile Command Unit, Tech Rescue Demo
Robinson Twp.	Robinson Elementary 11801 120th	9/22/16	Thurs	5:30-8:00	EM Table, Tech Rescue Table provided
Port Sheldon Twp.	16045 Port Sheldon	10/3/16	Mon	7:00-9:00	EM Table, Tech Rescue, Table provided
Georgetown Twp.	Corner of 14th Ave and 44th St	10/6/16	Thurs	6-8	EM Table, Tech Rescue Rappelling(no truck)
Holland Area	Holland Civic Center	10/7/16	Fri	6:30 Parade 7:30-9:00 pm	EM Table
Crockery Township	16875 Main St, Nunica	10/10/16	Mon	7:00 Setup 5:30-6:30	EM Table, Table provided
Grand Haven Twp.	13250 168th Ave	10/11/16	Tues	6:00-8:00 setup by 5:15	EM Table, Tech Rescue Table provided
Spring Lake Twp.	16681 148th Ave	10/13/16	Thurs	6:00-8:00 setup by 5:30	EM Table Table provided
Grand Haven City Department of Public Safety	525 Washington	10/15/16	Sat	11:00-1:00 Set up btw 9-10:15	EM Table Narrow table provided

The following letter was sent to each jurisdiction in Ottawa County.

County of Ottawa
Sheriff's Office

Gary A. Rosema
Sheriff

Steve A. Kempker
Undersheriff

Emergency Management Unit/Beth Thomas, Director
12220 Fillmore Street
West Olive, Michigan 49460-9672
(616) 738-4050
(888) 731-1001
Fax: (616) 738-4053

November 14, 2016

Jerry Alkema
Allendale Charter Township
6676 Lake Michigan Dr
Allendale, MI 49401

Re: Hazard Mitigation Plan Update

Dear Jerry:

Please reply with your answers to my office by **November 25, 2016.** We will use this information to update the plan and submit the updated version to the State for approval.

Enclosed with this letter you will find an excerpt from the 2012 Hazard Mitigation Plan (HMP) for Ottawa and Kent Counties. This excerpt is the portion of the plan that outlines your jurisdiction's intent to work toward mitigating or preventing known hazards in your jurisdiction. Jurisdictions in Ottawa County seeking eligibility for Hazard Mitigation Grants must be included in this manner in the HMP.

The Hazard Mitigation Plan must be updated every five years and we are currently working on the update which must be submitted and approved by FEMA by May 2017. FEMA's approval follows the State's approval and this process can take several months.

Please take the time to look over the tactical suggestions in the excerpt provided and determine

1. Whether any action was taken, albeit successful or not. Any attempt should be documented. (Example: Grant application was denied so mitigation measure was not feasible or, not feasible due to lack of funding.)
2. Project completed. Provide brief explanation and completion date.
3. Project no longer applicable (Explain why. Perhaps something changed in your jurisdiction that already mitigated this hazard.)
4. Any additional projects you deem applicable. This could be a new hazard that has been identified, or a new project or method to mitigate a known hazard.

There are three types of hazard mitigation grants possible:

1. Pre-disaster mitigation grant
   This grant comes annually and is meant to assist you with the projects that you've identified in the Hazard Mitigation Plan.
2. Post-disaster Hazard Mitigation Grant
   This grant may become available following a declared disaster. These are typically high in dollar amounts with a 25% match and will greatly aid your jurisdiction during recovery from a large-scale disaster.

Once approved by the State *and* by FEMA, we will forward a copy of the plan to you with a request for your jurisdiction to formally adopt the plan. Adoption of the plan by your jurisdiction is imperative since without it, your jurisdiction will not be eligible for hazard mitigation funding. You are currently covered under the current (2012) version of the plan.

We would like to have this update process finalized by the end of December 2016. I will be contacting your office again in 2017 once the HMP is approved to assist in addressing your board for formal adoption of the plan. When the time comes I will be happy to address one of your meetings in order to answer any questions you might have.

Thank you for your assistance in this process and please feel free to call me with any question (638-7760)

Respectfully,

BATBR

B.A. Thomas-Baas, PEM
Director
Ottawa County Emergency Management

Enclosures:
Hazard Mitigation Plan 2012 Excerpt
Hazard Mitigation Grant Fact Sheet

cc: Mike Keefe

miOttawa

Ottawa County

Public Officials Conference

March 15, 2017

8am

Main Conference Room

AGENDA

7:30 - 8:00	Registration
8:00 - 8:05	Welcome and Overview Randy Mergener, LEPC Chairperson
8:05 - 9:10	Ottawa County Emergency Management Beth Thomas, Ottawa County EMD
9:10 - 9:45	Michigan Emergency Management Act 390 Lt. Mark Russo, Michigan State Police
9:45 - 10:00	Networking Brunch
10:00 - 10:30	SARA Title III, Community Right To Know
10:30 - 11:00	Local LEPC and Your Jurisdiction Randy Mergener, LEPC Chair
11:00 - 11:15	Networking
11:15 - 11:25	Ottawa County HazMat
11:25 - 11:45	51st WMD Civil Support Team
11:45 - 12:15	See Something, Say Something
12:15 - 12:30	Closing Remarks and Questions Randy Mergener and Committee

LEPC ...safety in knowledge®

Conference Attendees

First Name	Last Name	Email	Attendee Status	Cell Phone	Type Of Employm
Jay	Poll	jayp@lakeshoreer	Checked In	616-402-4403	LEPC
Andrée	Garner	safhsollarc@yaho	Checked In		LEPC
Sindee	Maxwell	smaxwell26@gma	Checked In	616.566.2125	LEPC
MONICA	BEDKER	monica.bedker@t	Checked In	231-392-4256	Facilities
Randy	Mergener	Randy.mergener@	Checked In	(616)460-8461	Government
Don	Hutchens	don.hutchens@ty	Checked In	616-283-1152	LEPC
Travis	Westra	travis.westra@tys	Checked In		Facilities
Kathryn	Kuck	supervisor@robin	Checked In		Government
Lynette	Kemme	lynette.kemme@	Checked In	616-283-2881	Hospital
Elisa	Hoekwater	ehoekwater@the	Checked In		Government
Brandi	Waldman	bwaldman@senio	Checked In	231-750-5946	Citizen
Brandon	Parkhurst	bparkhurst@ghbl	Checked In		Facilities
Nick	Bonstell	nbonstell@cityofz	Checked In	616-610-1442	Fire
Mark	VerBerkmoes	mverberkmoes@	Checked In		Government
Bill	Cargo	bcargo@ght.org	Checked In		Government
Christopher	Karish	ckarish@occda.or	Checked In	616-638-3114	Government
Denise	Chalifoux	dchalifoux@ght.o	Checked In		Government
Andrea	Sandoval	asandoval@ght.o	Checked In		Government
Stacey	Fedewa	sfedewa@ght.org	Checked In		Government
Nathan	Dreyer	n.dreyer@catchar	Checked In	616-795-2574	Government
Bill	Sahlberg	supervisor@polkt	Checked In		Government
Frank	Garcia	fgarcia@miottaw	Checked In	616-610-3995	Government
Josh	Westagte	supervisor@ocwri	Checked In	616-292-0293	Government
Ryan	Wise	ryan.wise@mjn.c	Checked In	6167487036	OSHA/Safety Rep
Kate	Riggs	kate.riggs@gente	Checked In		Facilities
Michele	Klush	michele.klush@ge	Checked In		Facilities
Rachel	McDuffee	rachel.mcduffee@	Checked In		Facilities
Tim	Klunder	citymgr@cityofze	Checked In	616-772-6400	Government
Stephen	North	stvnorth@yahoo.	Checked In	616-780-7836	Citizen
Dwight	Sheridan	djsheridan2@gma	Checked In	616-485-7711	Fire
Derek	Schroeder	dschroeder@miot	Checked In		Government
Jeff	Lukas	jeff.lukas@gentex	Checked In		Facilities
Chris	Saddler	csaddler@miotta	Checked In		LEPC
Brenda	Katerberg	b.katerberg@city	Checked In		Government
Steve	Kempker	skempker@miott	Checked In		Law Enforcement
Justin	Roebuck	jroebuck@miotta	Checked In		Government
Kendra	Spanjer	spanjerk@michig	Checked In		Government
Geri	Mccaleb	gmccaleb@grandl	Checked In		Government
Jason	Poll	jaypcpg@gmail.co	Checked In	616-402-4403	LEPC
Valerie	Weiss	Vweiss@miottaw	Checked In		Law Enforcement
Tammy	Smith	tammysmith@oc	Checked In		Law Enforcement
Judy	Visscher	jvisscher@holland	Checked In	616-405-0213	Facilities

Job Title	Company	Work Address 1	Work Address 2	Work City	Work State
Project Manager/I	Lakeshore Enviror	803 VerHoeks Stre		Grand Haven	MI
LEPC	ARC	17305 Rolling Dun		West Olive	MI
Board member	Ottawa County LE	12220 Fillmore		West Olive	MI
SECURITY SUPERV	TYSON FOODS	8300 96TH AVE		ZEELAND	MI
LEPC Chairman	Ottawa county LEI	16480-88th Avenu		Coopersville	MI
Safety Manager	Tyson Foods	8300 96th Avenue		Zeeland	MI
Safety Supervisor	Tyson Foods, Inc.	8300 96th. Ave.		Zeeland	MI
Supervisor	Robinson Townshi	12010 120th Aver		Grand Haven	MI
Emergency Prepar	Spectrum Health	8333 Felch		Zeeland	MI
Senior Transporta	Macatawa Area C	301 Douglas Aven		Holland	MI
Emergency Prepar	Senior Resources	560 Seminole Roa		Norton Shores	MI
Chemical System S	Grand Haven Boar	1700 Eaton Drive		Grand Rapids	MI
Fire Chief	Zeeland Fire Resc	21 S Elm St		Zeeland	MI
Public Services Dir	Grand Haven Char	13300 168th Aver		Grand Haven	MI
Manager	Grand Haven Char	13300 168th Aver		Grand Haven	MI
Training Supervisc	Ottawa County Ce	12101 Stanton		West Olive	MI
Assessing Director	Grand Haven Char	13300 168th Aver		Grand Haven	MI
Accounting Direct	Grand Haven Char	13300 168th Aver		Grand Haven	MI
Community Devel	Grand Haven Char	13300 168th Aver		Grand Haven	MI
Transit Supervisor	Mactawa Area Ex	11660 Greenway I		Holland	MI
Supervisor	Polkton Township	6900 Arthur Stree		Coopersville	MI
County Commissic	Ottawa County	961 Bay Ridge Dr		Holland	MI
Supervisor	Wright Township	PO Box 255		Marne	MI
EHS Specialist/Hea	Mead Johnson Nu	725 E Main Ave		Zeeland	MI
Life Safety Coordi	Gentex Corporatic	600 N Centennial		Zeeland	MI
Security Coordina	Gentex Corporatic	600 N Centennial		Zeeland	MI
Security Specialist	Gentex Corporatic	600 N Centennial		Zeeland	MI
City Manager	City of Zeeland	21 S Elm St		Zeeland	MI
Volunteer Coordir	American Red Cro	7003 28th Ave.		Hudsonville	MI
Fire Chief	Chester Twp. Fire	PO Box 33		Conklin	MI
LEPC - Coordinato	Ottawa County	12220 Fillmore St		West Olive	MI
Security Manager	Gentex Corporatic	600 N Centennial		Zeeland	MI
RPC	Ottawa County En	12220 Fillmore St		West Olive	MI
Clerical Assistant	City of Holland	270 S River Ave		Holland	MI
Sheriff	Ottawa County	12220 Fillmore St		West Olive	MI
County Clerk/Regi	Ottawa County	12220 FIllmore St	Room 130	West Olive	MI
Director	Ottawa County DI	12185 James St.		Holland	MI
Mayor	City of Grand Hav	519 Washington		Grand Haven	MI
Project Manager	Lakeshore Enviror	803 Verhoeks St.		Grand Haven	MI
Undersheriff	Ottawa County Sh	12220 Fillmore		West Olive	MI
Dispatch Supervis	Ottawa County Ce	12101 Stanton St		West Olive	MI
Environmmental F	Holland BPW	625 Hastings Ave		Holland	MI