

HAZARD MITIGATION PLAN

FOR KENT AND OTTAWA COUNTIES

**(including Grand Rapids, Kentwood, and
other local jurisdictions)**

**REVISED FEMA REVIEW COPY
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Executive Summary

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, the City of Kentwood, and various 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 plan has been updated from the “Pre-Hazard Mitigation Plan” that was approved by FEMA in 2006 and subsequently adopted by the counties and by numerous local jurisdictions within them.

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 2011 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 this updated plan was made available for public review and posted online to provide an opportunities for additional feedback to be submitted by citizens, area businesses, other stakeholders, non-profit organizations, regional and academic institutions, and neighboring communities. This new plan has been substantially reorganized from the 2006 edition, in order to better integrate information from participating communities and multiple pre-existing plans.

Hazards

Hazard 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. The Hazard Identification and Overview section examines the following hazards:

1. 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 Fahrenheit, 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.

2. Thunderstorm Hazards (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.

3. Tornadoes

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.

4. Drought

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.

5. Severe Winter Weather (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.

6. 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 upon shipping, marinas and watercraft.

7. Landslides

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.

8. Earthquakes

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.

9. Wildfires

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.

10. Urban and Structural Fires

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.

11. Other Fires

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

12. Dam Failure Flooding

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.

13. Riverine Flooding

Riverine flooding tends to be exacerbated in the springtime from a combination of frozen ground (less able to absorb precipitation), melting snow pack and sudden, heavy rainfalls. Several riverine floods have occurred in the Greater Grand Rapids area in the past 100 years, causing significant economic impact. Floodplain maps describe locations prone to flooding.

14. Urban Flooding

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.

15. Electrical Failures

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.

16. Communications Failures

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 ensure reliability.

17. Water System Failures

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 backup components help assure outages can be quickly remedied. With adequate back up electrical supply, loss of the water system caused by a natural disaster seems unlikely.

18. Sanitary Sewer Failures

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.

19. Natural Epidemics

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.

20. Hazardous Material Releases

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.

21. Transportation Accidents

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

22. 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.

23. 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.

Risk Scoring Evaluation Measures

To profile and evaluate hazards, a set of 12 weighted evaluation measures had been 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 Ranking

The total hazard scores determined each hazard’s ranking, with the highest scores for hazards posing the greatest threat to the most people in the Greater Grand Rapids area. 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 upon in this HMP all present significant elements of threat to the Greater Grand Rapids area. 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

Individual hazard risk assessment scores are ranked greatest to least:

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	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)

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

Goals

As a regional plan representing multiple agencies and jurisdictions, shared agreement exists about the need to mitigate the following top-priority hazards throughout the planning area. These goals have been amended from the previous 2006 edition of this plan, to make them more focused upon hazard mitigation actions, as follows:

1. 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.
2. Flooding – Efforts will continue to reduce the number of vulnerable structures in floodplain areas, and make any such at-risk properties less vulnerable, as funding, other resources, and the informed cooperation of property owners permits. Included in these efforts will be 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.
3. Communication Disruption – Continued reductions in communication infrastructure downtime will be sought and maintained, when possible.
4. Other hazard mitigation efforts – Other cost-effective or convenient hazard mitigation opportunities will be considered and sought, as opportunities and resources permit, to address any of the hazards considered within this plan to be significant in the region and/or its subjurisdictions.

Action Plan and Priorities

1. Severe Weather
 - a. Survey needs and add sirens to regions as needed.
 - b. 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.)
2. Flooding
 - a. Purchase eligible properties that are vulnerable to flooding, as funds become available.
 - b. Take measures to mitigate flood damage and reduce vulnerability to existing structures.
 - c. 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.
3. Communications Disruption
 - a. Identify infrastructure vulnerabilities.
 - b. Work with local utilities to develop a plan.
 - c. Implement measures identified in the plan.
4. Enhance, Strengthen, and Maintain Emergency Notification Systems Throughout the Region
5. All Communities to Consider NFIP Participation in Kent County
6. Area Master Plan Updates to Consider Hazard Mitigation Concepts and Actions
7. Other hazard mitigation strategies (specific to each hazard type, vulnerable system, or location)

Hazard Summary Table – by Community

	Winter Weather	Electr. Failure	Tornado	River Flooding	Commun. Fail	Thunderstorm	Urban Flooding	Intentional Act	Transport. Acc.	Haz. Mat. Rel.	Urban/Str. Fire	Water Syst. Fail	Epidemic	Nuc. Plant Acc.	San. Sewer Fail	Ext. Temps.	Dam Failure	Shoreline E/I/E	Earthquake	Drought	Wildfires	Other fires	Landslides
Ada Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Algoma Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Allendale Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Alpine Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Blendon Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Bowne Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Byron Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Caledonia (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Caledonia Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Cannon Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Cascade Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Casnovia (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Cedar Springs (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Chester Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Coopersville (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Courtland Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Crockery Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of East Grand Rapids (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Ferrysburg (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Gaines Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Georgetown Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grand Haven (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grand Haven Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grand Rapids (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grand Rapids Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grandville (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grattan Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Holland (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Holland Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Hudsonville (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Jamestown Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Kent City (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Kent County (K) (part NFIP)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Kentwood (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Lowell (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Lowell Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Nelson Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Oakfield Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Olive Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Ottawa County (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Park Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Plainfield Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Polkton Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Port Sheldon Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Rockford (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Robinson Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Sand Lake (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Solon Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Sparta (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Sparta Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Spencer Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Spring Lake (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Spring Lake Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Tallmadge Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Tyrone Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Vergennes Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Walker (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Wright Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Wyoming (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Zeeland (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Zeeland Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L

General Hazard Mitigation Objectives by Jurisdiction (community subsections have more items and detail)

	Communications	Emerg. Notificat	Consider NFIP	Master plan cons.	Flood mitigation	Severe Weath. pr.	Infrastr. Strength.	Fire Prepar.
Ada Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Algoma Township (K) NFIP	Y	Y		Y		Y	Y	Y
Allendale Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Alpine Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Blendon Township (O) NFIP	Y	Y		Y		Y	Y	Y
Bowne Township (K)	Y	Y	Y	Y		Y	Y	Y
Byron Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Caledonia (K)	Y	Y	Y	Y		Y	Y	Y
Caledonia Township (K) NFIP	Y	Y		Y		Y	Y	Y
Cannon Township (K) NFIP	Y	Y		Y		Y	Y	Y
Cascade Township (K) NFIP	Y	Y		Y		Y	Y	Y
Village of Casnovia (K)	Y	Y	Y	Y		Y	Y	Y
City of Cedar Springs (K)	Y	Y	Y	Y		Y	Y	Y
Chester Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Coopersville (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Courtland Township (K)	Y	Y	Y	Y		Y	Y	Y
Crockery Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of East Grand Rapids (K) NFIP	Y	Y		Y		Y	Y	Y
City of Ferrysburg (O) NFIP	Y	Y		Y		Y	Y	Y
Gaines Township (K)	Y	Y	Y	Y		Y	Y	Y
Georgetown Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Grand Haven (O) NFIP	Y	Y		Y		Y	Y	Y
Grand Haven Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Grand Rapids (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Grand Rapids Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Grandville (K) NFIP	Y	Y		Y		Y	Y	Y
Grattan Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Holland (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Holland Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Hudsonville (O) NFIP	Y	Y		Y		Y	Y	Y
Jamestown Township (O) NFIP	Y	Y		Y		Y	Y	Y
Village of Kent City (K)	Y	Y	Y	Y		Y	Y	Y
Kent County (K) (part NFIP)	Y	Y	Y	Y	Y	Y	Y	Y
City of Kentwood (K) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Lowell (K) NFIP	Y	Y		Y		Y	Y	Y
Lowell Township (K)	Y	Y	Y	Y		Y	Y	Y
Nelson Township (K)	Y	Y	Y	Y		Y	Y	Y
Oakfield Township (K)	Y	Y	Y	Y		Y	Y	Y
Olive Township (O) NFIP	Y	Y		Y		Y	Y	Y
Ottawa County (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Park Township (O) NFIP	Y	Y		Y		Y	Y	Y
Plainfield Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Polkton Township (O) NFIP	Y	Y		Y		Y	Y	Y
Port Sheldon Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Rockford (K)	Y	Y	Y	Y		Y	Y	Y
Robinson Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Village of Sand Lake (K)	Y	Y	Y	Y		Y	Y	Y
Solon Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Sparta (K) NFIP	Y	Y		Y		Y	Y	Y
Sparta Township (K) NFIP	Y	Y		Y		Y	Y	Y
Spencer Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Spring Lake (O) NFIP	Y	Y		Y		Y	Y	Y
Spring Lake Township (O) NFIP	Y	Y		Y		Y	Y	Y
Tallmadge Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Tyrone Township (K)	Y	Y	Y	Y		Y	Y	Y
Vergennes Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Walker (K) NFIP	Y	Y		Y		Y	Y	Y
Wright Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Wyoming (K) NFIP	Y	Y		Y		Y	Y	Y
City of Zeeland (O) NFIP	Y	Y		Y		Y	Y	Y
Zeeland Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y

EMDs will evaluate changing conditions and input from interested parties, then suggest changes to the existing plan. This strategy allows the existing edition of the plan to be used as a benchmark which may be modified in the future by simple editing. As future plan proposals are developed they will be made available to the public and other interested parties through meetings, public announcements or web site postings. Once an updated proposed plan is developed, local jurisdictions will consider adopting the plan through resolution as long as they choose to participate in the regional hazard mitigation plan.

Along with the counties themselves, all of the minor civil divisions in the area (townships, cities, and villages listed in the previous tables) are considered to be covered by, and participants in, this regional plan. Their adoption of the finalized plan (whose content has also been approved by FEMA) will be a final demonstration of their participation and commitment to hazard mitigation, and this official adoption procedure will take place during 2012, on the part of both counties and all minor civil divisions.

Plan Implementation

Implementation of this action plan, pending funding where required, will be led by the three EMDs of Grand Rapids, Kent County and Ottawa County (and where appropriate will also include the relevant representatives of other involved communities, such as Kentwood, Plainfield Township, and Robinson Township). Project implementation will be timely and efficient once the necessary funding is obtained. Acquisition of flood-prone properties would be coordinated through appropriate local governments, as specified in existing FEMA mitigation requirements. 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 negotiated to provide prompt improvement of the warning infrastructure. Study of communication infrastructure reliability would be coordinated by the local EMDs. Specific responsibilities and timelines would be arranged according to “request for proposal” documents, to be developed if funding becomes available. A formal cost-benefit analysis would be performed at approximately that time in the process.

HMP Maintenance

This document will be reviewed by the emergency management directors for Kent County, Ottawa County and the City of Grand Rapids every two years and updated every five years per FEMA guidance. Ideally, the HMP will be updated annually or as needed as determined by the emergency management directors. The EMDs shall develop reports and share information with each other each year within 30 days of the anniversary of FEMA approval of this plan. Responsibility for leading the coordination plan shall rest with Kent County.

Local jurisdictions, by agreeing to adopt this regional hazard mitigation plan, will cooperate in the maintenance of this plan according to FEMA guidance. Local jurisdictions will also provide sufficient resources in order to maintain this plan in order to meet FEMA guidance as long as they choose to participate in the regional hazard mitigation plan. The EMDs, as part of their job responsibilities, will take action appropriate to the needs of the public, based on this plan and any deficiencies which may be identified.

Public Participation

The HMP will remain available on the county websites. Input will be directed to the emergency management director of each organization. The EMDs shall periodically solicit public input, using their respective website links and other public announcements with an invitation for public input regarding HMP evaluation and update. Based on their assessment of the response, the EMDs may also hold public meetings for the purpose of public input to the HMP. The EMDs will not only target the general public, but members of business, academia, special interest groups, and others who may offer valuable input. EMDs will evaluate changing conditions and input from interested parties, then suggest changes to the existing plan. This strategy allows the previous edition of the plan to be used as a benchmark which may be modified in the future by simple editing.

Future projects may be identified by local jurisdictions and integrated into the plan. Projects may be submitted to the EMDs for inclusion in the updated plan. The EMDs will monitor project submissions, then help to review and rank prospective submissions to the plan. EMDs will make local planning committees aware of updates. As future plan proposals are developed they will be made available to the public and other interested parties through meetings, public announcements or web site postings. Once an updated plan is developed, local jurisdictions will consider adopting the plan through resolution as long as they choose to participate in the regional hazard mitigation plan.

Plan Integration

When approved, copies of this plan will be distributed by the EMDs to each participating township, city, and village in the two counties, since all the communities administer their own local zoning. Jurisdictions agreeing to participate in the use of this HMP through local resolution have local planning departments who will be responsible for consideration of this HMP in existing planning and development mechanisms.

HAZARD MITIGATION PLAN: MAIN DOCUMENT

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, the City of Kentwood, and various 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 plan has been updated from the “Pre-Hazard Mitigation Plan” that was approved by FEMA in 2006 and subsequently adopted by the counties and by numerous local jurisdictions within them.

Planning Process

The original 2006 plan had been 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 2011 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 this updated plan was made available for public review and posted online to provide an opportunities for additional feedback to be submitted by citizens, area businesses, other stakeholders, non-profit organizations, regional and academic institutions, and neighboring communities.

Numerous meetings were held to present the project and collect input. Many of the meetings were open to the public, and attracted the participation of nonprofit groups, academia, business and government. Additionally, the plan was posted on the Ottawa and Kent County Emergency Management websites, at http://www.accesskent.com/CourtsAndLawEnforcement/SheriffsDepartment/sheriff_emergency.htm and <http://www.co.ottawa.mi.us/CourtsLE/Sheriff/emermgt.htm>, where public input was invited and contact information was provided, for the sending of such input.

Plans such as Emergency Action Guidelines (EAGs), the 2011 Michigan Hazard Mitigation Plan, Robinson Township Flood Mitigation Plan, City of Kentwood Hazard Mitigation Plan, and Plainfield Township Hazard Mitigation Plan were reviewed, as were studies and technical information from local jurisdictions and other interested parties. Applicable information was considered and included in this plan. Dam emergency actions plans were incorporated into the section 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 materials sections of this plan. While some existing plans are quite formal, such as the 50-Mile Emergency Action Plan for the release of radioactive material from the Palisades Nuclear Power Plant, other plans were less formal, yet still important and thus considered in the development of this all-hazards plan. The local American Red Cross has a plan to shelter tens of 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 being collected on the vulnerable structures within the hazard impact area as part of our ongoing GIS program.

This updated plan has been substantially reformatted from the original 2006 version. The original plan had huge appendices that were not well-integrated into the plan and made it far too difficult to locate the relevant information for each community and hazard type. Moreover, there were multiple separate hazard mitigation plans for different communities within the region. This newly updated version has consolidated the available plans and information into a new format that is focused upon each particular hazard that may affect the region or some part of it. Every community in the two-county area now has its own sub-section and a more focused presentation of its top priorities and hazard mitigation strategies. This new format has allowed a more unified and coordinated approach to hazards that are both regional and community-specific, allowing a simultaneous consideration of both a regional and a community perspective, and their integration into a consolidated planning framework—easier to use and to implement.

Each jurisdiction was asked to provide a point of contact (POC) and then provide input, as appropriate, for each of the 23 defined hazards. For each hazard the POC was asked to describe current hazard prevention efforts and planned mitigation projects. The POCs and their organizations are included below, even though some of the contact information may go out-of-date before the next edition of this plan:

HMP Points of Contact

KENT COUNTY AREA FIRE CHIEFS and ELECTED OFFICIALS

Revision: April 2011 (NOTE: See Appendix for detailed capability assessment, by community)

ADA

Ada Fire Department
Chief Jim Duvall
6990 E. Fulton, P. O. Box 370, Ada, MI 49301
Telephone: (616) 676-2376, Fax: (616) 676-2173, E-mail: jduvall@adatownshipmi.com

Ada Township Office
Supervisor George Haga
7330 Thornapple River Dr, P.O. Box 370, Ada, MI 49301
Telephone: (616) 676-9191 ext 50, Fax: (616) 676-5870, E-mail: ghaga@adatownshipmi.com

ALGOMA

Algoma Fire Department
Chief Steve Johnson
10531 Algoma, Rockford, MI 49341, (Training Facility: 10820 Edgerton, Rockford)
Telephone: (616) 866-2607, Fax: (616) 866-3832 (Twp.), E-mail: algomafire@charter.net

Algoma Township Office
Supervisor: Dennis Hoemke
10531 Algoma, Rockford, MI 49431
Telephone: (616) 866-1583, Fax: (616) 866-2649, E-mail: supervisor@algotatwp.org

ALPINE

Alpine Fire Department
Chief Ronald Christians
841 Alpine Church Rd., Comstock Park, MI 49321
Telephone: (616) 784-5750, Fax: (616)785-9115, E-mail: alpine.fd@alpinetwp.org

Alpine Township Hall
Supervisor: Alex Arends
5255 Alpine Ave NW, Comstock Park, MI 49321
Telephone: (616) 784-1262 ext 102, Fax: (616) 784-1234, E-mail: a.arends@alpinetwp.org

ALTO/BOWNE

Alto/Bowne Fire Department
Chief Philip Dougherty
6260 Bancroft, SE, P. O. Box 35, Alto, MI 49302
Station phone: (616) 868-0439, E-mail: firechief@bownetwp.org

Alto/Bowne Township Office
Supervisor Christian Wagner
8240 Alden Nash, P.O. Box 35, Alto, MI 49302
Telephone: (616)868-6846 Fax: (616)868-0110

BYRON CENTER

Byron Township Fire Department
Chief Rog Steenwyk
8085 Byron Center Ave., SW, Byron Center, MI 49315
Telephone: (616) 878-1222, Fax: (616) 878-3980, E-mail: jhondorp@byrontownship.org

Byron Township Office
Supervisor Audrey Nevins-Weiss
8085 Byron Center Ave., SW, Byron Center, MI 49315
Telephone: (616) 878-1222, Fax: (616) 878-3980, E-mail: audrey@byrontownship.org

CALEDONIA

Caledonia Township Fire Department
Chief Brian Bennett
8192 Broadmoor SE, Caledonia, MI 49316
Telephone: (616) 891-0140, Fax: (616) 891-0430, E-mail: firechief@caledoniatownship.org

Caledonia Township Offices
Supervisor Bryan Harrison
8196 Broadmoor SE, Caledonia, MI 49316
Telephone: (616) 891-0070 ext 211, Fax: (616) 891-0430, E-mail: bharrison@caledoniatownship.org

CANNON

Cannon Township Fire Department
Chief Jim Morris
6878 Belding Rd., Rockford, MI 49341
Telephone: (616) 874-6056, Fax: (616) 874-8940, E-mail: chief@cannontwp.org

Cannon Township Center
Supervisor Steve Grimm
6878 Belding Rd., Rockford, MI 49341
Telephone: (616) 874-6966, Fax: (616) 874-8940, E-mail: sgrimm@cannontwp.org

CASCADE

Cascade Township Fire Department
Chief John Sigg
2865 Thornhills Dr., SE, Grand Rapids, MI 49546-7192
Telephone: (616) 949-1320, Fax: (616) 285-2330, E-mail: jsigg@cascade.twp.com

Cascade Township Offices
Supervisor Robert Beahan
2865 Thornhills Dr., SE, Grand Rapids, MI 49546-7192
Telephone: (616) 949-1500, Fax: (616) 949-3918, E-mail: rbeahan@cascadetwp.com

CASNOVIA

Casnovia Township Fire Department
Chief Dennis Smith
17569 Bailey Rd., P. O. Box 95, Bailey, MI 49303
Telephone: (231) 834-7066, Fax: (231) 834-5705, E-mail: caz390@charter.net

Casnovia Village Offices
President Rand Kahrs
141 N Main St, Casnovia, MI 49318-9618
Telephone: (616) 675-4780, Fax: (616) 675-4780

CEDAR SPRINGS

Cedar Springs Fire Department
Chief Jerry Gross
66 S. Main St., P. O. Box 310, Cedar Springs, MI 49319
Telephone: (616) 696-1221, E-mail: csfire@cmedic.net

City of Cedar Spring
City Manager Kristine Burns
PO Box 310, 66 S. Main Street, Cedar Springs, MI 49319-0310
Telephone: (616) 696-1330, Fax: (616) 696-0202, E-mail: manager@cityofcedarsprings.org

COURTLAND

Courtland Township Fire Department
Chief Mickey Davis
7480 – 14 Mile Rd., NE, Rockford, MI 49341; New Substation: 9535 Myers Lake Rd., Rockford 49341
Telephone: (616) 866-3511, Fax: (616) 866-3451, E-mail: firechief@courtlantwp.org
Deputy Chief: Terry Welch, Phone: (616) 696-9643, E-mail: Deputy02@yahoo.com

Courtland Township Offices
Supervisor Chuck Porter
7450 – 14 Mile Rd NE, Rockford, MI 49341

Telephone: (616) 866-0622, Fax: (616) 866-3451, E-mail: cporter@courlandtwp.org

CUTLERVILLE

Cutlerville Fire Department
Chief Russell Jansen

11-68th Street SW, Grand Rapids, MI 49548

Telephone: (616) 455-7670, Fax: (616) 455-0221, E-mail: cfd@firehousemail.com , firemanr@gmail.com

Cutlerville Township Offices

Supervisor Don R. Hilton Sr.

8555 Kalamazoo Ave., SE, Caledonia, MI 49316

Phone: (616) 698-6640, Fax: (616) 698-2490, E-mail: don.hilton@gainestownship.org

DUTTON

Dutton Fire Department

Chief Russ Jansen

3411-68th St., SE, Caledonia, MI 49316

Telephone: (616) 541-0119, Fax: (616)541-0120, E-mail: firemanr@gmail.com, russelljansen@yahoo.com

Dutton Township Offices

Supervisor Don R. Hilton Sr.

8555 Kalamazoo Ave. SE, Caledonia, MI 49316

Phone: (616) 698-6640, Fax: (616) 698-2490, E-mail: don.hilton@gainestownship.org

EAST GRAND RAPIDS

East Grand Rapids Public Safety

Chief Mark Herald

770 Lakeside Drive SE, East Grand Rapids, MI 49506

Telephone: (616) 949-7010, Fax: (616) 940-4829, E-mail: mherald@eastgr.org

City of East Grand Rapids

Mayor Cindy Bartman

750 Lakeside Dr SE, East Grand Rapids, MI 49506

Telephone: (616) 949-2110, E-mail: cbartman@eastgr.org

City Manager Brian Donovan, 750 Lakeside Dr SE, East Grand Rapids, MI 49506

Telephone: (616)949-2110, E-mail: bdonovan@eastgr.org

FREEPORT

Freeport Fire and Rescue

Chief Jim Yarger

100 South State St, Freeport, MI 49325

Telephone: (269) 838-5421 or (269) 948-3320 (Barry Co.), E-mail: FAVFD@SBCglobal.net

Freeport Township Offices

100 South State St, Freeport, MI 49325

Telephone: (269) 838-5421 or (269) 948-3320 (Barry Co.)

GERALD R. FORD INTERNATIONAL AIRPORT

Gerald R Ford International Airport Fire Department

Chief Brian Kimball

5500 – 44th St., SE, Grand Rapids, MI 49512

Telephone: (616) 233-6079, E-mail: bkimble@grr.org

CITY OF GRAND RAPIDS

Grand Rapids Fire Department

Chief Laura Knapp

38 LaGrave Ave., SE, Grand Rapids, MI 49503

Telephone: (616) 456-3900, Fax: (616) 456-3898, E-mail: lknapp@ci.grand-rapids.mi.us

Deputy Chief: Gary Szotko, E-mail: gszotko@ci.grand-rapids.mi.us

Hazardous materials: Lt. Doug Carley, E-mail: dcarley@ci.grand-rapids.mi.us

Hazardous materials planner: Lt. Mary Johnson, E-mail: mjohnson@ci.grand-rapids.mi.us

City of Grand Rapids

Mayor George Heartwell

300 Monroe NW, Grand Rapids, MI 49503

Telephone: (616) 456-3168, E-mail: mayor@grcity.us
City Manager Gregory Sundstrom
Telephone: (616) 456-3166, E-mail: manager@grcity.us

GRAND RAPIDS TOWNSHIP

Grand Rapids Township Fire Department
Director of Public Safety Bob Radakovitz
1836 East Beltline Ave., NE, Grand Rapids, MI 49525
Telephone: (616) 361-7391 ext. 232, E-mail: chief@grandrapidstwp.org
Deputy Chief: Bob Versluys, Phone: (616) 361-7391 ext. 230

Grand Rapids Township Offices
Supervisor Mike DeVries
1836 East Beltline Ave., NE, Grand Rapids, MI 49525
Telephone: (616) 855-5802, Fax: (616) 361-6620, E-mail: mdevries@grandrapidstwp.org

GRANDVILLE

Grandville Fire Department
Chief Harvey Veldhouse
3315 Wilson Ave., SW, Grandville, MI 49418
Telephone: 530-6211, Fax: 530-4984, E-mail: veldhouseh@cityofgrandville.com
Lt. Mike May, E-mail: maym@cityofgrandville.com

GRATTAN

Grattan Township Fire Department
Chief Lou Kirkbride
12134 Old Belding Rd. NE, Belding, MI 48809
Telephone: (616) 691-7404, E-mail: grattanfirechief@comcast.net (or loucathyk@aol.com)

Grattan Township Offices
Supervisor Frank Force
12050 Old Belding Rd, Belding, MI 48809
Telephone: (616) 691-8450, Fax: (616) 691-8804, E-mail: supervisor@grattantownship.org

KENT CITY

Kent City Fire Department
Chief Mike Rexford
P. O. Box 262, 218 E. Muskegon, Kent City, MI 49330-0262
Telephone: (616) 678-4330, E-mail: kentcityfire@gmail.com

Kent City Village Offices
President John E. Petruska
P. O. Box 262, 218 E. Muskegon, Kent City, MI 49330-0262
Telephone: (616) 678-7232, Fax: (616) 678-4256, E-mail: vkc.clerk@kentcitymi.org

KENTWOOD

Kentwood Fire Department
Chief James E. Carr
P. O. Box 8848, Kentwood, MI 49518-8848
Telephone: (616) 554-0801, Fax: (616) 554-0799, E-mail: carrj@ci.kentwood.mi.us
Deputy Chief: Brent Loman, Phone: 554-0797, E-mail: Lomanb@ci.kentwood.mi.us

Kentwood City Offices
Mayor Richard Root
4900 Breton Ave SE, Kentwood, MI 49508
Telephone: (616) 698-9610, E-mail: mayor@ci.kentwood.mi.us

LOWELL

Lowell Fire Department
Chief Frank Martin
301 E. Main St., Lowell, MI 49331
Telephone: (616) 897-8135, Fax: (616) 897-4074, E-mail: chieffrankmartin@att.net

Lowell City Offices
Mayor Jim Hodges

301 East Main Street • Lowell, MI 49331
Telephone: (616) 897-8457, Fax: (616) 897-4085, E-mail: jhodes@ci.lowell.mi.us

OAKFIELD

Oakfield Township Fire Department
Chief Don Riker
10300 – 14 Mile Road, Rockford, MI 49341
Telephone: (616) 754-5122, Office (manned): (616) 754-5679, Fax: (616) 754-0989
E-mail: firechief@oakfieldtwp.org

Oakfield Township Offices
Supervisor William Dean
10300 – 14 Mile Rd, Rockford, MI 49341
Telephone: (616) 754-5679, Fax: (616) 754-0989, E-mail: info@oakfieldtwp.org

PLAINFIELD TOWNSHIP

Plainfield Township Fire Department
Chief David Peterson
4343 Plainfield, NE, Grand Rapids, MI 49525
Telephone: 361-2895, Fax: 364-1187, E-mail: chief@plainfieldfire.org
Deputy Chief: Don Bigger, Jr., Phone: 293-9759, Work: 361-2895, E-mail: donbig@prodigy.net

ROCKFORD

Rockford Fire Department
Chief Mike Reus (Captain: Rick VanHorn)
P. O. Box 561, Rockford, MI 49341
Telephone: 866-1553, Fax: 866-3451, E-mail: mreus@rockford.mi.us

SAND LAKE

Sand Lake Fire Department
Chief Edward Holtzlander
32 – 5th Street, Sand Lake, MI 49343
Telephone: 636-8854, Fax: 636-8511 (2nd Fax: 636-8444), E-mail: Ed_Holtzlander@Alticor.com

SOLON TOWNSHIP

Solon Township Fire Department
Chief Joyce VanderMey
2305 – 19 Mile Road, Cedar Springs, MI 49319
Telephone: 696-1718 (town hall), Fire Station: 696-0020, E-mail: Fire@solontwp.org

SPARTA

Fire Department
Chief Jerry Bolen
36 Elmwood Street, Sparta, MI 49345
Phone: 887-0900, Fax: 887-5055, (Town Hall 887-8863), E-mail: CHIEFBOLEN@aol.com (or spartafire@aol.com or nbolen@aol.com)
Deputy Chief Richard Simons, Phone: 887-0136
Lt. Shawn Morton, Phone: 887-0900

SPENCER TOWNSHIP

Spencer Township Fire Department
Chief Alan S. Wright
12131 – 18 Mile Road, NE, Gowen, MI 49326
Telephone: 984-2200, Work: 887-8088, E-mail: spencerchief@charterinternet.com but urgent material should instead be sent to 14420 Wabasis Ave., Cedar Springs, MI 49319.

WALKER

Walker Fire Department
Chief William Schmidt
4343 Remembrance Road, NW, Walker, MI 49534
Telephone: 791-6840, Fax: 791-6851, E-mail: bschmidt@ci.walker.mi.us

WYOMING

Wyoming Fire Department
Chief Bob Austin

OTTAWA COUNTY
Local Community Representatives in the Hazard Mitigation Planning Process

The following persons attended at least one of the four planning meetings that were held in August, 2010 for the purpose of reviewing and updating this hazard mitigation plan.

Michael Keefe (Allendale Township)
Jan Redding (Chester Township)
Jeannine Nyberg (Coopersville City)
Gary Dreyer (Crockery Township)
Roger DeYoung (Ferrysburg City)
Dan Hamming (Georgetown Township)
Julie Beaton, Rick Yonker, Joe Boyle, Dennis Edwards (Grand Haven City)
Paul Hascher, Jodi Syens, Chris Tinney, Matt Messer (Holland City)
Jon Mersman (Holland Township)
David Dahl, Richard Hohn, Patrick Waterman, John Crumb (Hudsonville City)
Thomas Saladino, Jim Miedema (Jamestown Township)
Todd Wolters (Olive Township)
Gordon VanderYacht, Howard Baumann (Port Sheldon Township)
Tracy Mulligan (Robinson Township)
Roger DeYoung (Spring Lake Village)
John Nash (Spring Lake Township)
Allan Brouwer (Tallmadge and Wright Townships)
JoAnn Becker (Wright Township)
Bill Gruppen, Tim Klunder (Zeeland City)

Also in attendance at one or more of these Ottawa County meetings were Mike Mitchell of the American Red Cross, Paul Geerlings and Mike Munch of the Ottawa County Drain Commission, John Stuparits of the Grand Haven-Spring Lake Wastewater Treatment Plant, Brandon DeHaan of Grand Valley State University's Police Department, Steve VanHoeven and Kent Rubley of the Ottawa County Road Commission, Paul Sachs from Ottawa Co. Planning, Adeline Hambley from Ottawa Co. Health, Keith Van Beek from County Administration, and 9 additional persons from the Ottawa County Sheriff's Office (including Emergency Management personnel).

Hazards were chosen based on historical occurrence, guidance provided by the Michigan State Police Emergency Management, internet research, local emergency response experience, and public input. The Hazard Identification and Overview section examines 23 individual hazards which are grouped in seven main categories:

- Severe Weather
 - Extreme Temperature
 - Thunderstorm Hazards (Hail, Lightning and Wind)
 - Tornado
 - Drought
 - Severe Winter Weather (Snow, Ice and Blizzard)
- Geological Events
 - Shoreline Flooding and Erosion
 - Landslides
 - Earthquake
- Fire

- Wildfire
 - Urban and Structural Fire
 - Other Fire
- Flood
 - Dam Failure Flooding
 - Riverine Flooding
 - Urban Flooding
- Infrastructure Failure
 - Electrical Failure
 - Communications Failure
 - Water System Failure
 - Sanitary Sewer Failure
- Public Health Emergency
 - Natural Epidemic
- Human-Induced Event
 - Hazardous Materials Release
 - Transportation Accident
 - Nuclear Power Plant Accident
 - Intentional Acts

Each of the 23 hazards has been analyzed in a similar format. Each hazard is introduced and summarized, followed by more detailed description. After a hazard is defined, historically significant and related events are detailed so that previous experiences might inform current preparedness, prevention, and mitigation activities. A section on Risk/Likelihood follows. In cases where high frequency and reliable historical data exist, an extrapolated prediction of future occurrence is given. Otherwise, a non-quantifiable estimate is presented. For this updated HMP, input from local jurisdictions and agencies has been incorporated into the appropriate hazard analysis sections. Locally relevant information has also been included from the Michigan Hazard Mitigation Plan. Finally, an overview of existing prevention programs is given.

The hazard analysis section is a snapshot of the situation faced by the Greater Grand Rapids Area. An overview is provided, which is based on the combined summary sections for each hazard. The hazard analysis also endeavors to measure the threat of each hazard in terms of relative risk. As part of this quantitative framework, one of four values is assigned to several characteristics, and each characteristic is weighted relative to the others. The risk scoring process includes an assessment of vulnerability based on life safety, structural damage and economic loss. The characteristics assessed are: Historical Occurrence, Affected Area, Speed of Onset, Population Impact, Economic Effects, Duration, Seasonal Pattern, Predictability, Collateral Damage, Availability of Warnings, Mitigation Potential, and Affected Population.

The HMP is a regional document, so the Hazard Analysis section concludes with a regional score. Hazard scoring for individual local jurisdictions, when significantly different from the region, are listed on the same page below the regional calculation.

Federal requirements call for the HMP to be reviewed and, if necessary, revised every five years. Those with comments or input may contact their respective emergency management director or send input via the contacts at the websites at <http://www.co.ottawa.mi.us/CourtsLE/Sheriff/emermgt.htm> and http://www.accesskent.com/CourtsAndLawEnforcement/SheriffsDepartment/sheriff_emergency.htm.

The following lists document the meetings, and their participants, involved in this update of the Kent-Ottawa regional hazard mitigation plan:

August 6, 2010 AM

9:00 Holland City Hall

SW Quadrant Meeting

Invited: Holland City, Zeeland City, Zeeland, Holland, Port Sheldon, Olive and Blendon Townships

Steve Van Hoveven – OC Road Commission
Paul Geerlings – Drain Commissioner
Chris Saddler – OC Emergency Management
Bill Smith – OC Emergency Management Director
Roger DeYoung - Spring Lake
Mike Mitchell – American Red Cross
Kent Rubley – OC Road Commission
Gordon VanderYacht – Port Sheldon Fire Chief
Paul Hascher – Holland City BPW
Howard Baumann – Port Sheldon Township
Todd Wolters – Olive Township
Tim Klunder – Zeeland City
Jodi Syens – Holland City
Chris Tinney – Holland City
Matt Messer – Holland City
Adeline Hambley – OC Health Department
Lee Hoeksema OC Sheriff Department
Cal Keuning – OC Sheriff Department
Paul Sachs – OC Planning and Performance

August 12, 2010

1:30 PM Coopersville City Hall

NE Quadrant Meeting

Invited: Coopersville City, Tallmadge, Wright, Chester and Polkton Townships

Mike Munch – Drain Commission
Steve Van Hoveven – OC Road Commission
Chris Saddler – OC Emergency Management
Bill Smith – OC Emergency
Jeannine Nyberg- Coopersville Volunteer
Dennis Luce - Sheriff's Dept.
Jan Redding – Chester Twp.
JoAnn Becker – Wright Township
Keith Van Beek – OC Administration

August 18, 2010

10:00 Grand Haven City Hall

NW Quadrant Meeting

Invited: Grand Haven and Ferrysburg Cities, Spring Lake Village, Spring Lake, Crockery, Grand Haven and Robinson Townships

Steve Van Hoveven – OC Road Commission
Chris Saddler – OC Emergency Management
Bill Smith – OC Emergency Management Director
Roger DeYoung - Spring Lake
Tracy Mulligan – Robinson Township Supervisor
John Stuparits – GH-SL Wastewater Treatment Plant
Jule Beaton – Grand Haven City
Rick Yonker – Grand Haven City
Joe Boyle – Grand Haven City
John Nash – Spring Lake Township
Dennis Edwards – Grand Haven City
Gary Dryer – Crockery Township Fire Chief

Mike Munch – Drain Commission

August 18, 2010

1:30 PM Hudsonville City Hall

SE Quadrant Meeting

Invited: Hudsonville City, Jamestown, Georgetown and Allendale Townships

Dean Devries – OC Sheriff Department
Brandon DeHaan –GVSU
Dan Hamming – Georgetown Township
Thomas Saladino – Jamestown Township
Michael Keefe – Allendale Township
Allan Brouwer – Wright Township
David Dahl – Hudsonville
Richard Hohr – Hudsonville
Patrick Waterman – Hudsonville
Bill Gruppen – Zeeland City
Jon Mersman – Holland Township
John Crumb – Hudsonville
John Ortman – OC Sheriff Department
Jim Scholma – OC Sheriff Department
Mike Bagladi – OC Sheriff Department
Jim Miedema – Jamestown Township
Steve Van Hoeven – OC Road Commission
Paul Geerlings – OC Drain Commission
Chris Saddler – OC Emergency Management
Bill Smith – OC Emergency Management

November 17, 2010

Grand Haven City Officials Meeting

8:30 AM Grand Haven DPS EOC

Chris Saddler – OC Emergency Management
Rick Yonker – GHDPS Captain
Denny Edwards – GHDPS Director
Steve VanHoeven – OC Road Commission
Jim Bonamy – City of Grand Haven Finance Director
Nikki Schellenberg – City of Grand Haven Executive Assistant
Bill Hunter – City of Grand Haven DPW Director
Shawn Matson – City of Grand Haven DPW
Bonnie Suchecki – City of Grand Haven HR Manager
Tom Manderscheid – Harbor Transit Director
Sandy Katt – Community Affairs Manager
Joe Vanderstel – Grand Haven Water Treatment Plant Manager
John Stuparits – Grand Haven Wastewater Director
Annette Allen – Grand Haven Board of Light and Power Manager
Wolverine Pipeline Representative

September 23, 2010

Holland City Departmental Meeting

9:00 AM Holland city Hall Training Room

Matt Messer – Holland City Police

Phil Meyer – City of Holland
Paul Hascher – Holland BPW
Cindy Osman – City of Holland
Steve VanHoeven – OC Road Commission
Jodi Syens – Holland Transportation Services
Brian White – City of Holland
Mat VanDyen – City of Holland
Gray Gogolin – City of Holland
Bill Smith – OC Emergency Management
April Abbatoy – Ottawa County

October 21, 2010
Holland City Departmental Meeting
10:00 AM Holland City Hall Training Room

Phil Meyer – City of Holland
Brian White – City of Holland
Gray Gogolin – City of Holland
Steve VanHoeven – OC Road Commission
April Abbatoy – Ottawa County
Chris Tinney – City of Holland

March 14, 2007 Meeting
Ottawa County Fillmore Complex

Al Vander Berg –OC Administrator
Gary Rosema – OC Sheriff
John Gutierrez – OC Road Commission
Kent Rubley – OC Road Commission
Steve VanHoeven – OC Road Commission
Paul Geerlings – OC Drain Commission
Mark Knudsen – OC Planning
Bret Laughlin – OC Road Commission
Bill Smith – OC Emergency Management

March 18, 2007 Meeting
Ottawa County Fillmore Complex

Steve Van Hoeven- OC Road Commission
John Gutierrez – OC Road Commission
Paul Geerlings – OC Drain Commission
Bill Smith – OC Emergency Management

May 15, 2009 Meeting
Ottawa County Fillmore Complex

Kent Rubley – OC Road Commission
Mike Mikata – OC Road Commission
Steve VanHoeven – OC Road Commission
Bill Smith – OC Emergency Management

May 20, 2009 Meeting
Ottawa County Fillmore Complex

Collin Williams – Intern
Steve VanHoeven – OC Road Commission
Bill Smith – OC Emergency Management

March 16, 2011 Meeting
Kent County Emergency Management Office

Jack Stewart - Kent County
Beth Thomas- Ottawa County Emergency Management
Chris Saddler – Ottawa County

Jan-Feb 2011: Input process – 2006 Hazard analysis reviewed by:

Jamie Bielinski – National Weather Service
Mark Walton – National Weather Service
Mike Moll – U.S. Department of Homeland Security
Dayna Partoer – Kent County Health Department
Kent County Drain Commission
Ottawa American Red Cross
Janine Klinge – STS hydropower
City of Grand Rapids Wastewater Department
City of Grand Rapids, Water Department
County Transportation Committee
County LEPC

March 30, 2011 Meeting
Kent County Emergency Management Office

Jack Stewart – Kent County
Gary Szotko – City of Grand Rapids
Mike Sobocinski – Michigan State Police Emergency Management
Mitch Graham – Michigan State Police Emergency Management

April to December 2011 research, input, contributions, state review:

Mike Sobocinski – Michigan State Police Emergency Management
(including numerous contacts with county personnel and other local subject matter experts, to clarify and revise the plan’s wording and organization)
Mitch Graham – Michigan State Police Emergency Management

The hazard mitigation plan was posted on the websites for Kent County and Ottawa County for public review and comment. Feedback dates allowed for timely comments to be included in this edition of the plan (no such public feedback was received), but the plan remains online with a message that feedback received later would be considered for a future update of the plan.

June 2011 meeting

Paul Geerlings – Ottawa County Drain Commissioner
Janine Klinge – STS hydropower

Additional 2011 information from:

Jeff Henrickson (floodplain properties in Kent County) – Kent Co. Property & Mapping

Brodey Hill (locations of emergency sirens in Kent County), Elliott Lowe – Kent Co. Info. Technology Matt Groesser (Operations Manager, Kent) and Melissa Ponstein (Regional homeland security planner, Kent) – updated contact information

December 2011

A review copy of the plan was submitted to FEMA for review.

December 15, 2011

The emergency management coordinators for Kent County and the City of Grand Rapids gave a presentation to the area’s Utility Advisory Board that included an overview of the hazard mitigation plan’s status. The Utility Advisory Board consists of representatives of public utility agencies and of political jurisdictions in the two-county Grand Rapids region.

Early 2012

Based upon feedback from FEMA’s review (received in January 2012), several major revisions were made to the hazard mitigation plan. Mike Sobocinski (Michigan State Police) helped to convey FEMA requirements to the region, and to edit new information obtained from county and local governments and agencies into the appropriate sections of the new regional plan update.

March 2012

A revised version of the hazard mitigation plan was sent to FEMA for approval.

Changes from the Original 2006 Plan

The original plan from 2006 did not coordinate as many communities as this updated 2012 edition. At that time, separate hazard mitigation plans also existed for the City of Kentwood, the Township of Plainfield, and the Township of Robinson, and Ottawa County had already developed an earlier county plan under the 1999 Project Impact program. This new 2012 edition has consolidated all of these communities into a single regional plan that covers all of the two-county Metropolitan Grand Rapids area.

In addition, based upon a review of early draft materials by Mike Sobocinski, a hazard mitigation planning specialist with the Michigan State Police, it was considered that the format that had been used in 2006 was far too difficult to retain, and that it would not be able to pass a review under the new FEMA guidelines that were placing a much greater emphasis upon the planning process and the specific risk and hazard mitigation details of each participating community within a multi-jurisdictional plan.

The original format had been created by a consultant which had not provided a version that could be edited by the communities, and therefore the old format had to be entirely dropped. Although the front section of that 2006 edition had contained many nice photographs and images, there had been far too much information placed into appendices that were too disorganized and unclear to effectively use. Every element of the 2006 plan was scrutinized to make sure that it was appropriate to either retain for the new 2012 plan, or was revised or replaced with new information and content. Even where sections of the 2006 plan were retained, clarifications were made throughout the text.

A substantial amount of new information was included within the hazard analysis section. Climatological information, new and expanded descriptions of historical hazard occurrences, a description of the new “Enhanced Fujita” tornado scale, and so on. Probably the most noticeable change is the huge expansion in the descriptions of previous weather events, such as winter storms, and flooding. The newest information sources were sought during this update process, including information from the 2011 edition of the Michigan Hazard Mitigation Plan. The section that was called “Natural Epidemic” has been renamed “Public Health Emergency” and substantially rewritten, for greater consistency with other documents and reference materials.

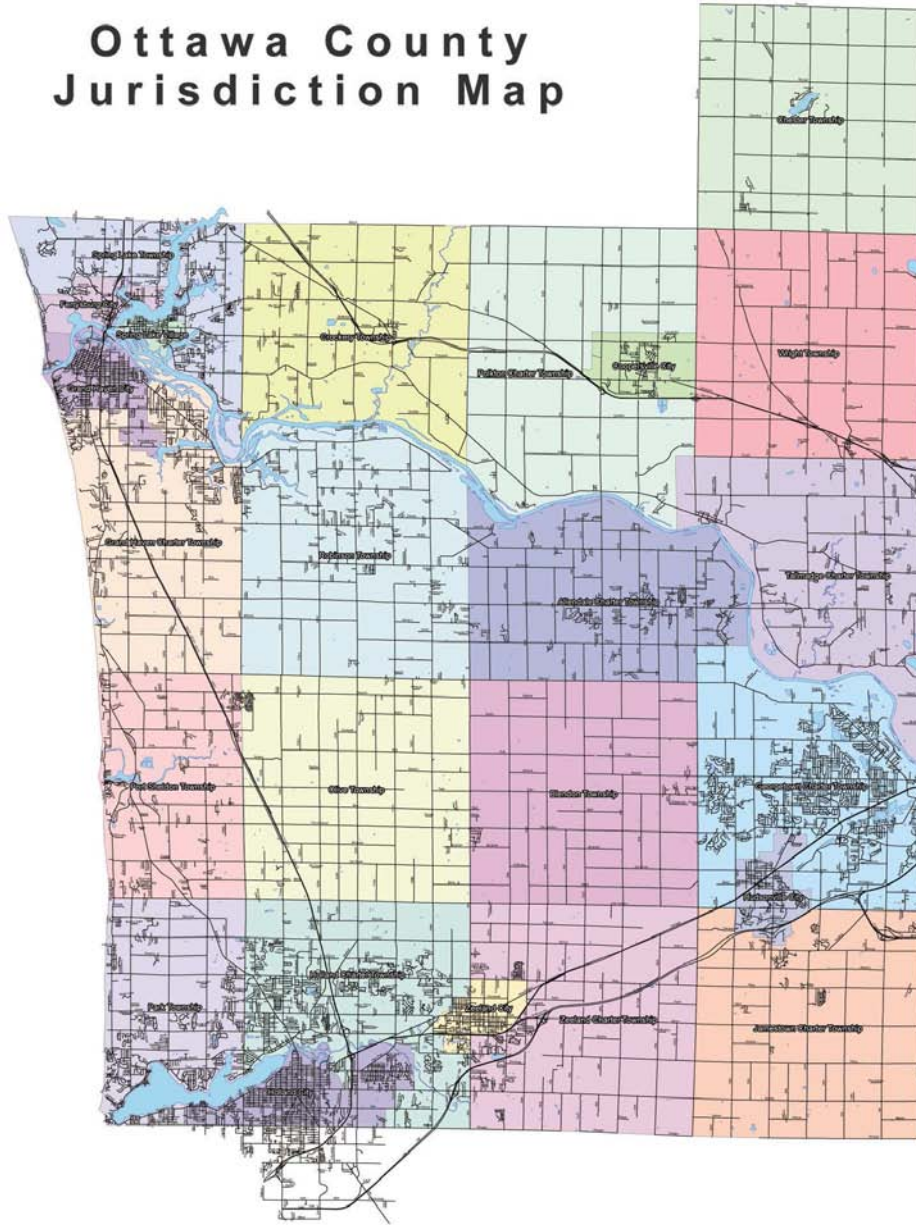
The section on riverine flooding was substantially expanded by the inclusion of more detailed information rooted in the flood plans that had previously been completed for Robinson Township and Plainfield Township. Rather than retaining their own separate plans, these communities agreed to merge their hazard mitigation planning efforts into this broader regional hazard mitigation plan.

New FEMA plan review requirements have been met, including a consideration of repetitive loss properties, NFIP compliance, and (in a new appendix) a capabilities list by community of potentially relevant resources and authorities. As required for a plan update, all of the mitigation actions that were listed in the 2006 plan have been re-listed with a brief explanation of the current status of each action, including whether it has been completed, or why it has not.

In order to more clearly meet all the multi-jurisdictional planning requirements, a new section of the plan was developed, containing a subsection for every community within the two-county region. A new section has been included that illustrates the locations of all the communities covered by this plan, summarizing the most recent 2010 population data and the changes in each community's population since 2000. The risk assessment section clarified the hazard rating process, corrected some errors that had been found in the 2006 plan, converted the hazard ratings to a new scale (from 0 to 100) that was felt to be more intuitive for readers and evaluators to understand. Most of the rankings did not change within the past 5 years, however. An entirely new table was added for the 2012 update, categorically summarizing the comparative priorities of all the assessed hazards for every jurisdiction within the two-county region and noting which communities are NFIP participants. The summary table of hazard mitigation actions that had originally appeared in the 2006 plan was expanded to include more columns with general strategies, and every community was again included in this table, matched with strategies that were considered most appropriate. The truly detailed strategies are found within the extensive local community subsection listings. The 2006 plan had included a long appendix that was inadequately edited and inconveniently organized by hazard. Such a format was considered to be inadequate for community and planning needs, since it required a plan user to leaf through literally dozens of pages of terse and fragmented text entries in order to try to glean some sense of a particular community's concerns and needs. The new 2012 edition plainly lists each community's needs within a single subsection. Not only does this provide an easily accessible source of material for each community, but each community's information has also been newly prioritized in order to meet the most current of plan review requirements. The 2006 plan had shown very little integration of diverse community input into the plan as a whole, but the updated 2012 edition clearly lists prioritized concerns and includes enough detail for the highest priority items so that each community subsection may serve as a kind of mini-plan within the whole. The region's community profile and hazard analysis is shared in the first half of the 2012 update, and the second half includes detailed breakdowns by community, but includes within these community listings some separate subsections that cover each county, and a couple of special authorities (such as Grand Valley State University) and participants (e.g. fire departments or public safety agencies within a community), where such information was provided from the community participation process. This new format facilitates and encourages multiple levels of local government to consider and address the identified needs and vulnerabilities according to their own resources and opportunities.

In the 2012 update, the appendix has been reserved for only two things: (1) supplemental documentation (sign-in sheets) from some of the meetings that had taken place, and (2) a new framework required by FEMA that essentially asks for a capability assessment of the region and its communities. Kent and Ottawa county participants collectively gathered all this new information specifically in order to comply with FEMA's request from its plan review of the draft (December 2011) edition of the plan update.

Ottawa County Jurisdiction Map



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 Act. The Ottawa County Policy on Environmental
 Access to Public Records and Act 442 of the
 Public Acts of 1996, as amended.

GIS Department
 1220 Fibbers Street, Suite 112
 West Olive, Michigan 49469
 Phone: (616) 728-4000
 Fax: (616) 728-4004
 www.ottawacounty.org

Jan 13, 2003

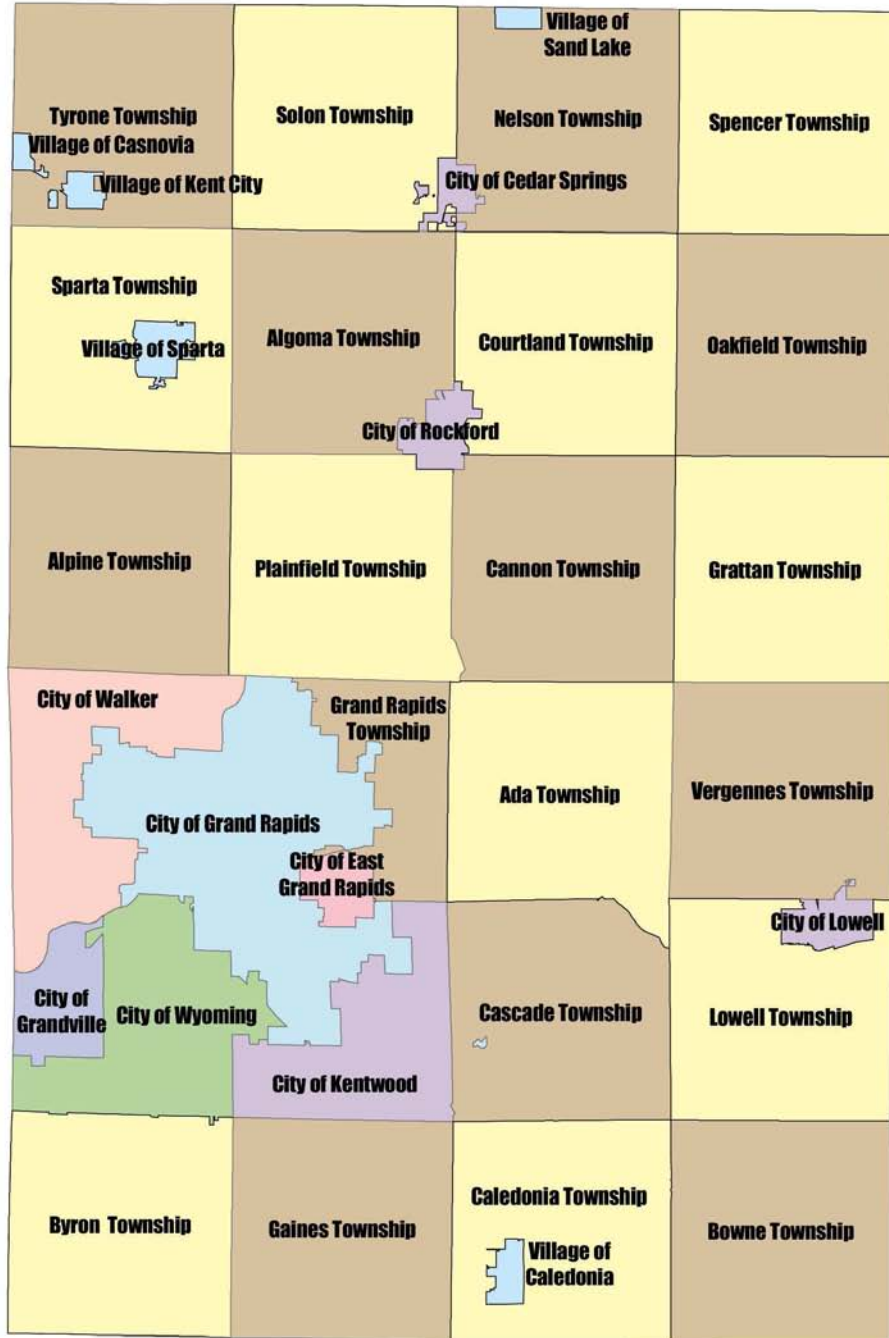
Ottawa County, Michigan



Legend

- Roads
- Allegan Charter Township
- Blenden Township
- Chester Township
- Coopersville City
- Crookston Township
- Fennsburg City
- Georgetown Charter Township
- Grand Haven Charter Township
- Grand Haven City
- Holland Charter Township
- Holland City
- Hudsonville City
- Janssontown Charter Township
- Olive Township
- Park Township
- Fulken Charter Township
- Port Sheldon Township
- Robinson Township
- Spring Lake Township
- Spring Lake Village
- Talmadge Charter Township
- Vailgt Township
- Zeeland Charter Township
- Zeeland City

Kent County, Michigan



Community Profile

The City of Grand Rapids and the Counties of Kent and Ottawa are home to nearly 1 million citizens, and it's easy to see why. The area is centrally located in terms of geography, economy and travel. Greater Grand Rapids is close to major U.S. markets throughout the Midwest. Located just a few hours from Detroit, Chicago, Cleveland, and Toledo, it is within a day's drive of half the country's population, half its manufacturing base, and nearly half its retail sales.

Greater Grand Rapids, perhaps more than any other region its size, offers an incredible breadth and depth of lifestyle options. Here is found a thriving arts community, entertainment that runs from baseball to alternative music, plus a recreational playground with numerous activities season after season. Grand Rapids' soul is expressed through its diverse range of museums, theater, events, and galleries attended by more than 1.5 million people annually.

Greater Grand Rapids is a recreational wonderland. Sailing, fishing, swimming, waterskiing on beautiful Lake Michigan, with its white sand beaches, and the many inland rivers, lakes and streams, make West Michigan a natural recreational haven. The rolling foothills that edge the lake offer tennis, skiing, camping, hanggliding and golf. With more daily-fee golf courses than anywhere in the nation, except California, Michigan is one of the world's great golf destinations.

Approximately 2,300 manufacturing establishments operate in the West Michigan area. These companies possess a high level of engineering and manufacturing know-how, intellectual property, product design, and productive workers. Greater Grand Rapids is home to a diverse base of business and education. Unemployment is relatively low, while 20% of the population over age of 25 holds at least one bachelor's degree and half of those hold graduate or professional degrees.

As the western link to the Michigan Life Sciences Corridor, the Greater Grand Rapids area will serve as a hub for technology and product development assistance as well as provide incubator space for biotechnology companies. The region has been ranked as 12th in the nation in biopharmaceuticals.

Greater Grand Rapids ranked 2nd among the top cities in the Midwest according to Entrepreneur magazine and Dun & Bradstreet's 8th Annual "Best Cities for Entrepreneurs" survey conducted in 2001. In the top nationwide large cities category, Greater Grand Rapids ranked 24th. Criteria included the number of businesses that are no more than five years old, the amount of small-business growth among businesses with 20 or fewer employees, general economic growth over a three-year period, and degree of business risk (cities with the lowest business failure rates).

Building on its strong traditions of entrepreneurship, innovation, community involvement, civic pride, family orientation, and a famous work ethic, Grand Rapids and Kent and Ottawa Counties are thriving, vibrant, and progressive. The land use for the area is generally residential, growing outward from the three metropolitan areas of Grand Rapids, Muskegon/Grand Haven, and Holland. All three of the metropolitan areas are growing into Ottawa County from the northwest, southwest, and the east. Lower density residential areas occur in outlying areas and agricultural use is still predominant in central Ottawa County and most outlying areas in Kent County. Land use maps for both counties have been included in this document, in the pages that follow.

All communities have authority over their own zoning, at the township, city, and village level. There is no county-level zoning in the region. For more information about various resources, authorities, etc. for each jurisdiction within the two-county region, please refer to the Appendix at the end of this plan.

WEST MICHIGAN FACT SHEET 2009

(Adapted from information assembled and published by “The Right Place,” a regional economic development organization for the advancement of the West Michigan economy. For completely up-to-date population data from the 2010 census, please refer to the pages following.)

POPULATION

City of Grand Rapids 193,167

Kent County 609,235

Grand Rapids Combined Statistical Area (Allegan, Barry, Ionia, Kent, Muskegon, Newaygo, and Ottawa Counties) – Population 1,333,240

Ranking among 120 CSAs 32

Median age 35.23

Black alone 87,946 (6.6%)

Hispanic or Latino 100,560 (7.54%)

AGES (Combined Statistical Area)

Under 17 years 345,540 (25.92%)

18 to 24 134,999 (10.13%)

25 to 44 364,625 (27.35%)

45 to 64 336,483 (25.23%)

65+ 151,593 (11.36%)

HOUSEHOLDS

City of Grand Rapids 72,338

Kent County 228,285

Grand Rapids-Muskegon-Holland Metropolitan Statistical Area 490,452

INCOME—CSA

Average household income \$61,300

Median household income \$49,449

Per Capita income \$22,880

HOUSING

Average apartment rent \$636

Median owner-occupied housing value \$129,714

TRAVEL TIME TO WORK (634,101 workers)

Less than 15 minutes 33.65%

15-29 minutes 41.22%

30-44 minutes 16.05%

45-59 minutes 5.10%

60 or more minutes 3.98%

EDUCATIONAL ATTAINMENT—CSA (25 years and older)

High school graduates, no additional education 32.30%

Some college, or associate’s degree 30.63%

Bachelor’s degree 14.76%

Graduate or professional degree 6.38%

BUSINESS—GRAND RAPIDS CSA 2008

Employment Base

Total 616,170 %

Manufacturing	128,907	21.3%
Trade, Transportation, Utilities	107,570	17.8%
Health Care, Social Assistance, Educational Services	84,854	14.1%
Professional and Business Services	76,405	12.7%
Government	64,191	11.6%
Leisure & Hospitality	51,296	8.5%
Financial Activities	27,548	4.6%
Natural Resources, Mining, Construction	26,541	4.4%
Other Services	24,174	4.0%
Information	7,537	1.2%

ESTABLISHMENTS—CSA

Total Private Businesses	108,301
Private Businesses with employees	27,573
Without employees	80,728
Manufacturers (with and without employees)	4,058

CIVILIAN LABOR FORCE—CSA

Civilian Labor Force	709,215
Employed	677,933
Unemployed	31,282 (7.3%)

CSA RANKINGS (compared to 120 CSAs)

	Ranking
Population	32
Under 18	19
18-34	27
35-44	29
45-54	25
55-64	33
65+	35
Employment	33
Mean Household Income	52
Income per capita	68

MAJOR PRODUCTS

Office furniture systems, auto parts, aerospace, industrial machinery, biopharmaceuticals, tool and dies, plastics, commercial printing, electronic equipment, scientific instruments, food processing.

TOP CSA EMPLOYERS

Spectrum Health	13,155
Meijer Inc.	10,840
Wal-Mart	4,662
Spartan Stores	4,440
Steelcase Inc.	4,300
Mercy General Health Partners	4,297
Alticor, Inc.	4,000
Herman Miller Inc.	4,000
Johnson Controls	3,959
Axios Incorporated	3,857
Grand Rapids Public Schools	3,478
Saint Mary's Health Care	2,800
Perrigo Co.	2,700

Gentex Corporation	2,640
City of Grand Rapids	2,512
Alcoa Howmet	2,420
Metro Health Hospital	2,200
Haworth Inc.	2,194
Hope Network	2,100
Roskam	2,000
Fifth Third Bank	1,946
Grand Valley State University	1,899
Kent County	1,849
Lacks Enterprises, Inc.	1,800
Holland Community Hospital	1,750
Calvin College	1,708
Farmers Insurance Group / Foremost	1,700

CULTURE & ENTERTAINMENT

Museums

- Gerald R. Ford Museum
- Grand Rapids Art Museum
- Grand Rapids Children's Museum
- Public Museum of Grand Rapids

Dance & Music

- Blue Lakes Fine Arts Music Camp
- Grand Rapids Ballet
- Grand River Folk Arts Society
- Grand Rapids Symphony
- Opera Grand Rapids
- St. Cecilia Music Society
- Schubert Male Chorus
- West Shore Symphony

Recreation

- Biking: 288 miles of bike trails in West Michigan (including "rails to trails")
- Golf: The highest proportion of golfers in the U.S.!
- Snow: Michigan has 5,600 miles of snowmobile trails and dozens of downhill skiing resorts
- Water: No more than 20 minutes from a lake or river

Sports Teams & Events

- Griffins International Hockey League
- Fifth Third River Bank Run
- Muskegon Fury Hockey
- Whitecaps Class A Minor League Baseball

Theater

- Actors' Theatre
- Broadway Theatre Guild
- Community Circle Theatre
- Frauenthal Theatre
- Grand Rapids Civic Theatre (one of the oldest in the U.S.)
- Heritage Theatre Group
- Jewish Theater
- Master Arts Theater
- Spectrum Theater

Other Attractions

- John Ball Zoological Garden
- Lake Michigan beaches

Frederik Meijer Botanical Gardens
 Van Andel Arena

TRANSPORTATION

Gerald R. Ford International Airport: 8 Passenger Airlines, 7 Cargo Airlines, approximately 2 million passengers. Major carriers: Air Canada, Allegiant, American Eagle, Continental Express, Delta Continental, Midwest Connect, Northwest.Northwest AirlinK, United/United Express. Approximately 260,000 pounds of air cargo pass through the airport daily, totaling 95 million pounds per year.

Railroads: Amtrak, CSX, Grand Elk RR, Grand Rapids Eastern, Marquette Rail, Michigan Shore RR, Mid-Michigan

CLIMATE

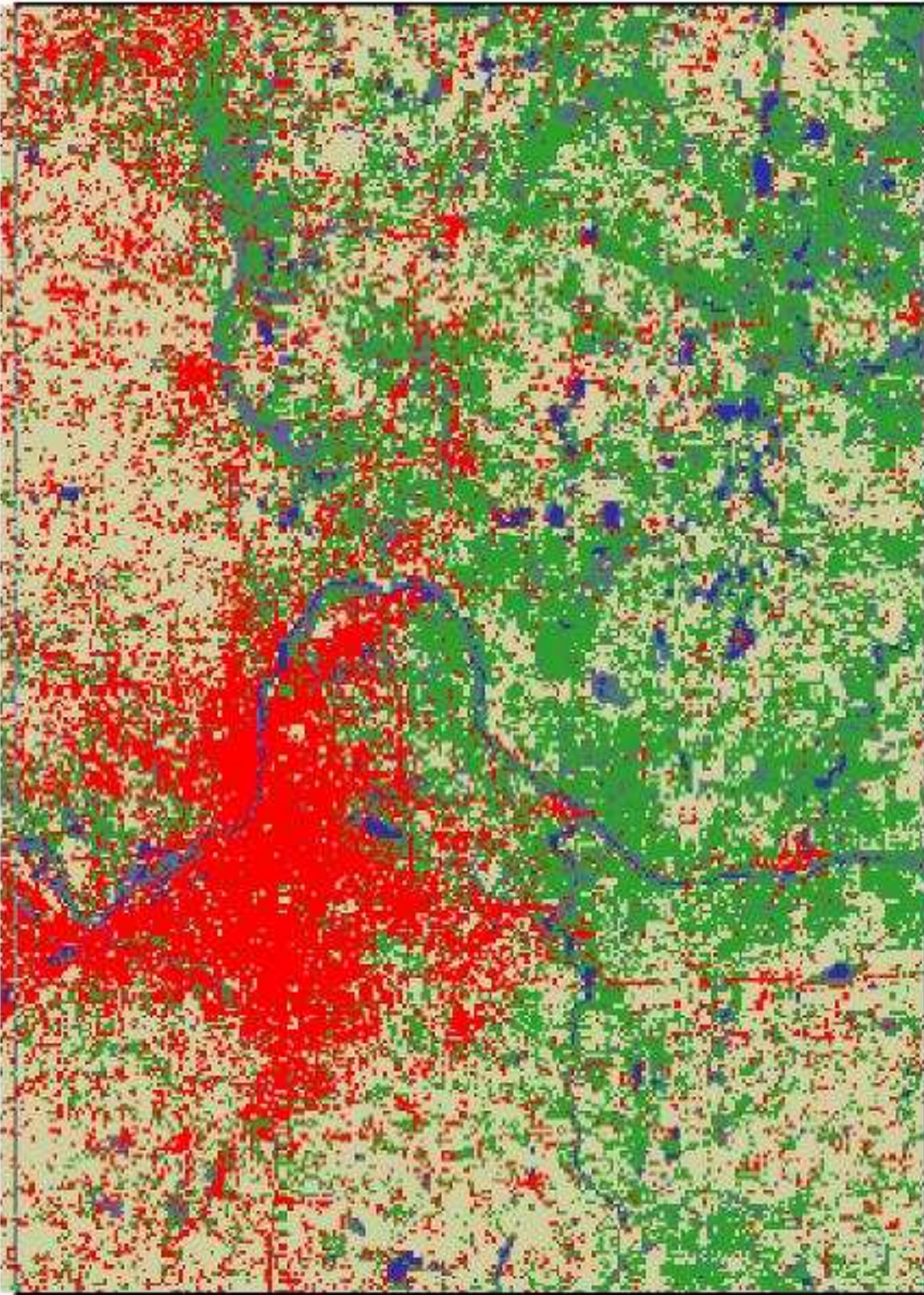
Average temperatures: January, 22.8° F; July 71.4° F;
 Annual Precipitation: 37.1 inches of rain, 71.9 inches of snow

Population Information – from the new 2010 Census

KENT COUNTY		OTTAWA COUNTY	
188,040	Grand Rapids City	46,985	Georgetown Township
72,125	Wyoming City	35,636	Holland Township
48,707	Kentwood City	26,035	Holland City (part) [33,051 total]
30,952	Plainfield Township	20,708	Allendale Township
25,146	Gaines Township	17,802	Park Township
23,537	Walker City	15,178	Grand Haven Township
20,317	Byron Township	14,300	Spring Lake Township
17,134	Cascade Township	10,412	Grand Haven City
16,661	Grand Rapids Township	9,971	Zeeland Township
15,378	Grandville City	7,575	Tallmadge Township
13,336	Cannon Township	7,116	Hudsonville Township
13,336	Alpine Township	7,034	Jamestown Township
13,142	Ada Township	6,084	Robinson Township
12,332	Caledonia Township	5,772	Blendon Township
10,694	East Grand Rapids City	5,504	Zeeland City
9,932	Algoma Township	4,735	Olive Township
9,110	Sparta Township	4,275	Coopersville City
7,678	Courtland Township	4,240	Port Sheldon Township
5,974	Solon Township	3,960	Crockery Township
5,949	Lowell Township	3,147	Wright Township
5,782	Oakfield Township	2,892	Ferrysburg City
5,719	Rockford City	2,423	Polkton Township
4,764	Nelson Township	2,017	Chester Township
4,731	Tyrone Township		
4,189	Vergennes Township		
3,960	Spencer Township		
3,783	Lowell City		
3,621	Grattan Township		
3,509	Cedar Springs City		
3,084	Bowne Township		
602,622	COUNTY TOTAL	263,801	COUNTY TOTAL

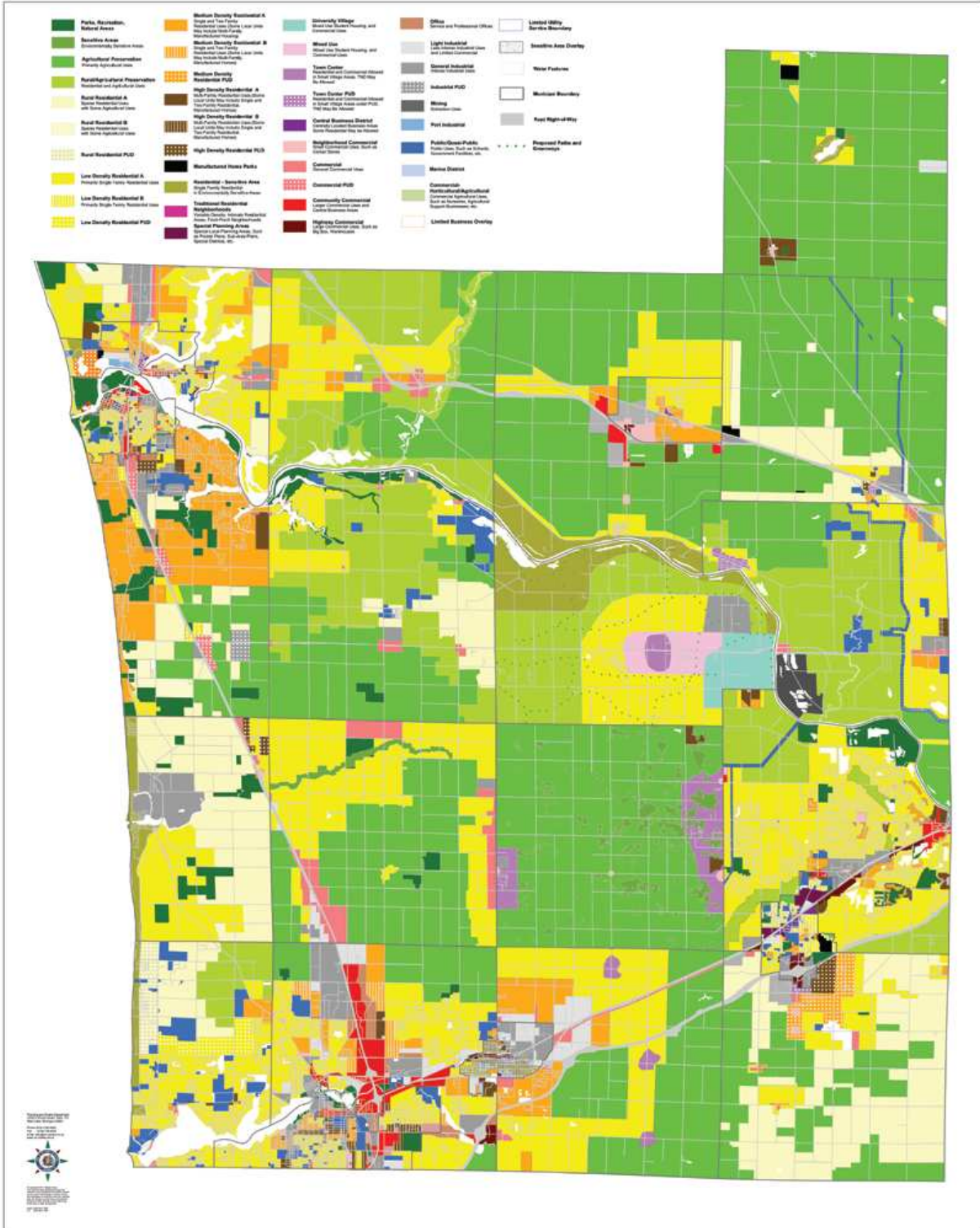
The census includes the following village populations within its counts for the townships in the listing above: Caledonia (1,511 in Caledonia Twp.), Casnovia (319 in Tyrone Twp.), Kent City (1,057 in Tyrone Twp.), Sand Lake (500 in Nelson Twp.), Sparta (4,140 in Sparta Twp.), and Spring Lake (2,323 in Spring Lake Twp.)

Kent Co. Land Use Map – 2003 Landsat



Red = Urban, Very Light Green = Agricultural, Green = Forest, Tan = Shrub, Light Blue = wetlands, Dark Blue = Water (From <http://www.iwr.msu.edu/farmbureau/fbupdate.htm>)

Local Master Plan Composite Map (Designations and Colors as Recommended by the Planning Department)



Hazard Identification and Overview Process

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, communications, 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 of section, for a quick overview. The hazard is described, affected areas identified, and its potential impact discussed. Historically significant and related events chronicle the hazard's past human, economic, and environmental impact. Where possible, the hazard's Risk/Likelihood is quantified, even if only as a rough estimate. Existing prevention programs at local, state and federal levels identify current efforts to mitigate or eliminate the hazard's threat.

Severe Weather Hazard Types

Extreme Temperatures

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 15 days of 90+ degree days and 12 days of less than 0 degrees will be experienced each year in Kent County; in Ottawa County 13 days of 90+ degrees and 6 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.

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, normal shivering reactions stop and emergency treatment is necessary. Symptoms of 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 23 days in January, 19 days in February, and 8 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.

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.

Average daily temperatures in Ottawa and Kent Counties (degrees Fahrenheit)

Month	Holland		Grand Haven		Grand Rapids	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
January	30.6	17.6	30.7	18.8	29.0	14.9
February	33.6	18.0	32.8	19.4	31.7	15.7
March	43.1	25.9	41.9	26.8	41.5	24.6
April	57.4	36.7	55.1	37.3	56.7	35.6
May	69.3	46.2	66.4	46.7	69.2	45.6
June	78.6	55.4	75.4	56.1	78.7	55.5
July	82.3	59.7	79.0	61.7	82.6	59.9
August	80.7	58.4	77.7	60.8	80.9	58.2
September	74.0	52.1	71.6	54.0	73.1	50.7
October	62.4	42.4	60.9	44.5	61.2	40.5
November	47.6	32.8	47.0	34.4	46.1	30.9
December	35.5	22.6	35.7	24.1	33.9	20.7
Annual Average	57.9	39.0	56.2	40.4	57.1	37.7

Source: MSU Climatology Program

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 1988, when temperatures exceeded 90 degrees for more than 30 days. Relative humidities were 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

The proximity of Lake Michigan tends to have a moderating effect upon Ottawa and Kent County weather. Other areas of Michigan have more extreme record temperatures than reported here. However, the potential for injuries from extreme weather events (especially from extreme cold) is present every year, since severe winter weather is an annual event and every year produces temperatures that are significantly below freezing. The following paragraphs give more detail about the extent and impact of more recent extreme weather events in Kent and Ottawa Counties.

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. The City of Detroit experienced 250 broken water mains from deep frost in 2003-2004. Water from one of the breaks affected telephone service to over a hundred homes. At the same time, East Lansing's average of 20 water main breaks jumped to nearly 50, at a repair cost of \$40,000. 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.

Community Impact

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 leading to three or four deaths per year within the regional jurisdiction. 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 need to be established for situations of loss of power or large-scale residential fires. Faster deployment of resources and faster shelter opening times are needed when special needs clients are involved that cannot be exposed to elements for extended periods of time. 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.

Risk/Likelihood

By analyzing historical climate data for the Grand Rapids area over the 30-year period from 1951 to 1980, 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 15 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 12 days of zero or below-zero temperatures each year. Again, note that there is no consideration of Wind Chill in these data.

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.)

Thunderstorm Hazards (Hail, Lightning and Wind)

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.

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).

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 Rapids, Kent County and Ottawa County have experienced two damaging derechos, in 1991 and 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 wind-related 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

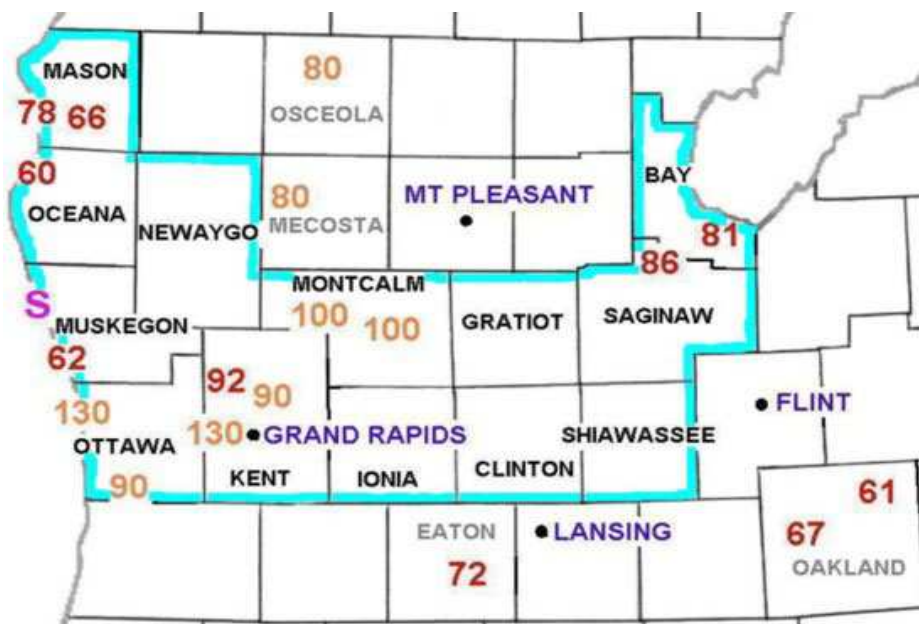
power—some for several days. During the recovery process, almost \$6.8 million in public and private assistance was made available to affected local jurisdictions and to residents in the affected areas. Four million dollars in low-interest disaster loans were made available through the Small Business 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.

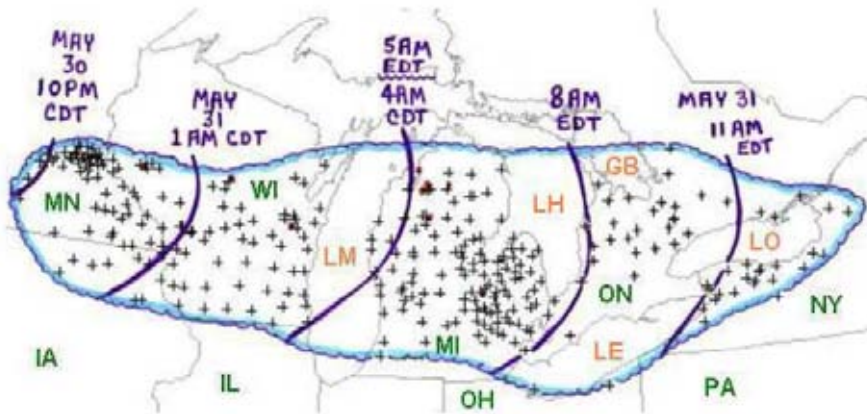
On April 12, 1996, hailstones of 0.75” diameter were reported by a weather spotter. The hailstones covered the ground near Adams Street and 80th Avenue, in Zeeland Township. The next year’s storm events were also heavy hail producers. On May 5, 1997, considerable hail was reported in Jenison, Zeeland, 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 (the governor agreed to a state of emergency declaration for Ottawa County). 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.

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.

Risk/Likelihood

Ottawa County averages about 36 thunderstorm days per year, and Kent County averages about 34. 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 damaged, casualties, or power failures. Some of these damaging storms do not otherwise meet the technical criteria to be classified as "severe," but were 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.

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. Lightning continues to be the most common cause of electric failure. Some jurisdictions have required hurricane straps and other building code requirements.

Tornadoes

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 touchdowns 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.

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 which 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 and 2011.

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 of Ottawa County. Once over land, they lose much of their strength and would not be of much significance to Kent County. A waterspout that develops from a severe thunderstorm over Lake Michigan can move onshore and track well inland, including the Kent County area.

The intensity of tornadoes 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:

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 (mph)	Type/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	over 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.

Tornadoes in Kent County 1/1/1956 to 8/31/2010

Mag = Magnitude, Dth = Deaths, Inj = Injuries, PrD = \$ Property Damage, CrD = \$ Crop Damage

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
KENT	04/03/1956	1815	Tornado	F5	4	130	25K	0
KENT	07/01/1956	1400	Tornado	F1	0	0	3K	0
KENT	04/16/1960	2340	Tornado	F0	0	0	25K	0
KENT	09/22/1961	1630	Tornado	F2	0	0	25K	0
KENT	04/11/1965	1710	Tornado	F4	5	142	2.5M	0
KENT	04/11/1965	1722	Tornado	F4	0	0	0K	0
KENT	04/20/1966	1945	Tornado	F1	0	0	25K	0
KENT	04/21/1967	1758	Tornado	F3	0	32	25.0M	0
KENT	04/21/1967	1930	Tornado	F2	0	0	25K	0
KENT	09/09/1968	1224	Tornado	F2	0	1	25K	0
KENT	06/25/1969	2105	Tornado	F1	0	0	25K	0
KENT	05/20/1975	1814	Tornado	F2	0	1	250K	0
KENT	06/15/1976	1530	Tornado	F1	0	0	25K	0
KENT	07/28/1976	1600	Tornado	F1	0	1	250K	0
KENT	07/24/1979	1730	Tornado	F0	0	0	25K	0
KENT	07/09/1987	1035	Tornado	F1	0	2	3K	0
KENT	09/06/1989	1317	Tornado	F1	0	0	3K	0
KENT	09/06/1989	1345	Tornado	F1	0	1	25K	0
KENT	09/14/1990	0811	Tornado	F1	0	0	25K	0
KENT	09/14/1990	0827	Tornado	F1	0	0	3K	0
KENT	07/07/1991	1745	Tornado	F0	0	0	3K	0
KENT	06/17/1992	1500	Tornado	F1	0	0	0K	0
Rckfd	08/19/1996	1640	Tornado	F1	0	0	5K	0
Gville	05/21/2001	1335	Tornado	F0	0	0	100K	0
CmtkP	05/21/2001	1429	Tornado	F1	0	0	200K	0
PfldHts	05/21/2001	1440	Tornado	F0	0	0	50K	0
Alpine	05/21/2001	1450	Tornado	F0	0	0	75K	0
Rckfd	08/13/2002	2030	Tornado	F0	0	0	40K	10K

Caledonia 9/23/2006 1645 Tornado F0 0 0 100K 20K
 Source: NCDC/NOAA

TOTALS:

30 tornadoes, 9 deaths, 310 injuries, \$29,108,000 property damage, \$30,000 crop damage

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

Tornadoes in Ottawa County 1956 to 2010

Mag = Magnitude, Dth = Deaths, Inj = Injuries, PrD = \$ Property Damage, CrD = \$ Crop Damage

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Ottawa	3/6/56	1630	Tornado	F2	0	0	25K	0
Ottawa	4/3/56	1605	Tornado	F3	0	0	250K	0
Ottawa	4/3/56	1755	Tornado	F5	14	200	25M	0
Ottawa	6/22/57	1530	Tornado	F2	0	0	25K	0
Ottawa	9/22/61	1620	Tornado	F2	0	1	25K	0
Ottawa	4/11/65	1654	Tornado	F4	0	0	25K	0
Ottawa	9/4/65	1940	Tornado	F2	0	0	25K	0
Ottawa	7/12/66	0300	Tornado	F2	0	0	25K	0
Ottawa	6/17/75	1500	Tornado	F0	0	0	25K	0
Ottawa	3/12/76	1519	Tornado	F1	0	1	250K	0
Ottawa	6/15/76	1500	Tornado	F1	0	0	250K	0
Ottawa	5/13/78	1248	Tornado	F0	0	0	0	0
Ottawa	8/9/79	2230	Tornado	F1	0	0	250K	0
Ottawa	8/9/79	2310	Tornado	F1	0	0	25K	0
Ottawa	8/9/79	2330	Tornado	F0	0	0	3K	0
Ottawa	7/9/87	1845	Tornado	F0	0	0	3K	0
Ottawa	5/30/91	1844	Tornado	F1	0	0	3K	0
Ottawa	6/17/92	1510	Tornado	F0	0	0	0	0
Coopersville	4/11/01	1842	Tornado	F0	0	0	0	0
Marne	5/21/01	1335	Tornado	F0	0	0	50K	0

Source: NCDC/NOAA

TOTALS:

20 tornadoes, 14 deaths, 202 injuries, \$3,758,000 property damage, \$0 crop damage

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

An additional hazardous time occurs following a tornado. A study of injuries after a tornado in Marion, Illinois, showed that 50 percent of the tornado-related injuries were suffered 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.

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 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 more than \$25 million in property damages, plus 32 injuries. More recent decades have fortunately not seen such widespread human casualties from tornado events.

Some of the more damaging incidents in more recent years have included 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 causes about \$250,000 in property damage, and one 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.

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.

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. FEMA suggests "HELP YOUR COMMUNITY GET READY."

The media can raise awareness about tornadoes by providing important information to the community. Here are some suggestions:

1. Publish a special section in your local newspaper with emergency information about tornadoes. Localize the information with phone numbers of local emergency services offices, the American Red Cross and hospitals.
2. Periodically inform your community 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 dramatically 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 NOAA Weather Radios sold in many stores. The average range is 40 miles, depending on topography. The National Weather Service recommends purchasing a radio that has both a battery backup and a tone-alert feature which automatically alerts you when a watch or warning is issued.

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 from six to thirteen minutes. 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 every 90 seconds on websites.

Public warning systems, such as outdoor warning sirens and NOAA weather radios, are effective at saving lives and communicating immediately. 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.

Drought

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.

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.

Historically Significant and Related Events

Some of the early droughts in the area took place in the periods of 1871, 1895-1896, 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 streamflows 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. Streamflows 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.

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.

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 \$8,353,511. This amount represents about half of the actual loss. Payments are formulated based 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. It is important to note that these payments are not only for drought events and some cover losses from other causes.

Severe Winter Weather (Snow, Ice and Blizzard)

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.

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 person's 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 (54,000 accidents in Michigan in 2003 occurred when roads had ice, snow or slush.)
- 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

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 a band 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 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 regions primary arteries. I-94 was closed for several times due to jack-knifed trucks. There was also a multiple vehicle pileup on I-196.

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.

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 upon NWS and local weather forecasts and alerts of storm conditions.

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 the next 12 to 18 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.

Wind Chill Warning

A wind chill warning is issued when wind chills of -25F or lower are expected.

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) six 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) six 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.”

The American Red Cross in Grand Rapids has emergency shelters available throughout the 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.

Geological Events

Hazard Identification and Overview

Shoreline Flooding and Erosion

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.

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.

Historically Significant and Related Events

The lake level fluctuates. In the past decade, Lake Michigan had 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:

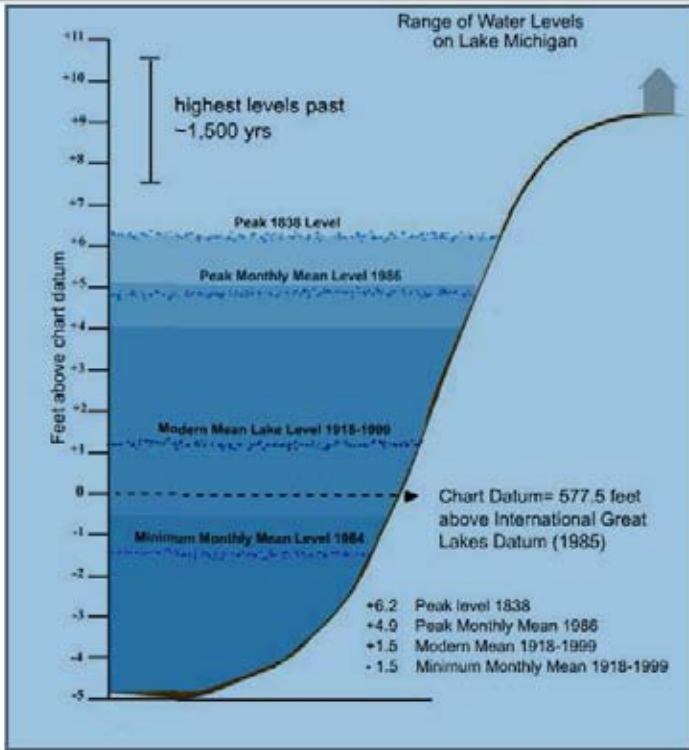
- "Loss specific to marinas: It is possible to demonstrate a financial loss to marinas in the five study counties of between \$2 to \$4 million. These are estimates but are based in part on fairly exact recordkeeping of marina owners and on observable numbers of marina slips.
- Loss of trip-related spending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

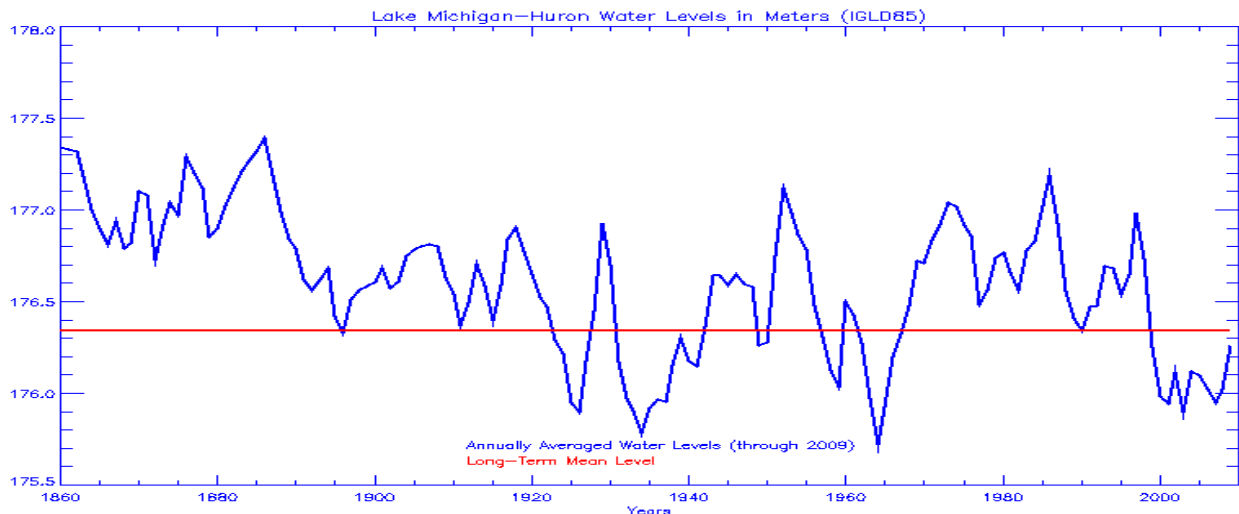
three unique shoreline flooding and erosion mitigation programs aimed at reducing future flood impacts on shoreline communities and homeowners.

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.

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

Ten year comparison of shoreline protection in Ottawa County.

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.

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.

Landslides

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.

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:

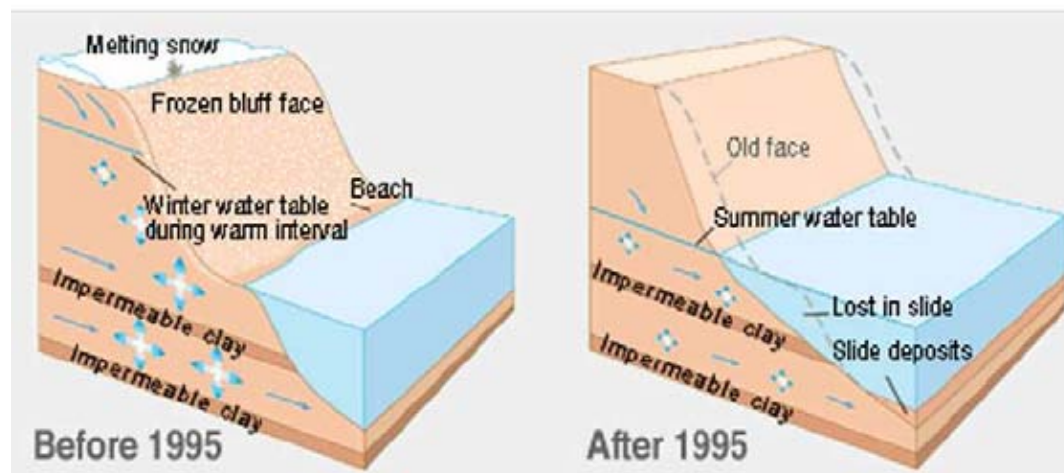
- erosion by rivers or waves create over-steepened slopes
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- earthquakes create stresses that make weak slopes fail
- excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from 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.

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 landslide.

In 1995 a huge landslide occurred along the lakeshore of a dune in Sleeping Bear State Park in northwestern lower Michigan. The 35 million cubic foot landslide crushed the beach and everything in its path, gouged a huge hole in the bottom of Lake Michigan and washed debris underwater more than two miles away. The Sleeping Bear landslide is believed to have been caused by subterranean water pressure rather than by erosion of the face of the dune.



Coastal landsliding at Sleeping Bear Point may be related to increases in fluid pressure in the spaces between grains of sand (pore pressure). High pore pressure lessens the forces holding sand grains together, which may weaken the bluff enough to trigger a slide. Pore pressure may be increased by water from snowmelt in winter being trapped behind the frozen bluff face or within sand layers confined by impermeable clay beneath the bluff. All three known slides at Sleeping Bear Point (1914, 1971, and 1995) had occurred in unseasonably warm winter months. In the illustration above, the four-sided blue arrows denote pore-water pressure; larger size indicates greater pressure. Simple blue arrows denote water flows.

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.

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.

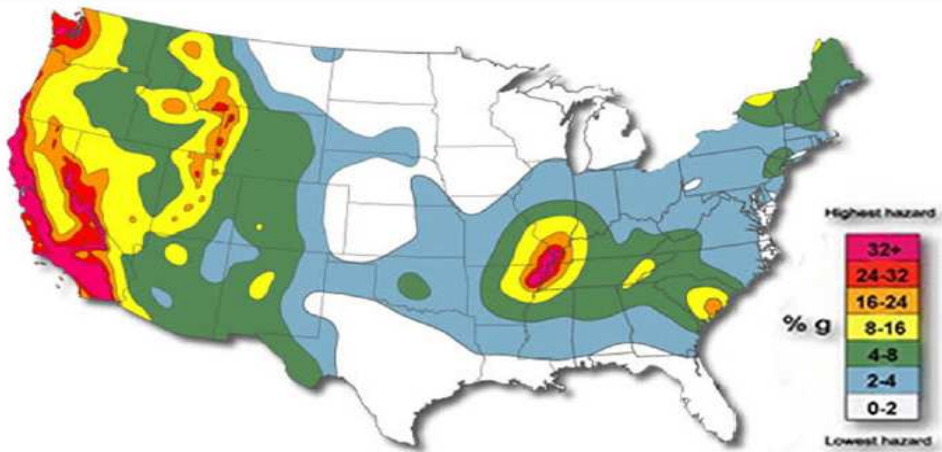
Risk/Likelihood

No model could be found to predict the likelihood of landslides along the Lake Michigan bluff shoreline. Historically, the hazard does exist, so it can be expected to occur again.

Earthquake

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).

Earthquake Hazard Probability Map. Source: United States Geological Survey (USGS).

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.

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 at 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.

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).

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.

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/>.

Fire

Wildfire

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.

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.

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.

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.

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.

Urban and Structural Fire

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.

Hazard Description

Urban and structure fires typically involve a single structure, such as a house. Due to the 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.

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 lost 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.

Existing Prevention Programs

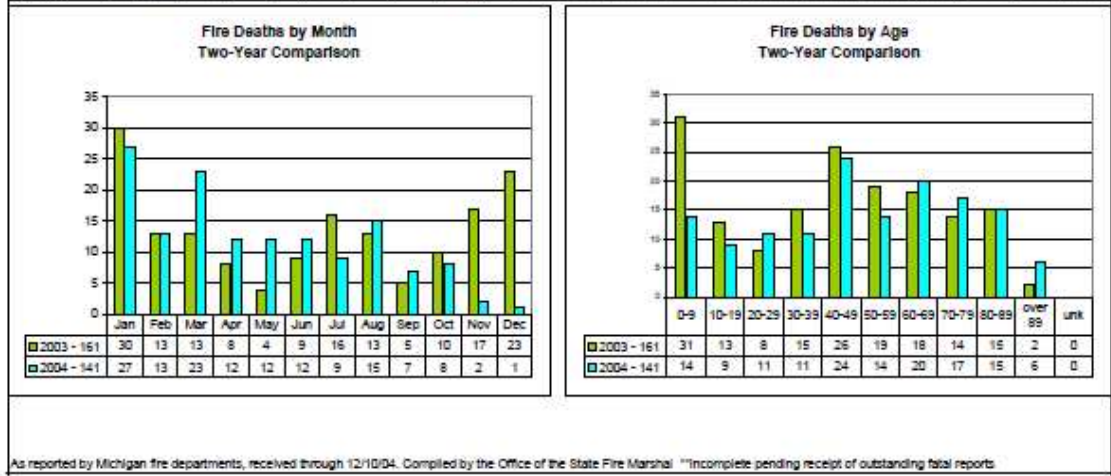
Several programs exist related to fire safety. They include:

- 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

Michigan Fatal Fire Statistics - Year 2004**

	Total Fire Deaths	Commercial	Vehicle	Other or Unknown	Residential	Residential Smoke Alarm Use in Fatal Fires:					
						Number of Residential Fires	No Alarm or Unknown	Alarm Present	Alarm Not Operational	Alarm Operational	Alarm Operation Unknown
January	27	0	2	3	22	15	14	1	0	1	0
February	13	0	0	0	13	11	9	2	0	2	0
March	23	0	2	2	19	15	12	3	2	1	0
April	12	0	1	2	9	7	4	3	2	1	0
May	12	0	0	1	11	10	9	1	1	0	0
June	12	0	1	0	11	10	7	2	0	1	1
July	9	0	2	1	6	4	3	2	0	2	0
August	15	0	2	1	12	10	8	2	0	2	0
September	7	0	1	1	5	3	3	0	0	0	0
October	8	0	0	0	8	6	1	5	2	3	0
November	2	0	0	0	2	2	0	2	0	2	0
December	1	0	0	0	1	1	1	0	0	0	0
Totals **	141	0	11	11	119	94	71	23	7	15	1



Source: MDLARA: http://www.michigan.gov/lara/0,1607,7-154-28077_42271_42321-34648--,00.html

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.

Other Fires

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.

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.

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.

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.

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.

Flooding

Dam Failure Flooding

Hazard Description

Flooding caused by dam failure or misoperation can result in a sudden drop in the water level above the dam and a sudden rise and resultant flooding below the dam. Dam failure may lead to losses of life and property as well as the disruption of business. A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dam failures may occur during flood events (which may cause overtopping of the dam) or as a result of misoperation, 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 from the dam.

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. 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 misoperation 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 misoperation 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 misoperation will probably cause loss of human life.

Ottawa County currently has 8 dams (in 2011). 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.

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

Dam Name	River	City	NID Height	NID Storage	Year Built	Hazard	County	NID ID No.
Ada	Thornapple	Ada	32	3000	1926	L	Kent	MI00501
Cascade	Thornapple	Ada	41	4300	1926	H	Kent	MI00502
East-Brook Lake Level Control Structure	Whiskey Creek	Grand Rapids	13	136	1965	L	Kent	MI00429
Falconcrest Industrial Park Detention	Plaster Creek	Kentwood	25	-9.9	1989	S	Kent	-
Fallasburg	Flat River	Vergennes Township	35	2000	1903	H	Kent	MI00506
Flat River Diversion Dam	Flat River	Vergennes Township	35	2000	1903	L	Kent	MI00506
King Milling Company Dam	Flat River	Lowell	15	645	1942	S	Kent	MI00570
La Barge	Thornapple	Alaska	32	5250	1901	L	Kent	MI00503
Lake Bella Vista Dam	Barkley Creek	Belmont	29	5917	1969	S	Kent	MI00453
Oakfield Center Dam	Wabasis Creek	Morgan Lake	11	60	1864	S	Kent	MI00571
Rockford Dam	Rogue River	Rockford	19	247	1888	S	Kent	MI00572
Secluded Lake Dam	Tributary of Grand River	Grand Rapids	19	50	1967	S	Kent	MI00792
Westdale Family Dam	Tributary of Honey Creek	Ada	21	53	1974	L	Kent	MI00665

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

Dam Name	River	City	NID Height	NID Storage	Year Built	Hazard	County	NID ID No.
Berrens Dam	Macatawa River	Zeeland Twp	38	228	1993	S	Ottawa	MI01353
Kenowa Lake Level Control Structure	Huizeinga Dr. Tributary to Rush Cr	Georgetown Twp	8	95	1975	L	Ottawa	MI00727
Rush Creek Dam Phase 1	N Branch Rush Creek	Georgetown Township	14	375	1978	L	Ottawa	MI00704
Rush Creek Dam Phase 2	Deweerd Dam	Jamestown Township	19	172	1983	L	Ottawa	MI00812
Steenwky Dam	Macatawa River	Zeeland Twp	30	73	1991	L	Ottawa	MI01354
Timmer Dam	Macatawa River	Zeeland Twp	-	-	-	L	Ottawa	-
Rush Creek Phase III Buttermilk Creek Dam	N Branch Rush Creek	Jamestown Twp	13	240	2000	L	Ottawa	MI04010

The Root Dam, on the Sand Creek River in Tallmadge Township, is still listed in NID, but is not included in this table because it was destroyed by a flood on May 21, 1989 and never rebuilt. Many privately owned dams are also located in Zeeland Township, where soil types and ravines allow them to be easily constructed. The Timmer Dam, which holds a permanent water body that forms an 11 acre 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.

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.

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.

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	
OTTW.-KENT PLATING LAGOON	OTTAWA	1984	OT HAZ. WASTE 1/84	8
ROOT DAM	OTTAWA	1989	EROSION UNDER SPILLWAY	

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 Berrens Dam, Buttermilk Dam, Rush Creek Phase 1 Dam, Rush Creek Phase 2 Dam, Steenwyk Dam, and Timmer Dam.

Risk/Likelihood

The likelihood of a dam failure is low. Dams in both counties and Grand Rapids are maintained and inspected regularly.

Riverine Flooding

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.

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:

<u>NAME</u>	<u>TYPE</u>	<u>TOWNSHIP(S)</u>
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
Roy's 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 couple of decades, apparently due to gradual changes in the river (i.e. from sedimentation and other deposition). Ice jams and the accumulation of woody debris have also caused localized flooding—sometimes in areas where it might not otherwise be expected. In the winter of 1996, an ice jam on the Grand River caused flooding that forced several families from their homes in Robinson Township. 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 thus 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. (An additional section follows in this document, about “urban flooding.”)

Historically Significant and Related Events

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 temporarily homeless, 2,500 homes were surrounded by floodwater, 30 factories were closed, 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 Brookmeadow 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 bankfull. 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.

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 Georgeown 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 and 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 damage to 111 homes and five businesses, in addition to nearly \$700,000 in public damages. On 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, which caused wide spread flooding over Southern Lower Michigan. Much of the rainfall occurred in saturated areas that had 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 ten to twenty years across southwestern and south central Lower Michigan. It was the third wettest May on record in Grand Rapids. A Presidential Major 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 dam. The river peaked at 18.3 feet, five feet above flood stage. The areas 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.

On January 23rd, 2005, the ice jam that had formed on the Grand River downstream from the city of Grand Rapids had caused river levels to rise over the 6th Street Dam, flooding Comstock Park. A fly-

over by a local TV station indicated that the ice jam extended from Grand Haven (near Lake Michigan) through the city of Grand Rapids, a distance of over 40 river miles.

On January 31st, 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.

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 \$3.6 million in flood damages occurred in Ottawa County. This event resulted in county emergency declarations. In June 2009, about \$34 million in flood damages occurred to some 2,000 homes in Ottawa County. The county declared a local state of emergency. 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.

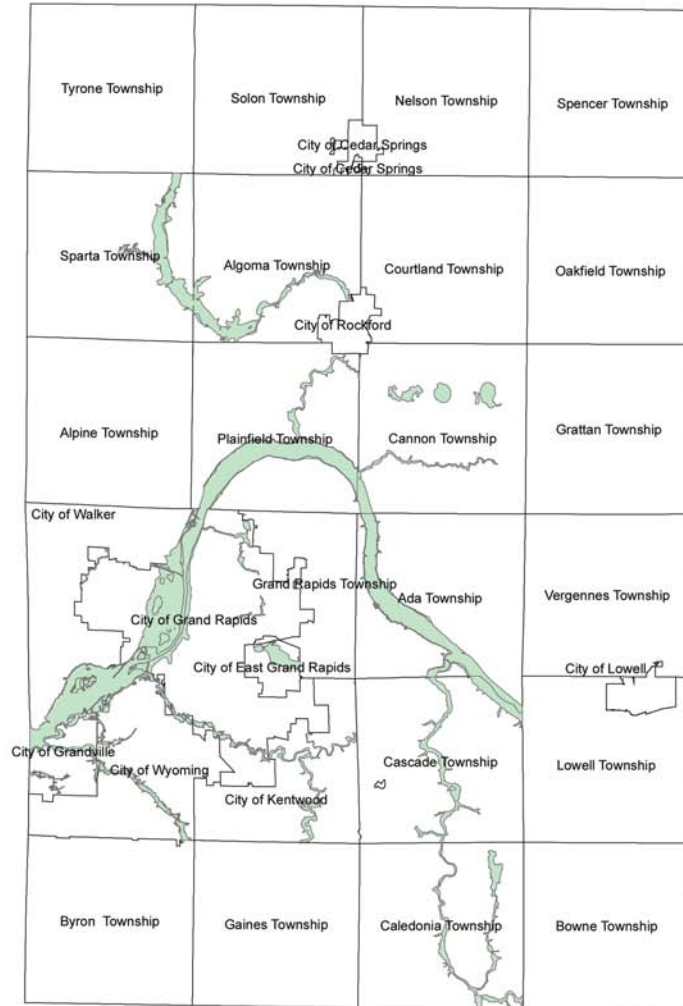
On May 31st, 2010, a flash flood occurred in Kent County near the city of Rockford. The flash flood caused multiple roads to be washed out, ripped out culverts, and flooded several homes. One home had over 8 feet of standing water in its basement. The water in the basement was from overland flow that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

The Federal Emergency Management Agency has a long history of flood mitigation. Floodplain maps are available which identify vulnerable structures in an effort to mitigate future flooding. 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 can be generally described as the areas of Abrigador Trail, Limberlost Lane, and Van Lopik Avenue, plus some areas along North Cedar, 120th Avenue, and 118th Avenue. Floodplain areas for both Kent and Ottawa Counties are shown on the following pages. FEMA-fundable flood mitigation projects have been prepared, including about 2 dozen flood-prone structures in Plainfield Township and the City of Grand Rapids. (q.v. the hazard mitigation action section and community subsections of this plan.)

According to *The Holland Sentinel* newspaper (January 1, 2000), the heaviest rainfall event in the area (the City of Holland) took place on July 17 and 18, 1982. On those dates, 11.0 inches of rainfall were 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 was covering the worst rainfall events of the entire 20th Century.

Kent County – Map of Approximate Floodplain Locations

Kent County Floodplain



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, and 2009.

In Kent County, it was actually possible to identify all the properties in identified floodplains, through the use of county property information. A computerized analysis assessed the location of many thousands of potentially floodprone properties in relation to the officially mapped floodplains, and these properties were then sorted by community and structure type (as well as properties with no built structures). The following table provides the results of this analysis for Kent County. Properties that overlap with identified floodplains were all counted here, but that doesn't necessarily mean that the locations of built structures on those properties were also in the floodplain, or were vulnerable to flooding. The following table merely provides a liberal estimate of the number and types of properties potentially at-risk from floodplain-related events in Kent County.

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

In Ottawa County, such a feat was not manageable at this time. General descriptions have already been provided of the greater risk areas, along with a map of approximate floodplain locations and historical summaries of previous major events there. However, additional emphasis will also be given to the Robinson Township flood-risk areas, which have been suffering for more than a decade and have been prioritized for flood mitigation activities. Please refer to the "Additional Flood Analysis" section that follows the subsection on "Urban Flooding," below.

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 Floodprone Properties, and other State and Federally-Assisted Flood Hazard Mitigation Projects (e.g. Pre-Disaster Mitigation Program, Hazard Mitigation Grant Program).

Risk/Likelihood

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.

Urban Flooding

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.

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.

Historically Significant and Related Events

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. Progress has been made in reducing CSOs, but more remains to be done in this years-long effort.

The National Weather Service issues advisories, watches and warnings when urban flood hazards threaten the area. An example is provided below (with portions of it removed to conserve space).

...FLOOD STATEMENT NATIONAL WEATHER SERVICE GRAND RAPIDS MI 347 AM EST THU JAN 13 2005
THE NATIONAL WEATHER SERVICE IN GRAND RAPIDS HAS ISSUED A
* URBAN AND SMALL STREAM FLOOD ADVISORY FOR... KENT COUNTY IN SOUTHWEST MICHIGAN ...
OTTAWA COUNTY IN SOUTHWEST MICHIGAN...
* UNTIL 600 PM EST
* AT 345 AM EST... NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED MUCH OF SOUTHWEST
LOWER MICHIGAN HAS RECEIVED AT LEAST AN INCH OF RAIN SINCE WEDNESDAY. AREAS NORTH OF I-
96 AND WEST OF US-131 HAVE RECEIVED CLOSE TO 2 INCHES. THE COMBINATION OF SNOWMELT AND
RUNOFF FROM THE RAIN HAS CAUSED AREA STREAMS TO RISE. PONDING ON AREA ROADWAYS AND
RISES ON STREAMS AND CREEKS ARE EXPECTED TO LEAD TO MINOR FLOODING OF LOW LYING AREAS
TODAY. ANOTHER HALF INCH OF RAIN IS EXPECTED TODAY BEFORE COLDER AIR TURNS THE RAIN TO
A BRIEF PERIOD OF LIGHT SNOW.
THIS URBAN AND SMALL STREAM FLOOD ADVISORY REPLACES THE FLOOD WATCH THAT HAD BEEN IN
EFFECT. DO NOT DRIVE YOUR VEHICLE INTO AREAS WHERE THE WATER COVERS THE ROADWAY. THE
WATER DEPTH MAY BE TOO GREAT TO ALLOW YOUR CAR TO CROSS SAFELY.

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 Floodprone 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.

Risk/Likelihood

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 greenspaces.

Flood Mitigation Goals

The overarching Flood Mitigation Strategy for Kent and Ottawa Counties is to apply the principles of the Unified National Program for Floodplain Management to flood mitigation as follows:

1. Modify human susceptibility to flooding: Encourage and assist with floodproofing homes and businesses; Improve flood forecasting and warning.
2. Modify the impact of flooding: Raise awareness; Make all levels of the community better prepared to respond to and recover from flooding.
3. Change the flooding itself: Add floodwater storage; Provide structural protection to developed areas where possible, without increasing flooding elsewhere.
4. Preserve and restore natural resources: Stabilize riverbanks using natural means; Improve the health of our rivers.

Controlling floodplain development is the key to reducing flood-related damages. Although there are state and local programs to regulate new development and substantial improvements in flood-prone areas, floodplain development in many communities continues to increase, resulting in corresponding increases in flood-related risks and damages. The opportunity to mitigate flood hazards rests primarily with local government, since it controls the regulation or direction of land development. 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.

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 Grand Haven. The average slope of the Grand River is 1.8 feet per mile. From its source in 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. A dam with a classification of "high hazard" indicates that the dam is located where a failure may cause serious damage to inhabited homes, agricultural buildings, campgrounds, recreational facilities, industrial or commercial buildings, public utilities, main highways, or class 1 carrier railroads, or where environmental degradation would be significant, or where danger to individuals exists with the potential for the loss of life. A dam with a significant hazard rating is a dam located in an area where its failure may cause damage limited to isolated inhabited homes, agricultural buildings, structures, secondary highways, short line railroads, or public utilities, or where environmental degradation may be significant, or where a danger to individuals exists. The Emergency Management Offices have emergency action plans for these

dams. These plans are updated on a regular basis and exercises are held in the Emergency Operations Centers (EOCs) to test the plans.

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.

The Grand River at Lowell takes about 5 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 from Ionia. Flood stage for the Grand River at Lowell is 15 feet. The top 20 historical crests are shown below:

- (1) 19.00 ft on 03/22/1948
- (2) 18.50 ft on 04/08/1947
- (3) 17.80 ft on 03/19/1942
- (4) 17.38 ft on 04/02/1960
- (5) 17.26 ft on 03/07/1976
- (6) 17.17 ft on 05/26/2004
- (7) 16.85 ft on 10/03/1986
- (8) 16.80 ft on 03/18/1943
- (9) 16.40 ft on 03/19/1982
- (10) 16.40 ft on 04/06/1950
- (11) 16.12 ft on 05/12/1956
- (12) 16.10 ft on 02/15/1938
- (13) 15.90 ft on 10/04/1981
- (14) 15.80 ft on 02/24/1997
- (15) 15.75 ft on 12/30/2008
- (16) 15.50 ft on 03/09/1946
- (17) 15.10 ft on 04/08/1985
- (18) 15.02 ft on 04/30/2009
- (19) 14.86 ft on 05/21/2000
- (20) 14.00 ft on 04/25/1999

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 12 hours from the local area. The second crest occurs in about 4 days. Flood stage for the Thornapple River at Caledonia is 10 feet. The top 20 historical crests are shown below:

- (1) 14.40 ft on 04/07/1947
- (2) 11.43 ft on 02/27/1985
- (3) 11.21 ft on 05/26/2004
- (4) 10.96 ft on 04/22/1975
- (5) 10.79 ft on 05/10/1956
- (6) 10.60 ft on 02/22/1997
- (7) 10.60 ft on 04/02/1960
- (8) 10.33 ft on 12/28/2008
- (9) 9.87 ft on 03/15/1986
- (10) 9.86 ft on 03/09/1979
- (11) 9.79 ft on 05/19/2000
- (12) 9.59 ft on 10/05/1986
- (13) 9.58 ft on 04/23/1993
- (14) 9.47 ft on 06/11/2008
- (15) 9.44 ft on 12/01/1990
- (16) 9.37 ft on 02/15/2001
- (17) 9.25 ft on 03/08/1976
- (18) 9.15 ft on 01/16/2005

(19) 9.10 ft on 01/05/1993

(20) 8.96 ft on 04/13/1952

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. The top 20 historical crests are shown below:

(1) 21.60 ft on 02/28/1986

(2) 21.56 ft on 05/26/2004

(3) 21.55 ft on 02/28/1985

(4) 20.75 ft on 03/08/1976

(5) 20.72 ft on 02/24/1997

(6) 20.65 ft on 10/10/1986

(7) 20.65 ft on 03/18/1982

(8) 20.05 ft on 12/31/2008

(9) 20.00 ft on 10/04/1981

(10) 19.45 ft on 04/23/1975

(11) 19.22 ft on 04/04/1985

(12) 18.95 ft on 03/08/1974

(13) 18.84 ft on 05/21/2000

(14) 18.72 ft on 01/05/1973

(15) 18.26 ft on 02/13/2001

(16) 18.23 ft on 05/01/2011 (provisional measurement)

(17) 18.21 ft on 03/17/1990

(18) 18.20 ft on 02/14/2001

(19) 18.00 ft on 06/22/1996

(20) 17.80 ft on 01/16/2005

The Rogue River at Rockford crests in about 1 day. Flood stage for the Rogue River at Rockford is 8 feet. The top 20 historical crests are shown below:

(1) 11.35 ft on 09/13/1986 (no longer listed under USGS streamgage info; different datum?)

(2) 9.29 ft on 03/06/1976

(3) 8.84 ft on 12/29/2008

(4) 8.76 ft on 03/14/2006

(5) 8.62 ft on 10/02/1981

(6) 8.62 ft on 05/19/2000

(7) 8.61 ft on 06/01/1989

(8) 8.60 ft on 05/17/1974

(9) 8.59 ft on 03/31/1960

(10) 8.50 ft on 06/21/1996

(11) 8.43 ft on 05/31/2010

(12) 8.40 ft on 09/01/1975

(13) 8.34 ft on 02/21/1994

(14) 8.32 ft on 02/23/1997

(15) 8.30 ft on 06/25/1994

(16) 8.27 ft on 03/15/2007

(17) 8.23 ft on 03/06/2004

(18) 8.08 ft on 02/13/2009

(19) 8.06 ft on 04/13/1965

(20) 8.00 ft on 03/17/1982

The Grand River in Comstock Park crests in about 5 days. A sharp rise may occur in the first 24 hours due to the contribution of local tributaries and urban areas. The next 2 days will show a slow rise or leveling off trend until the water from upstream makes its way down to Comstock Park. The crest at Comstock Park is mostly a function of the water coming down from Ada. The Rogue River is not a major contributor to the crest at Comstock Park, which can add about a quarter of a foot to the crest at Comstock

Park. The flood stage for the Grand River at Comstock Park is 12 feet. The top 20 historical crests are shown below:

- (1) 17.75 ft on 03/22/1948
- (2) 17.45 ft on 04/09/1947
- (3) 16.70 ft on 03/01/1985
- (4) 16.60 ft on 05/27/2004
- (5) 16.15 ft on 03/03/1960
- (6) 16.00 ft on 10/04/1986
- (7) 15.90 ft on 03/08/1976
- (8) 15.40 ft on 03/01/1971
- (9) 15.33 ft on 04/07/1950
- (10) 15.19 ft on 01/01/2009
- (11) 15.00 ft on 02/25/1997
- (12) 15.00 ft on 03/05/1986
- (13) 14.85 ft on 02/04/2008
- (14) 14.73 ft on 03/08/1974
- (15) 14.70 ft on 05/01/2009
- (16) 14.50 ft on 05/21/2000
- (17) 14.50 ft on 04/09/1985
- (18) 14.28 ft on 04/23/1975
- (19) 14.00 ft on 06/05/1989
- (20) 13.84 ft on 01/05/1973

The Grand River in Grand Rapids crests in about 5.5 days. A sharp rise may occur in the first 24 hours due to the contribution from local tributaries and urban areas. The next 2 days will show a slow rise or leveling off trend until the water from upstream makes its way down to Grand Rapids. The crest at Grand Rapids is mostly a function of the water coming down from Ada. The Rouge River is not a major contributor to the crest at Grand Rapids—it can add about a foot to the crest at Grand Rapids. The flood stage for the Grand River at Grand Rapids is 18 feet. The top 20 historical crests are shown below:

- (1) 22.49 ft on 03/28/1904
- (2) 21.36 ft on 03/23/1948
- (3) 20.66 ft on 01/24/1907
- (4) 20.56 ft on 04/09/1947
- (5) 20.26 ft on 06/09/1905
- (6) 19.64 ft on 03/01/1985 (highest peak currently listed on USGS streamgage records for current datum)
- (7) 19.54 ft on 05/27/2004
- (8) 19.29 ft on 03/08/1976
- (9) 19.25 ft on 04/03/1960
- (10) 19.25 ft on 10/04/1986
- (11) 19.06 ft on 03/20/1942
- (12) 18.83 ft on 03/19/1982
- (13) 18.56 ft on 03/20/1919
- (14) 18.56 ft on 03/18/1918
- (15) 17.96 ft on 03/30/1916 (National Weather Service flood stage is at 18.00 feet.)
- (16) 17.96 ft on 04/07/1912
- (17) 17.87 ft on 02/25/1997
- (18) 17.84 ft on 12/31/2008
- (19) 17.70 ft on 05/13/1956
- (20) 17.42 ft on 05/22/2000

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 has been established.
- Buck Creek - Buck creek tends to crest in about 18 - 24 hours. No flood stage has been established.

Mill Creek - Mill creek along West River Drive in Comstock Park tends to crest in about 6 - 12 hours. No flood stage has been 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 has been established.

There are not as many stream gauges being used in Ottawa County. The USGS waterwatch 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 on 06/20/2009
- (2) 13.50 ft on 06/08/2008
- (3) 12.57 ft on 10/30/2009

As of 12/17/2010, there were 724 flood policies with a total coverage of \$141,864,000. Since 1978, 373 flood insurance claims have been paid in Kent County for a total worth of \$3,372,307. Sixteen out of 34 communities in Kent County and all of Ottawa County's 24 participate in the National Flood Insurance Program. Plainfield Township is the only community within Kent County that participates in the NFIP Community Rating System (CRS) at a level 9, which lowers flood insurance premiums by 5%. The following is a list of communities within Kent and Ottawa Counties, sorted according to their current (2011) NFIP participation status.

Current NFIP participants include (in Kent County) Ada Township, Algoma Township, Alpine Township, Caledonia Township, Cannon Township, Cascade Township, East Grand Rapids, Grand Rapids, Grandville, Kentwood, Lowell, Plainfield Township, Sparta Township, Village of Sparta, Walker, Wyoming, and (in Ottawa County) Allendale Township, Blendon Township, Chester Township, Coopersville, Crockery Township, Ferrysburg, Georgetown Township, Grand Haven, Grand Haven Township, Holland, Holland Township, Hudsonville, Jamestown Township, Olive Township, Park Township, Polkton Township, Port Sheldon Township, Robinson Township, Spring Lake Township, Village of Spring Lake, Tallmadge Township, Wright Township, Zeeland, and Zeeland Township.

There are no known communities within Kent or Ottawa Counties that have been "sanctioned" by the NFIP (and thus ineligible to participate). However, a comparison of the list of participants with a list of all communities within the region reveals that the following Kent County communities were not officially recognized as NFIP-participating communities, as of the latest (2011) FEMA Community Status Book: Bowne Township, Byron Township, Village of Caledonia, Cedar Springs, Courtland Township, Gaines Township, Grand Rapids Township, Grattan Township, Lowell Township, Nelson Township, Oakfield Township, Rockford, Village of Sand Lake, Solon Township, Spencer Township, Tyrone Township, Vergennes Township. (All communities in Ottawa County are NFIP participants.)

There is also an official FEMA/NFIP list identifying "repetitive loss properties" that have made multiple claims within the past few decades. Repetitive loss structure have been officially defined by FEMA as an NFIP-insured structure that has had at least two paid flood losses of more than \$1,000 each in any 10-year period since 1978. The following information summarizes the repetitive loss properties identified within Kent and Ottawa Counties in the most current available data from FEMA (March 2010).

Kent County Repetitive Loss Properties

Ada Township: 4 single-family residential properties, all on the same street alongside the east bank of the Grand River, totaling more than \$150,000 in flood damages involving 10 separate insurance claims. The average total claims per property was more than \$17,000. Only 3 distinct addresses are given in the repetitive loss listings, suggesting that there are actually only three properties rather than four, and that the average total per property was most probably on the order of \$22,670 rather than \$17,000.

*** One property was misclassified by FEMA as being located in Grand Rapids, but was actually in Ada Township, on the banks of the Grand River, according to its address – this single-family residential property reported \$17,593 in damages across 2 insurance claims, averaging \$8,796 apiece, and bringing the total repetitive-loss properties in the township to 5.

Algoma Township: 2 listings involve the same address, a single-family residential property, located on the banks of the Rogue River, and totaling \$18,680 in damages across 5 claims averaging \$3,736 apiece.

East Grand Rapids: 1 single-family residential property located near Reeds Lake, totaling \$50,658 in damages across 2 claims averaging \$25,329 each.

City of Grand Rapids: 10 properties - 2 near the Grand River (1 single-family residential, 1 a non-residential downtown office complex), 5 at different locations near the Kenosha Creek (4 single-family residential not all in the same area, 1 non-residential industrial facility distant from the other properties), 1 nonresidential office building near a tributary to the Kenosha Creek, 1 large non-residential industrial facility at a creek-side location not too far from downtown. The total flood damages paid on these 10 properties, across 24 claims, was about \$1,342,207.

Grandville: 1 single-family residential property located near the Buck Creek, totaling \$3,428 in damages across 2 insurance claims.

Plainfield Township: 9 single-family residential structures, all near the banks of the Grand River (but at various locations across the township, not all near each other), totaling about \$172,400 in damages across 25 separate flood claims.

Village of Sparta: 1 single-family residential structure, located near Nash Creek, totaling about \$124,397 across 6 separate flood claims averaging more than \$20,000 each.

Wyoming: 4 single-family residential structures near Buck Creek (or its tributaries), totaling about \$94,000 in damages across 10 separate insurance claims.

Ottawa County Repetitive Loss Properties

Georgetown Township: 1 single-family residential property not located adjacent to any clear hydrological drainage feature, totaling more than \$3,600 in damages across 2 flood claims.

Holland Township: 4 properties, 3 single-family residential (2 located near the Macatawa River, 1 near Sawyer Creek) and totaling about \$133,756 in damages across 7 insurance claims, and 1 large non-residential commercial structure (not located near any clearly apparent drainage feature of hydrological risk) totaling more than \$27,100 in damages across 2 claims.

Park Township: 4 properties, all non-residential industrial/warehouse structures located near Lake Macatawa, totaling about \$155,688 in damages across 8 insurance claims.

Robinson Township: 3 single-family residential properties located near the Grand River, totaling about \$89,732 in damages across 8 insurance claims.

Spring Lake Township: 1 single-family residential property located near Spring Lake itself, totaling about \$4,122 in flood damages across 2 insurance claims.

Tallmadge Township: 1 single-family residential property located next to the Grand River, totaling about \$57,181 in damages across 4 flood claims.

City of Zeeland: 1 single-family residential property located near Sawyer Creek, totaling about \$18,385 in flood damages across 2 insurance claims.

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, but 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. One source of flooding there involved a sanitary sewer line that was located in front of a storm drain pipe and inhibited the path of outflowing water. Flooding also occurred in a neighborhood that was located at the low end of an 847-acre watershed emptying into Lake Macatawa through a major sewer trunk line. The water outlet in the lake was under water and lacked the pressure to carry storm water into the lake, thus causing backups during heavy rain events. 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 these. Power outages have also caused Zeeland lift stations to fail, resulting in similar backups into homes.

In Zeeland Township, Maple Lake condominium residents experienced sanitary sewer backups when the Rose Drain reached flood stage and waters entered an available sanitary sewer manhole. Holland Township residents near Quincy Street and 142nd Avenue received wet basements in June 1997 when a local resident had removed a sanitary sewer manhole cover to relieve yard flooding near Pine Creek. Water then flooded the sanitary sewer system and entered nearby homes. Continued floodplain developments would increase the potential for flood damage to homes, businesses, and infrastructure, and therefore it is vital, in this age with new knowledge of stormwater 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. Developed areas have a greater proportion of impermeable surfaces and other land uses that generate high volumes of stormwater runoff, causing rivers to rise to higher levels more rapidly and thus for the impacts of flooding to become more severe.

Activities to reduce the amount of stormwater entering the sanitary sewer system have included:

1. The installation of better seals on sanitary sewer manholes.
2. Raising the height of sanitary sewer manholes above the level of possible floodwaters.
3. Covering the sanitary sewer openings in open basements during new construction projects.
4. Improvements along Bliss Creek in Georgetown Township to alleviate flooding near the intersection of 44th Street and Kenowa Avenue.
5. Construction of a relief drain at the Rose Drain in Zeeland.
6. Construction of a flood control berm near Pine Creek in Holland Township, to help protect a home there.
7. The installation of culverts where US-31 crosses New Holland Street, Quincy Street, and Riley Street.
8. Improvements to three dams (Berens, Steenwyk, and Timmer) in the Black Creek Watershed
9. Removal of flood-prone structures in Robinson Township, through two PDMP project grants from 2005.
10. The removal of a flood-prone structure in Ada Township, through a PDMP project grant from 2006.
11. An HMGP 1527 project grant for flood-prone property acquisitions, through the Kent County Drain Commission.
12. Ongoing work on flood-prone property acquisitions in Plainfield Township, through an HMGP 1777 project grant.
13. A culvert replacement and acquired structure in Coopersville, through an HMGP 1346 project grant.
14. The Plaster Creek flood control project in Grand Rapids, through an HMGP 1346 project grant.
15. A culvert/bridge upgrade in Kent City, through an HMGP 1346 project grant.
16. An HMGP 1346 grant-funded stormwater project in Kentwood.
17. 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).
18. A culvert project of the Ottawa County Road Commission, funded through an HMGP 1346 grant.
19. The acquisition of 3 flood-prone properties in the City of Wyoming, through an HMGP 1237 grant.
20. A bridge replacement project (improving water flows) in Wyoming, through an HMGP 1226 grant.
21. Two Ottawa County stormwater/drain projects, through the Drain Commission and HMGP 1181 grants.
22. An acquisition project in the City of Holland, through an HMGP 1181 grant.
23. New acquisition projects for Plainfield Township, through HMGP 1777 and PDMP FY 2011 grants.
24. An acquisition project involving 8 structures in Grand Rapids, through a PDMP FY 2011 grant.

25. 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.

26. Encouraging participation and continued compliance with the National Flood Insurance Program.

More detail about some of the most problematic flood-prone areas in the region is appropriate here. In particular, the flood risks in Plainfield Township and Robinson Township will be further described in the two subsections that follow.

Plainfield Township Flood Risks and Problems

The Grand River presents the greatest flood risks to residents of Plainfield Township. 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.



Flooded home along Abrigador Trail, when the Grand River is 2 feet above flood stage at Comstock Park.



The following year, 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 Abridador Trail under water, along with Konkle Drive. The next year again saw new flooding, from February 9 to 11, 2011, 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, Abridador 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 Abridador Drive and Willow Drive. 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 Abridador 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

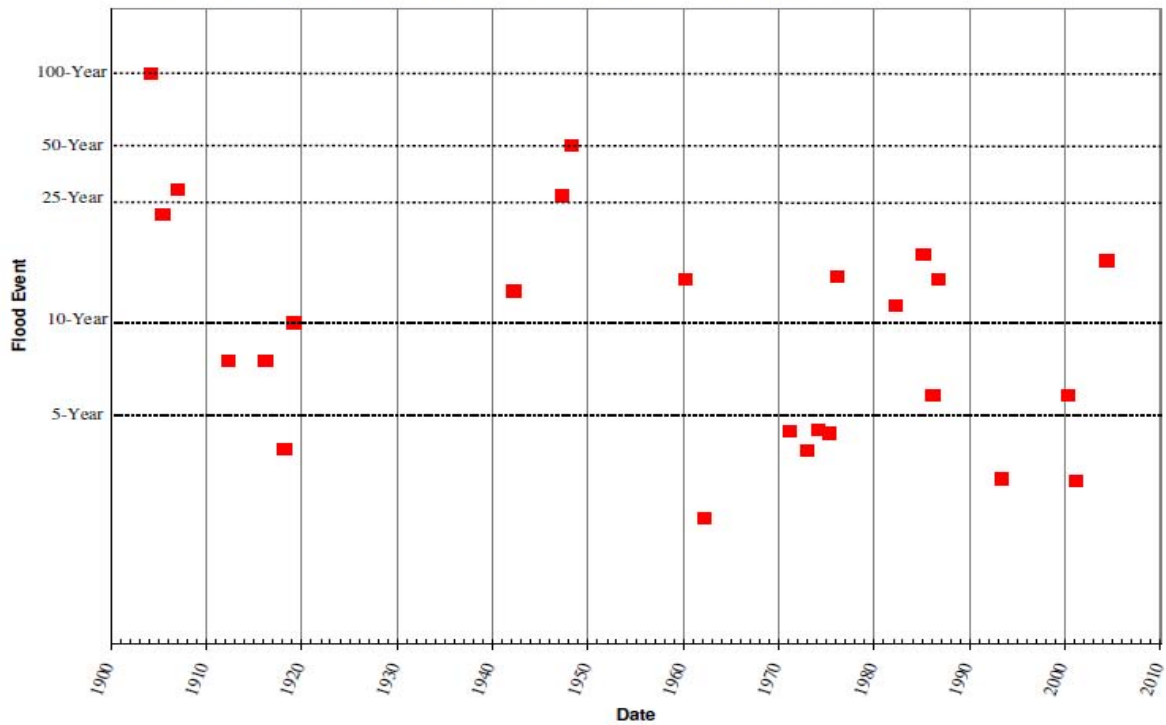
	“5-year” events (20% annual frequency)	“10-year” events (10% annual frequency)	“25-year” events (4% annual frequency)	“50-year” events (2% annual frequency)	“100-year” events (1% annual frequency)
Abridador Trail	21%	42%	90%	98%	100%
Konkle Drive	13%	53%	73%	93%	100%
Willow Drive	0%	0%	53%	94%	100%

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. The chart on the next page represents the history of flooding in the township over an entire century (and was obtained from the Plainfield Township Flood Mitigation Plan produced by township engineers Prein&Newhof).

Plainfield Township has a stormwater 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 not much more than \$300 per year (“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.

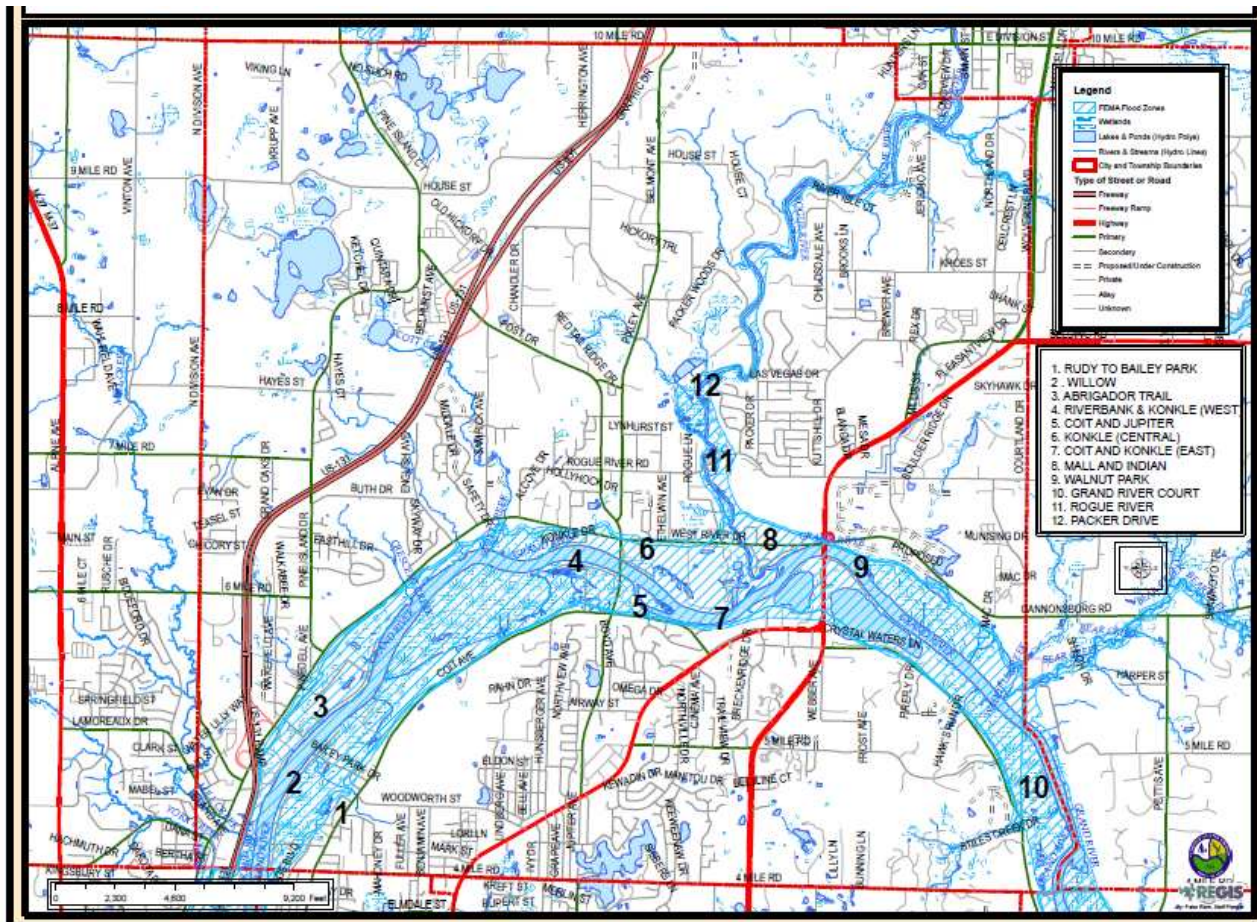
Figure 1 - Significant Historic Flood Levels Recorded in Plainfield Charter Township



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. Structures were identified for potential flood mitigation activities on the following streets (with the number of structures for each street listed in parentheses): Abridador Trail (49), Bailey Park (1), Canright Street (1), Coit Avenue (5), Filkins Drive (2), Forest Ridge Avenue (2), Grand River Drive, Grand River Court, Konkle Drive (12, plus 5 at the golf course), Indian Drive (4), Lovers Lane (2), Mall Avenue (4), Packer Drive (3), Plainfield Avenue (1), Purchase Street (6), Ripley Street (5), Riverbank Drive (21), Rogue River Road (4), Rudy Street (1), Verta Drive (2), Walnut Park Drive (5), West River Drive (16), and Willow Drive (59). This totals 210 properties, which had a collective assessed value of more than 12.6 million dollars (using 2006 SEV).



Grand River Gauge Location at Comstock Park



Plainfield Township Flood Risk Locations Map

Robinson Township Flood Risks and Problems

The other focus area that requires emphasis in this plan is the flood-prone portions of Robinson Township, which also has the Grand River running through it. The 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.

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, law enforcement reported that the intersection of 96th and Winans streets was completely washed out, and that numerous homes were flooded and area schools were closed. The Grand River crested at 14.8 feet on May 24, placing Van Lopik Road 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.

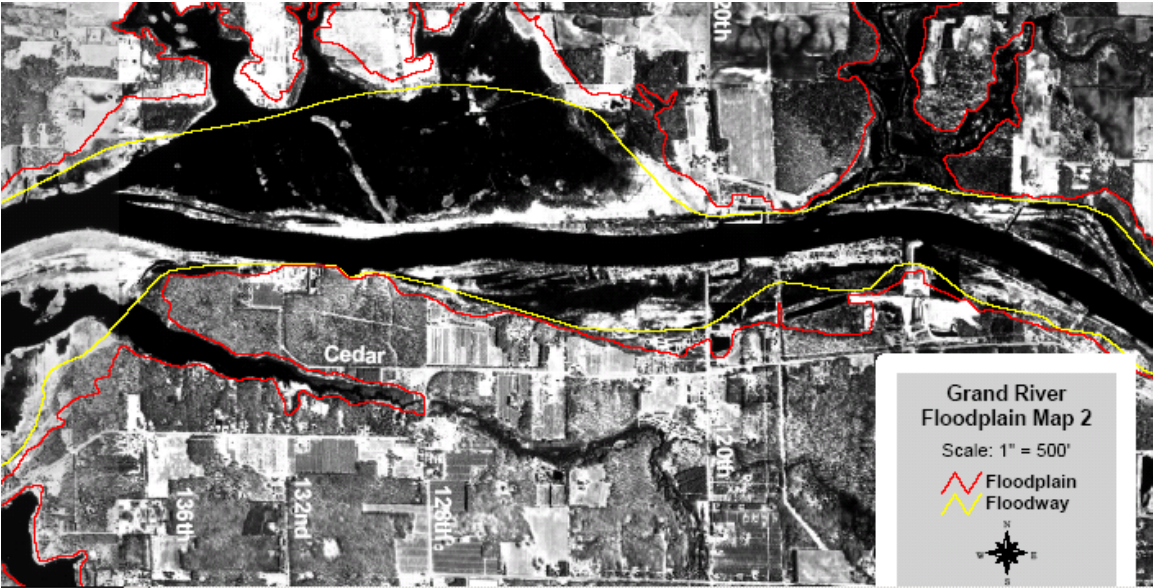
May 15, 2001: Thunderstorms developed during the morning hours of the 15th, producing several reports of large hail and high winds. It was also a record rainfall event for the Grand Rapids area, and 4 to 5 inches of rain fell in less than 6 hours across much of southwestern and south central lower Michigan.

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.

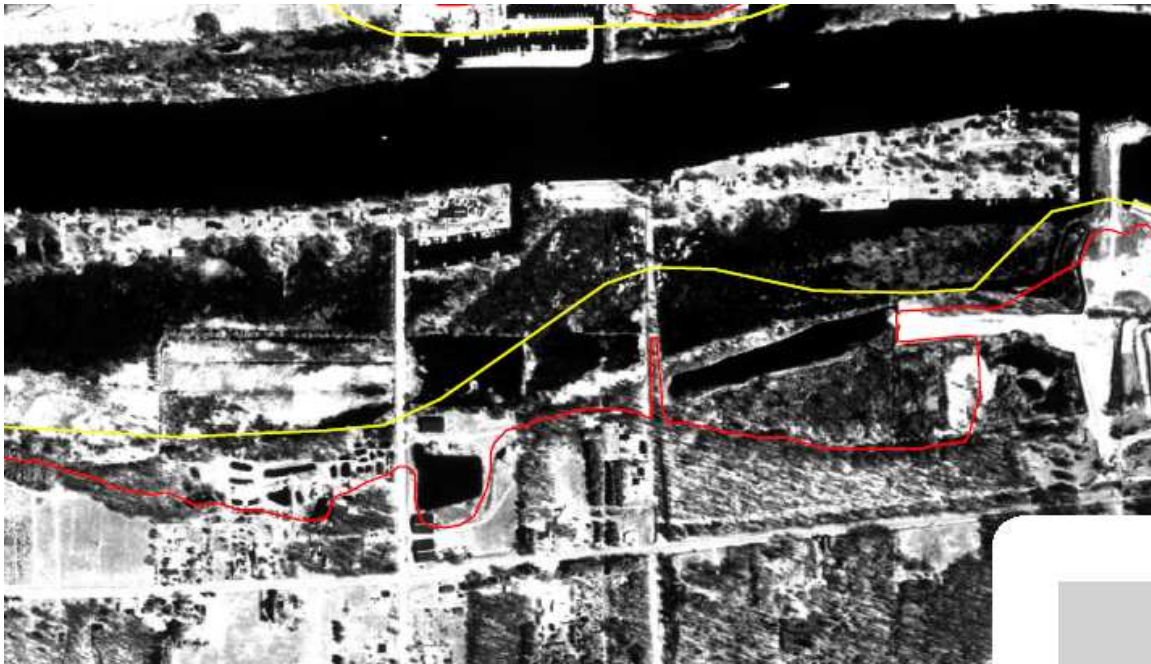
Jul 23, 2001: Flash flooding occurred during the early afternoon hours of the 23rd across mainly northwestern Allegan county and southwestern Ottawa county. Numerous roads were reported to be flooded along the Allegan and Ottawa county lines by area law enforcement. Several reports of flooding were received 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.

March 9, 2004: The Grand River at Robinson crested at 13.4 feet, flooding low-lying areas nearby.

May 20-June 1st 2004: Heavy rain and thunderstorms plagued all of Southern Michigan with 5” and 6” totals during May 20-24. The great influx of water caused river levels to swell quickly, resulting in widespread flooding, producing 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. 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 and Limberlost subdivisions 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 notated 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 and Limberlost homes are located in the floodway. MAP C and MAP D then give detail about the number and location of houses damaged in the 2004 flood event there.



MAP A

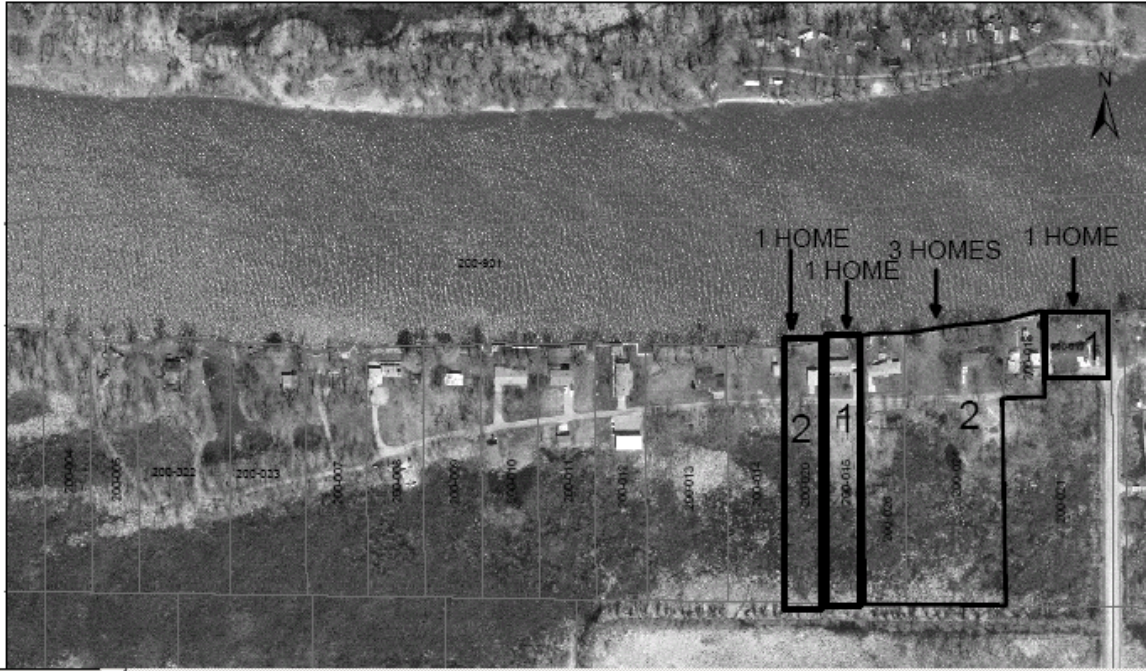


MAP B

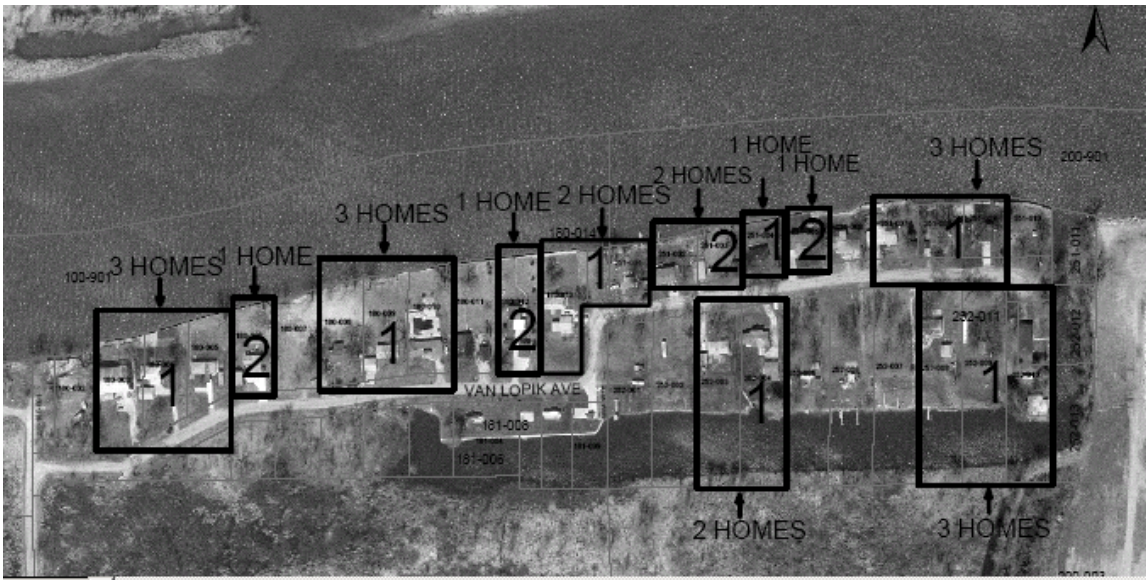
January 17-March 2005: Again the Van Lopik and Limberlost subdivisions in the north-central part of the township are severely impacted by flooding that resulted from an ice-jam on the Grand River, at the bend in the river portrayed on MAP E (on a later page in this plan). The event began on January 17, 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 and Limberlost. This was done for safety reasons. Rescue activities continued into the early evening of the 18th as the neighborhood is evacuated. Extensive media coverage of the event was broadcast and distributed. An official damage assessment was completed on January 20 (before the river crested, finding 32 homes affected) and numerous meetings occurred during subsequent weeks (summarized in an early section of this plan). According to National Weather Service data, a total of 30 homes on Van Lopik, and 20 more homes on Limberlost 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 arrive, inspect the area, and agree 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 have had to evacuate the area for a period of 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 choose instead to find temporary lodging with friends, relatives, or in motels.)

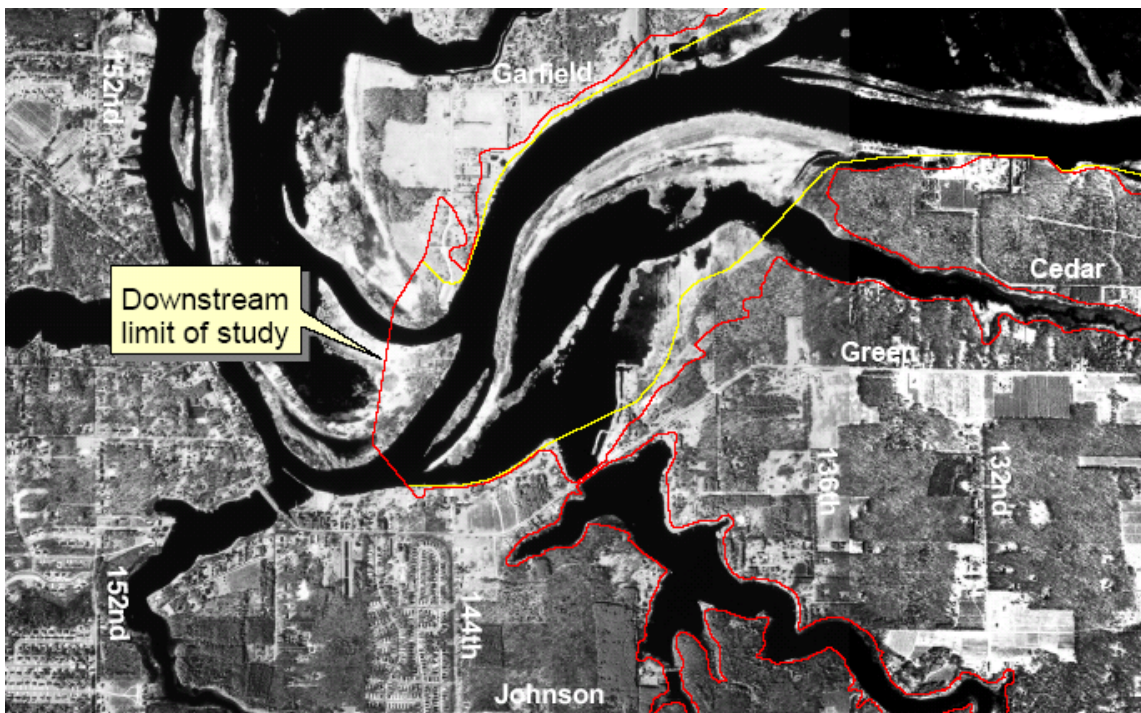
LIMBERLOST LANE PRIVATE FLOOD DAMAGE, 2004



MAP C



MAP D



MAP E

A river gauge exists on the Grand River and is used to monitor the levels of waters there, which has direct bearing on the safety and comfort of residents who live on Van Lopik and Limberlost Streets. 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 ten times per decade.

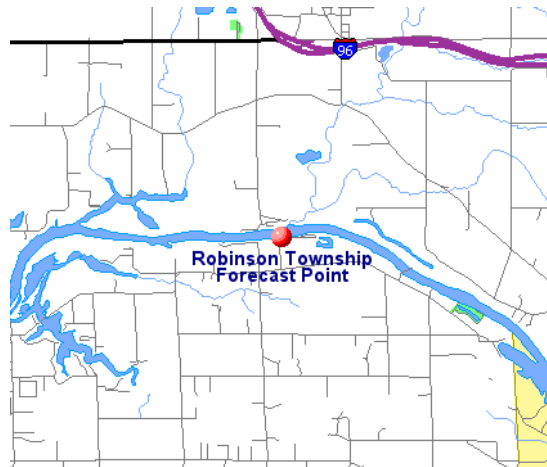
At 13.6 feet, the eastern edge of VanLopik and the western edge of Limberlost Roads begin to flood. Flooding begins to occur in low-lying areas in Deer Creek Park. At 13.7 feet, two of the houses along Van Lopik become surrounded by water. These water levels has been exceeded nine times since 1994.

At 13.9 feet, two homes on Van Lopik have about 7 inches of water on their first floors while several others are surrounded by water. This water level has been reached and exceeded seven times since 1994. At 15.0 feet, Van Lopik Road has 1 to 2 feet of water over it, and flooding of 19 homes on the east end of the road occurs. This water level has been exceeded four times since 1994.

At 16.0 feet, Van Lopik Road is under 2 to 3 feet of water, and 19 homes are flooded. These conditions have occurred three times since 1994. At 17.0 feet, 29 homes become flooded along Van Lopik. This has occurred in 1994 and now in 2005. Record flooding conditions were achieved in 2005, as waters crested at 18.3 feet and resulted in major flooding of 30 homes on Van Lopik Road, and flooding of 20 homes along Limberlost Road. Van Lopik Road is estimated to be under 4 to 5 feet of water, with water levels up to "seat-cushion level" inside several homes.

Top 12 historic crests (since 1994) for Robinson Township Gauge Point on the Grand River:

1. 18.30 feet – January 21, 2005
(35,539 cubic feet per second)
2. 18.00 feet – February 25, 1994
3. 16.20 feet – May 28, 2004
(27,560 cubic feet per second)
4. 15.60 feet – March 28, 1997
5. 14.80 feet – May 24, 2000
6. 14.50 feet – January 27, 1997
7. 13.92 feet – December 31, 1996
8. 13.80 feet – May 17, 2001
9. 13.80 feet – February 15, 2001
10. 13.50 feet – April 28, 1999
11. 13.40 feet – March 9, 2004
(16,885 cubic feet per second)
12. 13.30 feet – March 24, 1998



Flood stage is 13.3 feet at the gauge point – see MAP F, above right. Gauge information is from the National Weather Service station based in Grand Rapids.

MAP G, below, shows the assessed values of parcels in the floodplain areas along the Grand River (which are circled on the map). A survey had been performed on 29 homes located on Van Lopik, and 15 structures on Limberlost, with first floor elevation data collected by the U.S. Army Corps of Engineers and allowing calculated flood depths for each structure. Rather than reveal information for specific addresses for all the private residences in the area, for purposes of this plan, the information may result in the following assessment.

The resulting official damage calculations from the survey were based on the conditions of January 20 (before the river reached its record crest) and estimated an average flood depth of an average of approximately 1.3 feet above the first floor elevations for about 35 homes in the area. This survey noted that three of the 35 structures were trailers, which tend to suffer greater damages from flooding. When the river crested a day later, as measured by the National Weather Service, the effects had extended to some 50 homes in the area, and this expanded flood area plus deepened flood levels for the surveyed homes thus can be estimated to have caused damages of approximately 60% of the value of about 5 involved trailers (thus probably counting them as complete losses), roughly 20% of the value of approximately 30 permanent homes, and about 10% of the value of approximately 15 other homes. Based on the assessed values illustrated in MAP G, an assumption might be made that the average value in the area is about \$50,000. Although insufficient detail is available to work with anything other than averages and estimates in this plan, if that \$50,000 estimate is applied to the above distribution of structure types and flood depths, the resulting total damage would be estimated at \$625,000 from this single event. In addition to these purely structural damages must be added the damages to home contents (estimated as 30% of the value of the home), the loss of water, septic, and electric services (for more than 7 weeks and counting, at the time this document was last revised) displacement costs of about residents (the township average is 3 per household) who have still not been able to return to their homes, disruption to the schedules and work of area residents, the closure of these two roads, and response and rescue costs (including the use of Coast Guard equipment and personnel), and the estimated costs of this single event can easily be calculated as soaring to at least \$1,748,750. As the river gauge data shows, flood events in this area have been occurring regularly, and may worsen over time.

Parcels Assessed Value



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West Olive, Michigan 49480
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Fax (616) 730-4904
www.gis.co.ottawa.mi.us

Photography date: April 1999

Legend	
— Roads	\$40900 - \$81700
▭ Political Unit	\$81701 - \$135900
▭ parcels	\$135901 - \$261300
▭ Assessed Value	\$261301 - \$513200
▭	\$513201 - \$1300000

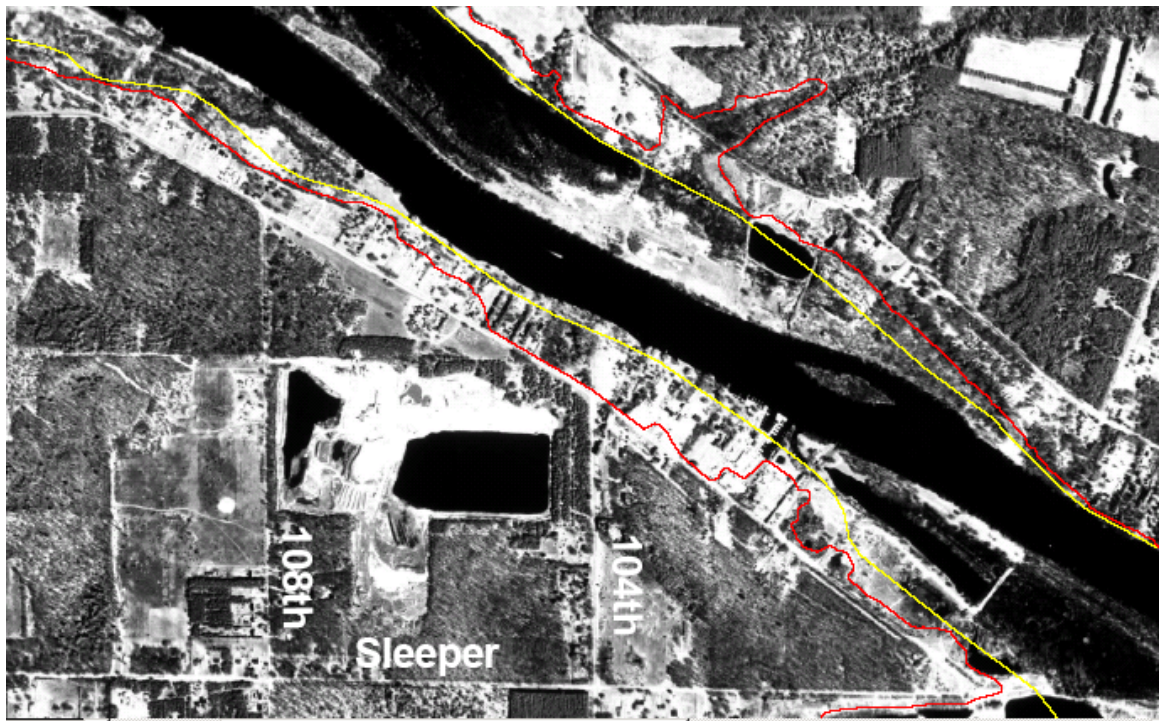


MAP G



MAP H

In addition to Van Lopik and Limberlost Streets, some additional areas of flood problems were identified in Robinson Township. In the northeast, along North Cedar Drive, from the area of approximately 108th Avenue and on for about a mile to the east of there. There are from 4 to 6 homes in this area that have suffered flood damages. About once per year, basement flooding occurs, with more than two feet of water accumulating there 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, and 2005. Please refer to MAP I and MAP J on the following page.



MAP I



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. A damage assessment last May estimated the effects at \$30,000. Flood damages occur here approximately every other year.

At the county park in this same area, flood problems are also experienced. With advance notice, picnic tables have to be moved out of harm's way, or losses will occur. There is also damage to landscaping there. Numerous private docks suffer damages from floodwaters and ice effects (estimated as 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.

Near 128th Avenue and M-45, a house is 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 during the wrong time of year (e.g. Spring). The problems in this case may stem from a drain that flows nearby, but 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. Most other houses in the area have no basements, which is probably the wisest strategy for such developments, since although information about water levels is available during the permitting process, such water levels typically fluctuate over time rather than remaining constant.

A special concern observed by response personnel in this last event 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, were 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 may endanger the lives of residents.

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 lower priority than the riverine flooding that directly affects the homes and lives of

residents (and thus dealt with in a different section), 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 on MAP K below (adapted from the truck route map to show the circled locations of high-priority problem road areas).

Along Buchanan Street, from 112th Avenue and to the east for a half mile (approximately to where 108th Avenue would be), 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 stuck 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 mucky to allow many vehicles to safely get through. People get their vehicles stuck there every year trying to get through. The road has been closed off about four times in the past ten years, when several inches of water cover it. Closures have lasted about a week. After these flood and weather effects, the county then has to dump and smooth the gravel before reopening it.

Another location that suffers the same sort of effects is Johnson Street between 112th Avenue and just past 108th Avenue. The type, frequency, and severity of the flooding here is of the same type described above.

A third 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 such a 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 back-ups. Additionally, where the Bass Creek crosses over Buchanan Street, Pierce/96th Avenue, and Winans, flooding and road damage has been regularly observed.

Since 2005, various hazard mitigation activities have been used, as noted on pages 100-101, to mitigate the impacts of flooding in Robinson Township. These activities continue into the present, and more will be said about them in a later section of this document, describing the updated hazard mitigation actions for 2011.

Robinson Township Designated Truck Route Map

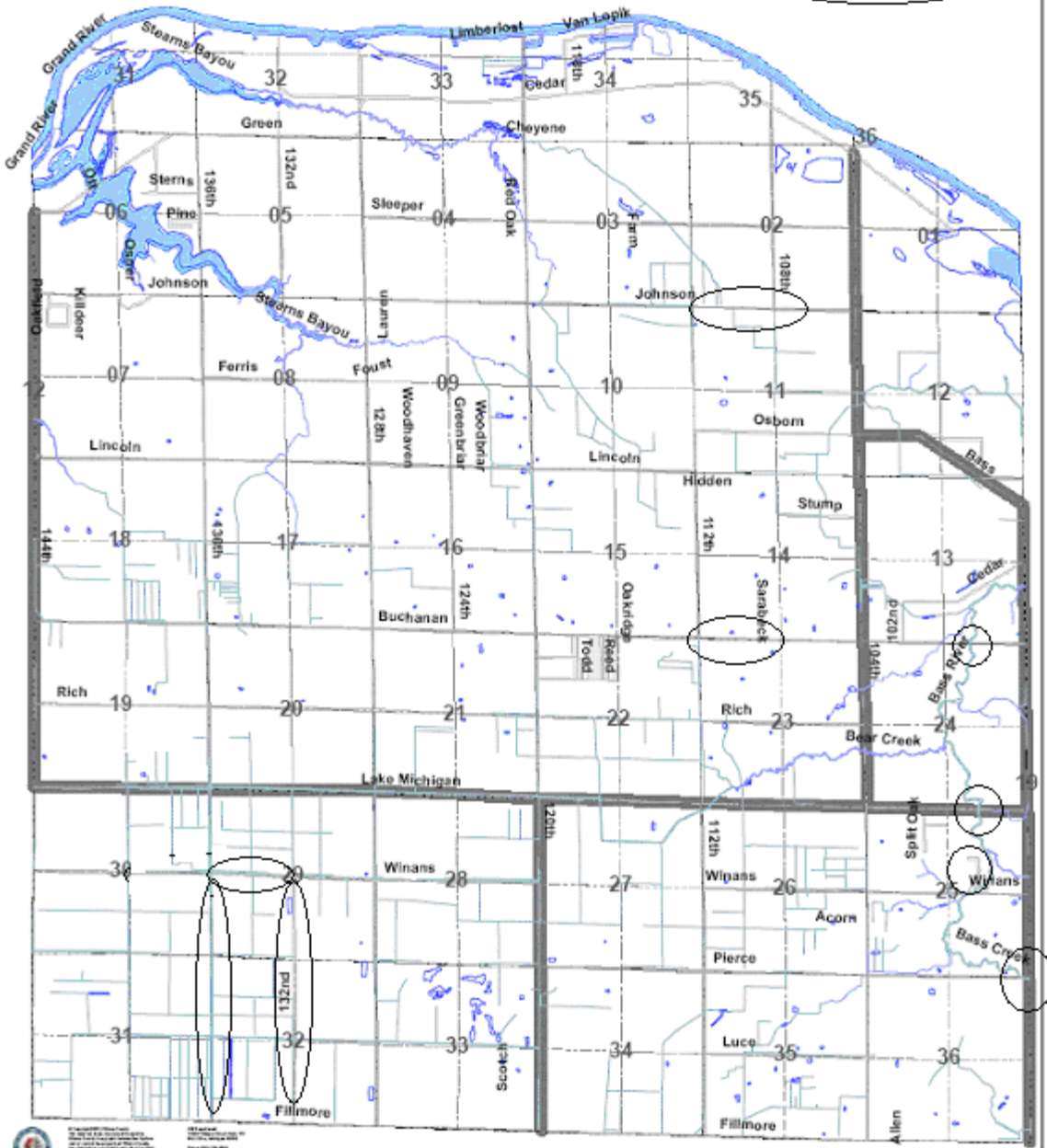


Legend

Truck Routes

T07-08N, R15W

Flood problems/risks



MAP K

Additional Flood Photographs



Photos from a 1986 flood along the Rogue River, almost 3 feet above flood stage.



Flooding associated with the Thornapple River and the Grand River.



Flood in the City of Lowell, 2004

Infrastructure Failure

Electrical Failure

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.

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 devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes. When the water or wastewater treatment systems in a community are inoperable, serious public health problems arise that must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur. 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.

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.

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.

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 interruption of service. Patterns will be determined and mitigation measures will be implemented upon the completion of the study.

Communications Failure

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.

Hazard Description

Communications failure involves the loss of critical public or private communications infrastructure that affects essential services. Communications facilities are located across the area and are subject to damage from digging, fire, traffic accidents, floods, severe weather, and day-to-day events.

Communications 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 signalling systems.

These communication systems are subject to failure, from many causes. For example, a Texas hospital lost the use of its pagers when a communications satellite failed. Hospital functions were seriously impacted.

Historically Significant and Related Events

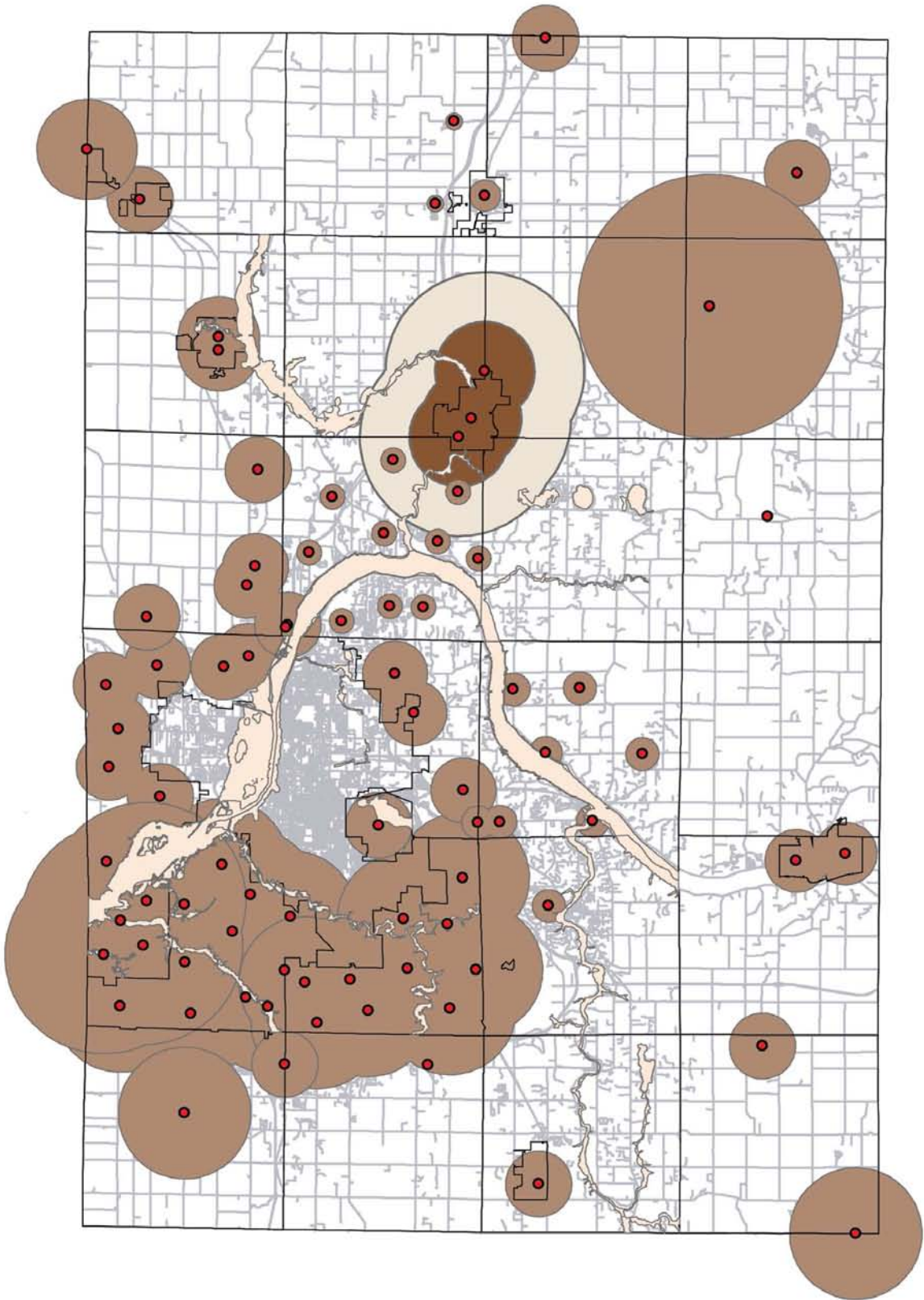
Our technology is accelerating faster than data can be accumulated and analyzed about the systems' reliability. Still, some general estimates can be made. Communication functions are heavily dependent on electrical supply. Severe weather, solar flares, electromagnetic pulses, and excavations can have significant impacts on communications reliability.

Existing Prevention Programs

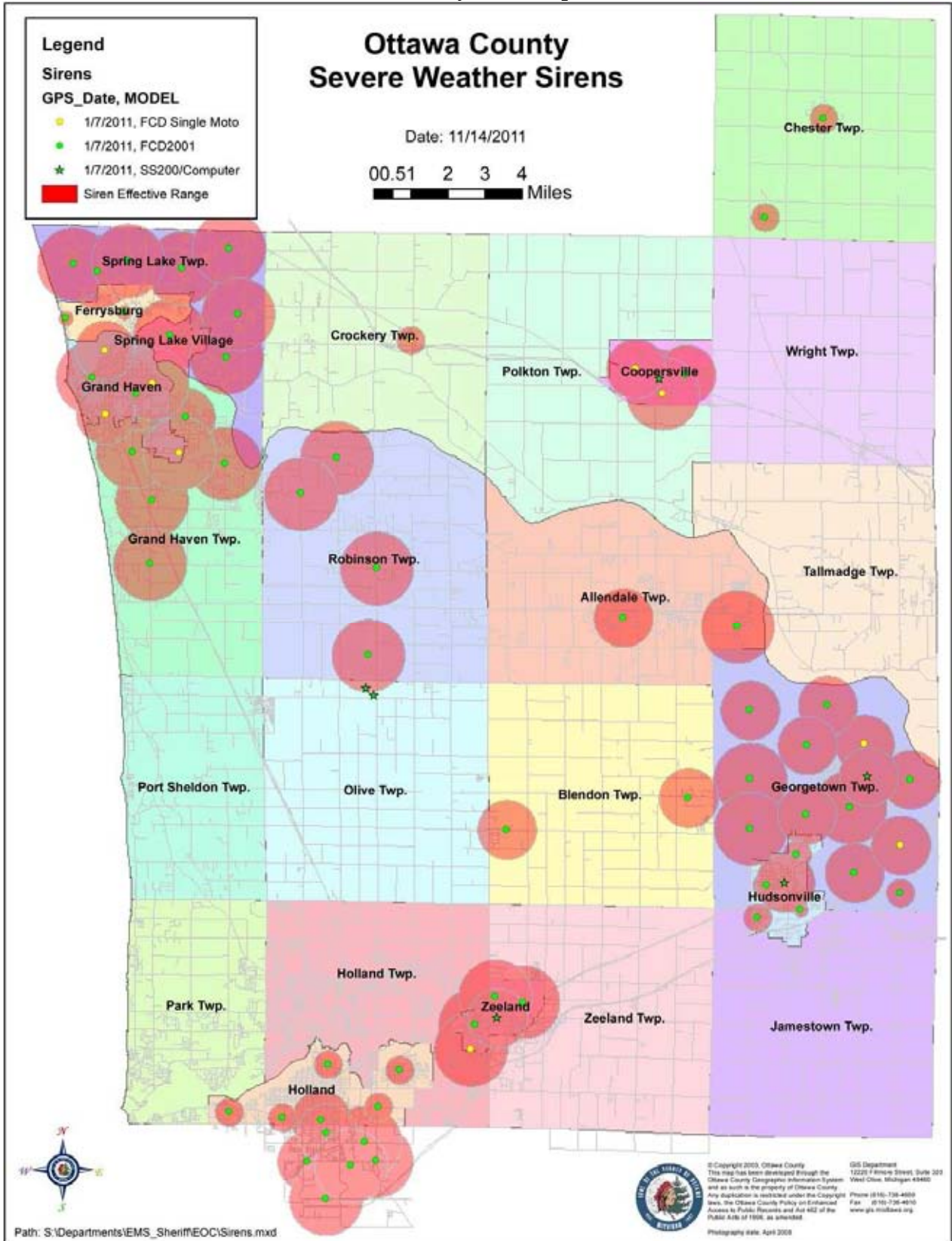
Existing prevention programs are in place, but have not been tested over a long time period. Programs such as Miss Dig help to keep the infrastructure intact.

Sirens used for emergency communication warnings are used in both counties, but the system is not universal. Information on existing siren warning infrastructure is provided on the following pages.

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)

Risk/Likelihood

The likelihood of communications 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.

Ottawa County Siren Information (these sirens have all been updated to be 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	8 sq miles
Zeeland EOC	1	4 sq miles

Water System Failure

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.

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.

Historically Significant and Related Events

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.

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. Redundency and back-up systems are in place to reduce the risk of water infrastructure failure.

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.

Sanitary Sewer Failure

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.

Hazard Description

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

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.

Existing Prevention Programs

Sanitary sewer systems across the area vary from single residential septic tank systems to cross-linked 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.

Risk/Likelihood

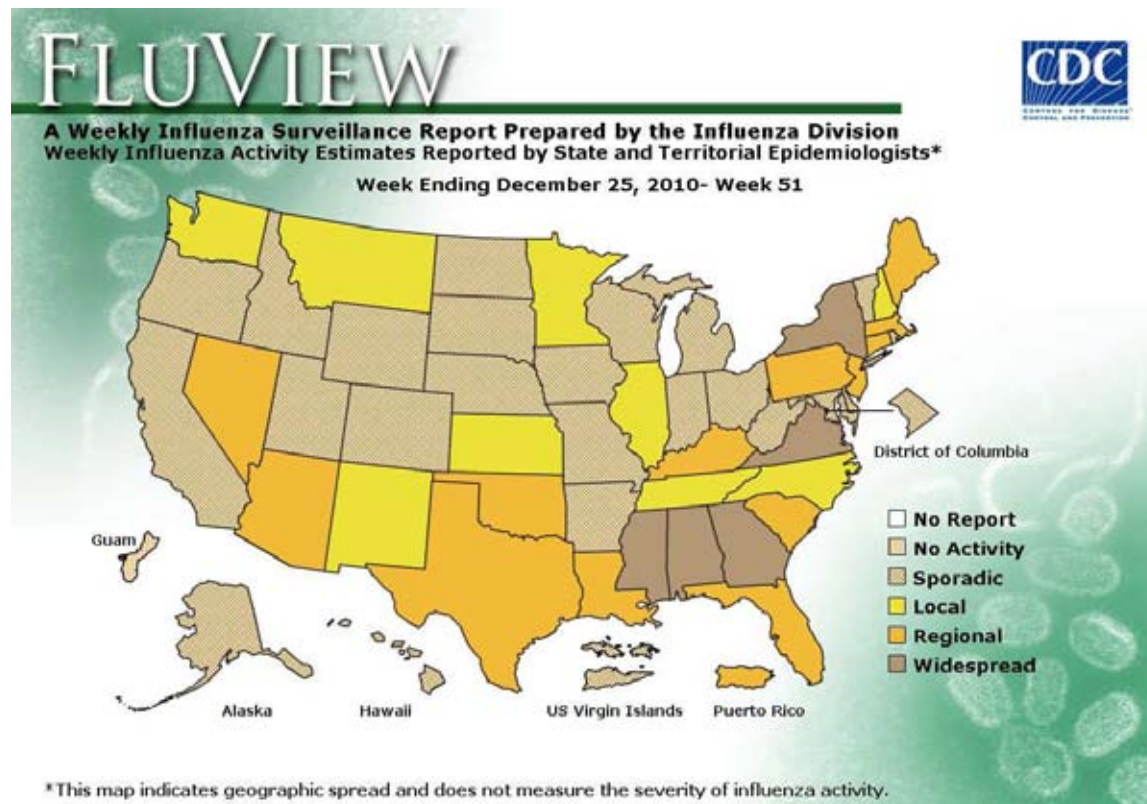
The sanitary sewer system is not fail-safe, however, the risk of failure continues to decrease as progress is made on the long term combined sewer overflow project. Modern engineering, materials, construction, and planning and zoning have made the sanitary sewer system more reliable. The potential for 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.

Public Health Emergency

Summary

Communicable disease is a threat to all residents. Disease is more easily transmitted between people in areas of concentrated population, such as public gathering areas, schools, and businesses. Communicable disease surveillance and outbreak investigation, vaccination, education, and other mitigation programs help to safeguard public health.

The Centers for Disease Control and Prevention (CDC) use maps such as this to monitor weekly reports of influenza activity and its geographic spread.



Hazard Description

A public health emergency is a widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and wellbeing of the public. Public health emergencies can take many forms, including but not limited to (1) disease epidemics; (2) large-scale incidents of food and water contamination; (3) extended periods without adequate public water and/or sewer services; (4) harmful exposure to chemical, radiological or biological agents; and (5) large-scale infestations of disease vectors, such as insects or rodents.

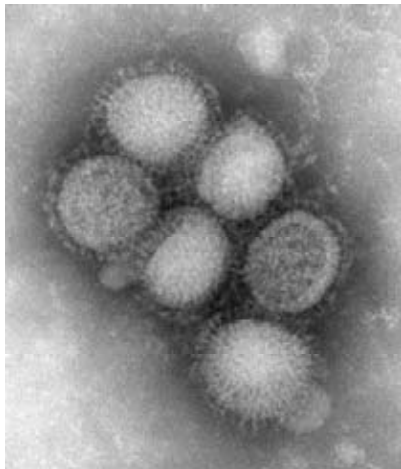
Public health emergencies may occur as primary events, or may be secondary to other disasters or emergencies, such as a flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people.

Historically Significant and Related Events

Communicable disease and epidemics have occurred throughout history. The most recent outbreak of significance occurred in 2009 with the emergence of the 2009 H1N1 Flu pandemic. The 2009-2010 influenza season in Kent County was unlike any seen in recent history. During 2009-2010, influenza season peaked during the last week of October. Typically, influenza activity peaks sometime between

January and March. During 2009-2010, however, very little influenza activity occurred after the month of November. By the end of 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). Through the end of April, schools and daycare centers reported 36,689 cases of respiratory flu and 33,847 of “unknown” flu. These numbers were much greater than the numbers reported over a similar time frame during the 2008-2009 influenza season (24,351 cases of respiratory flu and 30,703 cases of “unknown” flu).

The health department 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 County, and launched a mass-vaccination campaign in late October 2009 (when vaccine became available). These combined efforts helped reduce the impact of 2009 H1N1 Flu in Kent County.



2009 H1N1 Flu virus image courtesy of CDC Influenza Laboratory.

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.

A multi-state outbreak of Listeriosis, from August 1998 to February 1999, had its origin at a Bil Mar Foods meat plant in Zeeland in Ottawa County. (Listeriosis is caused by the foodborne bacterium *Listeria monocytogenes*, commonly call Listeria, that can cause serious illness and death to pregnant women, newborns, older adults, and persons with weakened immune systems.) Health officials identified the vehicle for transmission of the *Listeria* bacterium as hot dogs and deli meats produced at the plant under numerous brand names. The exact source of the contamination was not determined. A total of 21 deaths and 100 illnesses nationwide had been linked to the contaminated meats. In December, 1998, 35 million pounds of hot dogs and deli meats were voluntarily recalled by the manufacturer, the largest meat recall in U.S. history. Once the recall was instituted, the number of illnesses caused by the outbreak decreased dramatically. The Zeeland plant was allowed to resume meat production in March, 1999, after more stringent food safety procedures were implemented. In 2002, at least 40 persons were sickened and 10 were killed in a nationwide listeria outbreak linked to the meat company Pilgrim’s Pride Corp. The company then recalled 27.4 million pounds of meat, after tests at a Pennsylvania plant revealed strains of *Listeria monocytogenes* that matched the outbreak strain.

In addition to pandemic influenza, in April 2007, a Kent County dermatologist was tried and convicted in U.S. District Court for the Western District of Michigan on charges of health care fraud.

During the course of the investigation, the federal investigators became aware of information that may have had public health implications and the dermatology office was immediately closed. Possible public health issues surfaced in uncorroborated statements made by some of the dermatologist's staff, who were not medical personnel, indicating that the dermatologist may have been cleaning and reusing medical instruments originally designed and intended for use only on one patient. These instruments included scalpels, syringes, gloves and suture materials. The dermatologist allegedly placed the scalpels and suture material in a sterilizing solution before they were used on other patients, and while this sterilizing solution has proven to be effective against bloodborne viruses, it is not a standard accepted medical practice for medical instruments that penetrate skin. Statements indicated that the use of traditional sterilization techniques stopped approximately thirteen (13) years before.

The public health investigation was hindered by the fact that there was an ongoing criminal investigation. The statements made by employees remained largely uncorroborated throughout the investigation period. While unable to conduct a typical public health investigation, KCHD worked collaboratively with the U.S. Attorney's Office and by the end of October 2007, had determined that sufficient confirmation of events had been obtained, and a public health alert was issued.

The viruses of concern included Hepatitis B, Hepatitis C, and Human Immunodeficiency Virus (HIV). The risk assessment conducted by KCHD indicated that the risk of acquiring Hepatitis B, C or HIV through procedures performed by the dermatologist was very low, but not zero. To be prudent, KCHD recommended that anyone who had undergone a surgical procedure performed by the dermatologist in the fifteen (15) years prior to November 2007 should consult their physicians and be tested for Hepatitis B, Hepatitis C, and HIV. This recommendation extended to patients of the dermatologist's office in a neighboring county, under the assumption that the same medical practices were in place. Personal notification and fact sheets were sent to over 4,900 patients in November 2007, and subsequent to executing search warrants and cross referencing the dermatologist's files with the initial 4,900 records, an additional 8,500 personal notifications were mailed in January 2008.

KCHD worked closely with medical providers to ensure that they had the tools necessary for risk assessment and testing guidelines. For patients without medical insurance or those who wished to be tested by the health department, KCHD established a public information and scheduling line and held venous blood-draw clinics from November 2007 through January 2008.

Existing Prevention Programs

Local health departments are committed to protecting health and safety, and they coordinate their emergency preparedness and response with local, regional, and state officials. Emergency preparedness applies to natural and man-made disasters. Examples of public health emergencies include large-scale disease outbreaks caused by contaminated food, water, or air. Natural disasters, emerging diseases, and potential terrorist threats involving biological, chemical, radiological, or nuclear exposure are all areas of potential focus for public health collaboration, planning, and response. Examples of public health responsibilities include (1) food safety; (2) mass vaccination or antibiotic/antiviral medication distribution; (3) drinking water safety; (4) quarantine/isolation authority; (5) communicable disease containment and surveillance; (6) epidemiology; (7) pest infestation control; and (8) public education.

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

Risk/Likelihood

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

Disease outbreaks should be viewed as ongoing events which much must be managed to protect public health and safety. This all-hazards plan will help to promote mitigation efforts in a manner that does not adversely affect public health initiatives.

Human-Related Events

Hazardous Material Release

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.

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.

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 the blaze. There was a at least one reported injury. (September 15, 2007)

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 truck and 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)

One indicator of hazardous materials incident frequency and severity can be found in the following sample of NFIRS data from Kent County over a 10-year period. (Updated information was not readily usable for the update of this plan.) The information documents the Hazardous Materials Evacuation Reports that were coded in NFIRS over the 10-year period between 1995 and 2005. (Selected Coded Field: Area Evacuated Units). Mutual aid was not reported as being provided during this period.

DESCRIPTOR	FREQ (%)	EXPs	CIV DTHS (%)	CIV INJS (%)	FF DTHS (%)	FF INJS (%)	PROP LOSS (%)	CONT LOSS (%)	TOTAL LOSS (%)
1. Square Feet	67 (91.78%)	0	0 (0.00%)	15 (55.56%)	0 (0.00%)	2 (66.67%)	0 (0.00%)	500 (25.00%)	500 (7.69%)
2. Blocks	4 (5.48%)	0	0 (0.00%)	12 (44.44%)	0 (0.00%)	1 (33.33%)	4,500 (100.00%)	1,500 (75.00%)	6,000 (92.31%)
3. Square Miles	2 (2.74%)	0	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Totals	73 (100.00%)	0	0 (100.00%)	27 (100.00%)	0 (100.00%)	3 (100.00%)	4,500 (100.00%)	2,000 (100.00%)	6,500 (100.00%)

DESCRIPTOR	FREQ (%)	EXPs	CIV DTHS (%)	CIV INJS (%)	FF DTHS (%)	FF INJS (%)	PROP LOSS (%)	CONT LOSS (%)	TOTAL LOSS (%)
1. Square Feet	5 (100%)	0	0 (0.00%)	1 (100.00%)	0 (0.00%)	1 (100.00%)	1,035,000 (100.00%)	265,000 (100.00%)	1,300,000 (100%)
Totals	5 (100%)	0	0 (100%)	1 (100.00%)	0 (100.00%)	1 (100.00%)	1,035,000 (100.00%)	265,000 (100.00%)	1,300,000 (100%)

Hazard Identification and Overview

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.

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 2011), by community and its number of EHS facilities:

Ada	4	Cutlerville	1	Plainfield	6
Alpine	40	Dutton	4	Rockford	2
Bowne	2	Freeport	0	Sand Lake	2
Byron	10	Gr. Rapids Twp.	2	Solon Twp.	1
Caledonia (Twp & Village)	2	Grattan	18	Sparta	17
Cannon	3	Grandville	4	Spencer Twp.	0
Cascade	14	Kent City	7	Walker	14
Casnovia	1	Kentwood	23	Wyoming	36
Cedar Springs	2	Lowell	8		
Courtland	11	Oakfield	7		

The Ottawa County EHS communities are listed below, with each's number of facilities. All of these EHS sites have plans (Note: West Olive breaks down into 4 in Olive Township and 5 in Port Sheldon Township):

Jamestown	1	West Olive	11	Dorr	1
Jenison	2	Zeeland	17	Grand Haven	11
Marne	4	Allendale	1	Tallmadge Township	2
Nunica	3	Conklin (Chester Township)	16	Holland	36
Spring Lake	4	Coopersville	12	Hudsonville	8

Both counties have strong local emergency planning committees with active planning for the extremely hazardous substance (EHS) sites. Kent County has 241 Extremely Hazardous Substance (EHS) sites. These sites include fixed facilities and farms. Ottawa County has 168 Extremely Hazardous Substance (EHS) sites, 144 of which are active. In Kent County, 73 non-farm facilities have a completed plan for 100% compliance. Of 56 farms, 45 had completed plans (80% compliance) by the mid-2000s. The City of Grand Rapids had 34 EHS sites in 2011 (22 of which had plans).

Emergency Tubes, provided through the Groundwater Stewardship program, give first responders critical information when responding to a call on the farm. The tubes are located on a farm and filled with printed information about the chemicals stored on the farm, responder information, etc. 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.

Risk/Likelihood

Both Kent and Ottawa County LEPCs are very active and help to reduce the likelihood of hazardous materials incidents. Hazardous materials are an integral part of our economy and way of life. Risk of a hazardous materials 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.

Transportation Accidents

Summary

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

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.

Historically Significant and Related Events

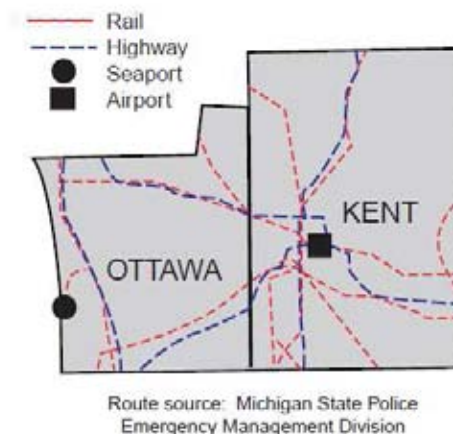
Holland Twp. (Ottawa County)--A freight train derailed, causing a spill of hydrogen fluoride. The accident prompted the evacuation of 1,500 persons. (November 12, 1979)

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.

Existing Prevention Programs

The NTSB was assigned the role of integrating the resources of the Federal Government with those of local and state authorities and the airlines to meet the needs of aviation disaster victims and 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.

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.

Nuclear Power Plant Accidents

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).

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.

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.

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.

Risk/Likelihood

Current NRC regulations are based largely on deterministic analyses developed without the benefit of quantitative or measurable estimates of risk. Most NRC regulatory requirements were 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]).

Intentional Acts

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.

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.

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.

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.

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.

Population Trends in the Region

The new population information from the 2010 census provides information about population trends in the many communities of Kent and Ottawa Counties. The following list of communities states the 2010 census population (followed in parentheses by the percent change in population since the last census in 2000). The list has been arranged in a manner that suggests each community's geographic location within the two-county region. NOTE: Villages have their names listed in parentheses because their population figures (unlike cities) are here included with the population of the township(s) in which they are co-located.

Kent County → 602,622 (+4.9%)			Tyrone Township 4,731 (+9.9%) (Casnovia) 319 (+2.2%) (Kent City) 1057 (-0.5%)	Solon Township 5,974 (+29.1%) Cedar Springs 3,509 (+10.9%)	(Sand Lake) 500 (+1.6%) Nelson Township 4,764 (+14.1%)	Spencer Township 3,960 (+7.6%)
Ottawa County 263,801 (+10.6%)			Chester Township 2,017 (-12.9%)	Sparta Township 9,110 (+2.0%) (Sparta) 4140 (-0.7%)	<u>Algoma Township</u> 9,932 (+30.9%) <u>Rockford</u> 5,719 (+23.5%)	Courtland Township 7,678 Oakfield Township 5,782 (+14.4%)
Spring Lake Township 14,300 (+8.8%) Ferrysburg 2,892 (-4.9%)	Crockery Township 3,960 (+4.7%) (Spring Lake) 2323 (-7.6%)	Polkton Township 2,423 (+3.8%) Coopersville 4,275 (+9.3%)	Wright Township 3,147 (-4.2%)	<u>Alpine Township</u> 13,336 (-4.6%)	<u>Plainfield Township</u> 30,952 (+2.5%)	<u>Cannon Township</u> 13,336 (+10.4%) Grattan Township 3,621 (+1.9%)
Grand Haven 10,412 (-6.8%) Grand Haven Township 15,178 (+14.3%)	Robinson Township 6,084 (+8.9%)	<u>Allendale Township</u> 20,708 (+58.8%)	Tallmadge Township 7,575 (+10.1%)	<u>Walker</u> 23,537 (+7.8%) <u>Grand Rapids</u> 188,040 (-4.9%)	<u>Grand Rapids Township</u> 16,661 (+18.5%) <u>East Grand Rapids</u> 10,694 (-0.6%)	<u>Ada Township</u> 13,142 (+33.0%) Vergennes Township 4,189 (+16.0%)
Port Sheldon Township 4,240 (-4.2%)	Olive Township 4,735 (-0.7%)	Blendon Township 5,772 (+0.9%)	<u>Georgetown Township</u> 46,985 (+12.8%) <u>Hudsonville</u> 7,116 (-0.6%)	<u>Grandville</u> 15,378 (-5.4%) <u>Wyoming</u> 72,125 (+4.0%)	<u>Kentwood</u> 48,707 (+7.6%)	<u>Cascade Township</u> 17,134 (+13.4%) Lowell Township 5,949 (+14.0%)
Park Township 17,802 (+1.3%)	Holland Township 35,636 (+23.2%) Holland (Ottawa part) 26,035 (-6.5%)	Zeeland Township 9,971 (+31.0%) Zeeland 5,504 (-5.2%)	Jamestown Township 7,034 (+39.0%)	<u>Byron Township</u> 20,317 (+15.9%)	<u>Gaines Township</u> 25,146 (+25.0%)	<u>Caledonia Township</u> 12,332 (+37.6%) (Caledonia) 1511 (+37.1%) Bowne Township 3,084 (+12.4%)

The total for the 6 contiguous cities (all in Kent County, whose names are underlined in bold type above) that make up the central Grand Rapids metro area in 2010 was 358,481, down a slight 0.8% from the 2000 total of 361,292. The broader urban area (including nearby townships, their villages, and non-contiguous cities that have at least 280 persons per square mile—a somewhat arbitrary cutpoint) did grow significantly, however, totaling 611,297 in 2010, up 25.8% from 486,084 in 2000. These additional suburban areas have their names underlined above (but are not in bolded type).

Two other notable metro areas also present, at least in part, in Ottawa County. The southwest portion of the county has the densest portions of the Holland-Zeeland urban area, and the portion of this

area's population that lives in Ottawa County totaled 94,948 in 2010, up 8.2% from 87,754 in 2000. The northwest portion of the county has a Grand Haven urban area (which is adjacent to the larger Muskegon area across the county line, but should not necessarily yet be considered to be a combined metro area for all purposes). The Grand Haven area's 2010 population was 42,782, up 5.3% from 40,626 in 2000.

These trends can generally be characterized in terms of denser central areas gradually losing some of their population, as lower density surrounding areas continue to be built up. Some rural areas have declined while others have gained, but the predominant trends in the region have been defined in terms of the suburban and exurban growth from the central cities, and those who commute to them. The region hopes this plan continues to raise awareness of hazard locations and conditions in a manner that encourages local and regional development plans to avoid authorizing developments in inappropriately high-risk areas, though the inclusion of hazard mitigation, prevention, and awareness activities in other plans, including community master plans (as they're updated).

Risk Assessment

Evaluation Measures and Benchmark Factors

In order to profile and evaluate hazards, a set of 12 evaluation measures was used for each hazard, with each measure being given a weighted rating along a four-category scale. The following is a description of the measures and scales used in this analysis. The scale categories include a weighting by point value. The 12 evaluation measures are listed in order of priority.

Historical Occurrence

Historical occurrence measures the frequency with which a particular hazard occurs in the Greater Grand Rapids area. The more frequently a hazard event occurs, the more potential there is for damage and negative impact on the community. The specific benchmark factors used in the historical occurrence analysis are:

10 points: Excessive Occurrence, indicating the hazard event is likely to occur 4 or more times per year;

7 points: High Occurrence, indicating the hazard event is likely to occur 2-3 times per year;

4 points: Medium Occurrence, indicating the hazard event is likely to occur 1 time per year;

1 point: Low Occurrence, indicating the hazard event occurs less than once per year.

Seriously Affected Population

Seriously affected population refers to the number of people in the Greater Grand Rapids area who can expect to be directly affected by a particular hazard event, either because they receive physical injury, property damage, economic hardship, or their day to day activities are severely disrupted because of severe damage to their community of residence or work. Specific benchmark factors used in the severely affected population impact analysis are:

10 points: Significant Population Affected, indicating more than 100,000 people are likely to be affected by the hazard event;

7 points: High Population Affected, indicating 50,000 to 100,000 people are likely to be affected by the hazard event;

4 points: Medium Population Affected, indicating 10,000 to 50,000 people are likely to be affected by the hazard event;

1 point: Low Population Affected, indicating fewer than 10,000 people are likely to be affected by the hazard event.

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. The specific benchmark factors used in the collateral damage analysis are:

10 points: High Possibility, indicating there is a great likelihood (76 % chance or greater) that the hazard event will cause secondary hazard events and damage;

7 points: Good Possibility, indicating there is a higher than average likelihood (50 to 75 % chance) that the hazard event will cause secondary hazard events and damage;

4 points: Some Possibility, indicating there is a less than average likelihood (less than 50 % chance) that a hazard event will cause secondary hazard events and damage;

1 point: No Possibility, indicating there is virtually no likelihood (0 % chance) that a particular hazard event will cause secondary hazard events and damage.

Population Impact

Population impact refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs. Specific benchmark factors used in the population impact analysis are:

10 points: High Impact, indicating 10 or more casualties can be expected;

7 points: Medium Impact, indicating 6-1 casualties can be expected;

- 4 points:** Low Impact, indicating 1-5 casualties can be expected;
- 1 point:** No Impact (none), indicating that no casualties can be expected.

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. Specific benchmark factors used in the economic impact analysis are:

- 10 points:** Significant Effects, indicating over \$100,000 in monetary damages incurred;
- 7 points:** Medium Effects, indicating \$50,000 to \$100,000 in monetary damages incurred;
- 4 points:** Low Effects, indicating \$10,000 to \$50,000 in monetary damages incurred;
- 1 point:** Minimal Effects, indicating less than \$10,000 in monetary damages incurred.

Affected Area

Each hazard affects a geographical area. For example, a blizzard might affect the entire Greater Grand Rapids area, 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. The specific benchmark factors used in the affected area analysis are:

- 10 points:** Large Area, if a hazard event has the potential to impact 3 or more townships or communities;
- 7 points:** Small Area, if the hazard event could impact 1 or 2 townships or communities;
- 4 points:** Multiple Sites, if the hazard event could impact more than one area within a township or community;
- 1 point:** Single Site, if the hazard event is likely to only impact a small area within a township or community.

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. Specific benchmark factors used in the duration analysis are:

- 10 points:** Long Duration, indicating the hazard event is likely to last longer than 1 week;
- 7 points:** Medium Duration, indicating the hazard event is likely to last from 1 day to 1 week;
- 4 points:** Short Duration, indicating the hazard event is likely to last from 12 to 24 hours;
- 1 point:** Minimal Duration, indicating the hazard event is likely to last less than 12 hours.

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 with 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. The specific benchmark factors used in the availability of warning analysis are:

- 1 point:** Warning Available, indicating that the nature of the hazard is such that warning of the hazard event is always available (100 %) and received in a timely manner;
- 4 points:** Warning Sometimes Available, indicating that the nature of the hazard is such that warning of the hazard event is available most of the time (50 to 99 %) and received in a timely manner;
- 7 points:** Warning Generally Not Available, indicating that the nature of the hazard is such that warning of the hazard event is generally not available (less than 50 %) and generally not received in a timely manner;
- 10 points:** Warning Unavailable, indicating that the nature of the hazard is such that warning of the hazard event is not available.

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. The specific benchmark factors used in the speed of onset analysis are:

10 points: Minimal or No Warning, indicating the hazard event could occur without any advanced notice or warning;

7 points: Less than 12 Hours, indicating the hazard event usually allows less than 12 hours advance notice before occurring;

4 points: 12-24 Hours, indicating the hazard event generally allows 12-24 hours advanced notice before occurring;

1 point: Greater than 24 Hours, indicating the hazard event generally allows more than 24 hours advance notice before occurring.

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. The specific benchmark factors used in the seasonal pattern analysis are:

10 points: Year-round Occurrence, indicating the hazard event can occur at any time of the year;

7 points: Three Season Occurrence, indicating the hazard event can realistically occur during 3 seasons of the year;

4 points: Two Season Occurrence, indicating the hazard event can realistically occur during 2 seasons of the year;

1 point: One Season Occurrence, indicating the hazard event realistically occurs during only 1 season of the year.

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. The specific benchmark factors used in the predictability analysis are:

10 points: Unpredictable, indicating the hazard is extremely difficult, if not impossible, to predict;

7 points: Somewhat Predictable, indicating the time of occurrence, location, and magnitude of the hazard can be predicted with less than 50 % accuracy;

4 points: Predictable, indicating the time of occurrence, location, and magnitude of the hazard can be predicted at 50 % or greater accuracy;

1 point: Highly Predictable, indicating the time of occurrence, location, and magnitude of the hazard is predictable virtually 100 % of the time.

Mitigation Potential

Mitigation potential refers to the relative ease with which a particular hazard event can be mitigated against through the application of structural or non-structural (or both) mitigation measures. Generally, the easier a hazard event is to mitigate against, the less of a future threat it may pose to a community in terms of loss of life and property. The specific benchmark factors for the mitigative potential analysis are:

1 point: Easy to Mitigate, indicating there are a wide variety of structural and nonstructural measures that can be reasonably and economically applied to lessen or eliminate future vulnerability;

4 points: Possible to Mitigate, indicating there are some structural and non-structural measures that can be applied, but not all can be applied in an economic manner or are completely effective to lessen or eliminate future vulnerability;

7 points: Difficult to Mitigate, indicating that there are very limited choices for mitigating, and not all measures may prove effective in lessening the vulnerability to the hazard;

10 points: Very Difficult to Mitigate, the hazard itself cannot be mitigated, although vulnerability can be lessened by focusing upon characteristics of physical development and awareness of the population.

Hazard Scoring

In order to rank the hazards from most severe threat to least threat to Greater Grand Rapids area, each aspect of every hazard has been assigned a specific point value of 10, 7, 4, or 1 point, based on each factor's relative severity and negative impacts. A higher point value was given to aspects and hazards that were associated with a more severe potential impact. Each evaluation measure was then weighted to reflect the fact that some impacts are more significant than others. Hazard weighting of the 12 measures was done in a way that emphasizes those measures that were deemed most important by the region's reviewers and communities. For simplicity of process and feedback, the weighting used a rank order for each of the 12 measures, 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 benchmark factor is multiplied by the weight, the measure receives more emphasis (points) than the other measures that are not assigned such a high weight. This way, the resulting quantitative analysis better states which areas are deemed most important. The following is a list of the measures and their assigned weight:

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 was then obtained by multiplying each measure's benchmark factor point value by the weight, giving the total score for that particular measure. Then the points for all the measures were summed for each hazard, giving each natural hazard a total hazard score. To make this score more intuitively understandable, the result was then converted to a standardized scale from 1 to 100, using a standard mathematical procedure for such conversions.

Hazard Ranking

The total hazard scores can then be compared to rank all the region's hazards. The most highly rated hazards were considered to pose the greatest threat to the most people in the Greater Grand Rapids area. The ranking process is not intended to discount the threat of any particular hazard and the hazards elaborated upon in the HMP are real threats to the Greater Grand Rapids area. Rather, the hazard ranking process allowed the overall comparison of hazards to each other, to estimate the amount and types of risks and impacts they present, with an emphasis upon hazards with the potential to injure or kill the most people in the area and cause the greatest economic hardship. For example, shoreline flooding and erosion can have a serious impact upon the homes, businesses, and roads located along the lakeshore, but will not directly affect persons living farther inland. On the other hand, severe winter weather such as a blizzard typically has a greater impact upon most communities in the region, year after year. The following is a summary of the total hazard score results and the hazard rankings.

Risk Assessment Scores

(Differences are noted where appropriate where communities or areas vary from the entire region.)

Extreme Temperatures

Historical Occurrence (frequency of event) [Weight: x 12]	Medium (4 points)	12 x 4 =	48
Seriously Affected Population [Weight: x 11]	10,000-50,000 (4 points)	11 x 4 =	44
Collateral Damage (secondary impacts) [Weight: x 10]	Significant (7 points)	10 x 7 =	70
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Minimal (1 point)	8 x 1 =	8
Affected Area (size of geographic area) [Weight: x 7]	Large Area (10 points)	7 x 10 =	70
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Available (1 point)	5 x 1 =	5
Speed of Onset (warning time) [Weight: x 4]	>24 hours (1 point)	4 x 1 =	4
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Two seasons (4 points)	3 x 4 =	12
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Very difficult (10 points)	1 x 10 =	10
			Total Score 357
			Adjusted Scale (0-100): 39.7

Thunderstorms (Hail, Lightning and Wind)

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	50,000-100,000 (7 points)	11 x 7 =	77
Collateral Damage (secondary impacts) [Weight: x 10]	Significant (7 points)	10 x 7 =	70
Population Impact (# of casualties) [Weight: x 9]	Very Low, 0-1 (2 points)	9 x 2 =	18
Economic Effects (\$ damage losses) [Weight: x 8]	Low (4 points)	8 x 4 =	32
Affected Area (size of geographic area) [Weight: x 7]	Multiple Sites (4 points)	7 x 4 =	28
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 point)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 point)	4 x 7 =	28
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Three seasons (7 points)	3 x 7 =	21
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 435
			Adjusted Scale (0-100): 50.9

Tornados

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	10,000-50,000 (4 points)	11 x 4 =	44
Collateral Damage (secondary impacts) [Weight: x 10]	High (10 points)	10 x 10 =	100
Population Impact (# of casualties) [Weight: x 9]	Medium, 6-10 (7 points)	9 x 7 =	63
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 point)	8 x 10 =	80
Affected Area (size of geographic area) [Weight: x 7]	Small Area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	Minimal/None (10 point)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Three seasons (7 points)	3 x 7 =	21
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 456
			Adjusted Scale (0-100): 53.8

Droughts

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 points)	8 x 10 =	80
(Economic Effects for the City of Grand Rapids :)	Low (4 points)	(8 x 4 =	32)
Affected Area (size of geographic area) [Weight: x 7]	Large Area (10 points)	7 x 10 =	70
Duration (time period hazard does damage) [Weight: x 6]	Long (10 points)	6 x 10 =	60
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Available (1 point)	5 x 1 =	5
Speed of Onset (warning time) [Weight: x 4]	>24 hours (1 point)	4 x 1 =	4
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Two seasons (4 points)	3 x 4 =	12
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Very difficult (10 points)	1 x 10 =	10

Total Score 321

(Grand Rapids Total Score: 273)

Adjusted Scale (0-100): 34.6

(Adjusted Scale for Grand Rapids: 27.8)

Severe Winter Weather (Snow, Ice and Blizzard)

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	>100,000 (10 points)	11 x 10 =	110
Collateral Damage (secondary impacts) [Weight: x 10]	High (10 points)	10 x 10 =	100
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Large Area (10 points)	7 x 10 =	70
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	12-24 hours (4 point)	4 x 4 =	16
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Two seasons (4 points)	3 x 4 =	12
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7

Total Score 561

Adjusted Scale (0-100): 68.8

Shoreline Flooding and Erosion Hazard

NOTE: This hazard only applies to the shoreline jurisdictions of Ottawa County: The cities of Ferrysburg and Grand Haven, and the townships of Grand Haven, Park, Port Sheldon, and Spring Lake.

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 points)	8 x 10 =	80
Affected Area (size of geographic area) [Weight: x 7]	Large Area (10 points)	7 x 10 =	70
Duration (time period hazard does damage) [Weight: x 6]	Long (10 points)	6 x 10 =	60
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 point)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	>24 hours (1 point)	4 x 1 =	4
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Highly Predictable (1 pt.)	2 x 1 =	2
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 342

Adjusted Scale (0-100): 37.6

Landslides

NOTE: These scores are primarily for the shoreline jurisdictions of Ottawa County: The cities of Ferrysburg and Grand Haven, and the townships of Grand Haven, Park, Port Sheldon, and Spring Lake. The City of Grand Rapids has also been scored (differently), as noted below.

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Low (4 point)	8 x 4 =	32
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
(Duration rating for the City of Grand Rapids ;))	Short (4 points)	(6 x 4 =	24)
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 points)	4 x 7 =	28
(Speed of Onset for the City of Grand Rapids ;))	Minimal/None (10 points)	(4 x 10 =	40)
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
(Seasonal Pattern for the City of Grand Rapids ;))	One Season (1 point)	(3 x 1 =	3)
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
(Mitigation Potential for the City of Grand Rapids ;))	Easy (1 points)	(1 x 1 =	1)

Total Score 243

(Grand Rapids Total Score: 240)

Adjusted Scale (0-100): 23.5

(Adjusted Scale for Grand Rapids: 23.1)

Earthquakes

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Multiple sites (4 points)	7 x 4 =	28
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Unavailable (10 points)	5 x 10 =	50
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 327

Adjusted Scale (0-100): 35.5

Wildfires

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 points)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Minimal (1 point)	8 x 1 =	8
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Short (4 points)	6 x 4 =	24
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Generally not avail (7 pts.)	5 x 7 =	35
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Two seasons (4 points)	3 x 4 =	12
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 330

Adjusted Scale (0-100): 35.9

Urban and Structural Fires

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 point)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 390

Adjusted Scale (0-100): 44.4

Other Fire Hazards

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 points)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Low (4 points)	8 x 4 =	32
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Generally not avail (7 pts.)	5 x 7 =	35
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7

Total Score 276

Adjusted Scale (0-100): 28.2

Dam Failure Flooding

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Significant (7 points)	10 x 7 =	70
(Kent County Collateral Damage)	High (10 points)	(10 x 10 =	100)
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 point)	8 x 10 =	80
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 point)	4 x 7 =	28
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 354

(Kent County Total Score 384)

Adjusted Scale (0-100): 39.3

(Adjusted Scale for Kent County: 43.6)

Riverine Flooding

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	High (10 points)	10 x 10 =	100
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 points)	8 x 10 =	80
Affected Area (size of geographic area) [Weight: x 7]	Small area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 point)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	>24 hours (1 point)	4 x 1 =	4
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 447

Adjusted Scale (0-100): 52.6

Urban Flooding

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	10,000-50,000 (4 points)	11 x 4 =	44
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Small area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 point)	4 x 7 =	28
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Three seasons (7 points)	3 x 7 =	21
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4

Total Score 411

Adjusted Scale (0-100): 47.4

Electrical Failure

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	>100,000 (10 points)	11 x 10 =	110
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Small area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Generally not avail (7 pts.)	5 x 7 =	35
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 points)	4 x 7 =	28
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7

Total Score 504

Adjusted Scale (0-100): 60.7

Communications Failure

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	50,000-100,000 (7 points)	11 x 7 =	77
Collateral Damage (secondary impacts) [Weight: x 10]	Significant (7 points)	10 x 7 =	70
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 point)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Small area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Short (4 points)	6 x 4 =	24
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Unavailable (10 points)	5 x 10 =	50
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 444
			Adjusted Scale (0-100): 52.1

Water System Failure

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 points)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Short (4 points)	6 x 4 =	24
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 point)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 384
			Adjusted Scale (0-100): 43.6

Sanitary Sewer Failure

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 4 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Low (4 points)	8 x 4 =	32
Affected Area (size of geographic area) [Weight: x 7]	Small area (7 points)	7 x 7 =	49
Duration (time period hazard does damage) [Weight: x 6]	Short (4 points)	6 x 4 =	24
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	<12 hours (7 points)	4 x 7 =	28
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Two seasons (4 points)	3 x 4 =	12
Predictability (arrival time, location, magnitude) [Weight: x 2]	Somewhat (7 points)	2 x 7 =	14
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (10 points)	1 x 7 =	7
			Total Score 366
			Adjusted Scale (0-100): 41.0

Natural Epidemic

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	No (1 point)	10 x 1 =	10
Population Impact (# of casualties) [Weight: x 9]	High, 10+ (10 points)	9 x 10 =	90
Economic Effects (\$ damage losses) [Weight: x 8]	Significant (10 points)	8 x 10 =	80
Affected Area (size of geographic area) [Weight: x 7]	Large Area (10 points)	7 x 10 =	70
Duration (time period hazard does damage) [Weight: x 6]	Long (10 points)	6 x 10 =	60
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Available (1 point)	5 x 1 =	5
Speed of Onset (warning time) [Weight: x 4]	>24 hours (1 point)	4 x 1 =	4
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Easy (1 point)	1 x 1 =	1
			Total Score 381
			Adjusted Scale (0-100): 43.2

Hazardous Materials Release

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 1 =	56
Affected Area (size of geographic area) [Weight: x 7]	Multiple sites (4 points)	7 x 4 =	28
Duration (time period hazard does damage) [Weight: x 6]	Short (4 points)	6 x 4 =	24
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Possible (4 points)	1 x 4 =	4
			Total Score 393
			Adjusted Scale (0-100): 44.9

Transportation Accidents

Historical Occurrence (frequency of event) [Weight: x 12]	Excessive (10 points)	12 x 10 =	120
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 points)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 393
			Adjusted Scale (0-100): 44.9

Nuclear Power Plant Accidents

Historical Occurrence (frequency of event) [Weight: x 12]	Low (1 point)	12 x 1 =	12
Seriously Affected Population [Weight: x 11]	<10,000 (1 point)	11 x 1 =	11
Collateral Damage (secondary impacts) [Weight: x 10]	Significant (7 points)	10 x 7 =	70
Population Impact (# of casualties) [Weight: x 9]	None (1 point)	9 x 1 =	9
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 points)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Single site (1 point)	7 x 1 =	7
Duration (time period hazard does damage) [Weight: x 6]	Medium (7 points)	6 x 7 =	42
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Generally not avail (7 pts.)	5 x 7 =	35
Speed of Onset (warning time) [Weight: x 4]	Minimal/none (10 points)	4 x 10 =	40
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Unpredictable (10 points)	2 x 10 =	20
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 339
			Adjusted Scale (0-100): 37.2

Intentional Acts

Historical Occurrence (frequency of event) [Weight: x 12]	High (7 points)	12 x 7 =	84
Seriously Affected Population [Weight: x 11]	50,000-100,000 (7 points)	11 x 7 =	77
Collateral Damage (secondary impacts) [Weight: x 10]	Some (4 points)	10 x 4 =	40
Population Impact (# of casualties) [Weight: x 9]	Low, 1-5 (4 points)	9 x 4 =	36
Economic Effects (\$ damage losses) [Weight: x 8]	Medium (7 point)	8 x 7 =	56
Affected Area (size of geographic area) [Weight: x 7]	Multiple sites (4 points)	7 x 4 =	28
Duration (time period hazard does damage) [Weight: x 6]	Minimal (1 point)	6 x 1 =	6
Avail. of Warnings (ease of warning the public) [Weight: x 5]	Sometimes (4 point)	5 x 4 =	20
Speed of Onset (warning time) [Weight: x 4]	12-24 hours (4 points)	4 x 4 =	16
Seasonal Pattern (seasonal predictability) [Weight: x 3]	Year-round (10 points)	3 x 10 =	30
Predictability (arrival time, location, magnitude) [Weight: x 2]	Predictable (4 points)	2 x 4 =	8
Mitigation Potential (ease of mitigating hazard) [Weight: x 1]	Difficult (7 points)	1 x 7 =	7
			Total Score 408
			Adjusted Scale (0-100): 47.0

Only minor changes were considered necessary for the updated rankings in 2011, compared to the original 2006 plan. Wildfires were rated slightly higher, and (as shown in the following list), nuclear power plant accidents became lower-ranked than some other hazards.

Risk Assessment Score Ranking

Individual hazard risk assessment scores are ranked greatest to least:

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	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)

The standardized scale shows the relative severity of hazards, with the lowest possible concern being rated as 0 and the maximum possible concern rated as 100. The identified hazards range from 23.1 to 68.8, showing that the region has concerns but should not be considered to be especially prone to hazard impacts in general. Severe winter weather and electrical failure are distinguished as having the most widespread, frequent, and damaging effects, on balance. Tornadoes, flooding, and thunderstorm hazards follow, in a second tier of concern, and the main goals of this plan focus upon these highest priorities (while not neglecting other potential sources of risk). Various human-related and technological hazards follow—still of significant concern. A few areas were assessed as having slightly different risks from the rest of the region, as previously specified.

The following section of this document provides a set of hazard mitigation actions that could potentially reduce or prevent negative community impacts from these hazards. First, the table on the next page provides an overview of the relative risk that each hazard constitutes for the various local jurisdictions throughout the region. In the table, each community is matched with each type of hazard, which is given a coded symbol to represent the relative amount of risk it is currently considered to pose to the community (through the previous hazard assessment techniques). Hazards that were rated above 47.0 on the standardized scale above are marked with an H in the community table below, to signify “High Priority” hazards. Hazards rated from 39.5 and 47.0 are marked with an M, to signify “Medium Priority” hazards for each community. Hazards rated below 39.5 are not to be considered insignificant, but their rarer or less serious average impacts in the area have given them a relatively “Lower Priority” at this time, and thus they have been marked with an L in the table. Although some riverine flood risk priorities might seem to be adjustable, to distinguish communities with known significant risks from those with lesser risks, this was not done because unmapped lake and stream risks probably exist. NFIP participation is also noted.

Hazard Summary Table – by Community

	Winter Weather	Electr. Failure	Tornado	River Flooding	Commun. Fail	Thunderstorm	Urban Flooding	Intentional Act	Transport. Acc.	Haz. Mat. Rel.	Urban/Str. Fire	Water Syst. Fail	Epidemic	Nuc. Plant Acc.	San. Sewer Fail	Ext. Temps.	Dam Failure	Shoreline E/I/E	Earthquake	Drought	Wildfires	Other fires	Landslides
Ada Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Algoma Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Allendale Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Alpine Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Blendon Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Bowne Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Byron Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Caledonia (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Caledonia Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Cannon Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Cascade Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Casnovia (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Cedar Springs (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Chester Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Coopersville (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Courtland Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Crockery Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of East Grand Rapids (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Ferrysburg (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Gaines Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Georgetown Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grand Haven (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grand Haven Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grand Rapids (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grand Rapids Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Grandville (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Grattan Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Holland (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Holland Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Hudsonville (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Jamestown Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Kent City (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Kent County (K) (part NFIP)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Kentwood (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Lowell (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Lowell Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Nelson Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Oakfield Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Olive Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Ottawa County (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Park Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Plainfield Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Polkton Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Port Sheldon Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Rockford (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Robinson Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Sand Lake (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Solon Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Sparta (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Sparta Township (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Spencer Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Village of Spring Lake (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Spring Lake Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Tallmadge Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Tyrone Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Vergennes Township (K)	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Walker (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Wright Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Wyoming (K) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
City of Zeeland (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L
Zeeland Township (O) NFIP	H	H	H	H	H	H	H	M	M	M	M	M	M	L	M	M	M	L	L	L	L	L	L

Hazard Mitigation Strategy, Goals, and Action Plan

Strategy

The strategy of the regional hazard mitigation plan is to reduce the impact of hazards on citizen life, health and economic well-being based upon a continuing hazard risk and vulnerability analysis.

Goals

As a regional plan representing multiple agencies and jurisdictions, shared agreement exists about the need to mitigate the following top-priority hazards throughout the planning area. These goals have been amended from the previous 2006 edition of this plan, to make them more focused upon hazard mitigation actions, as follows:

1. 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.
2. Flooding – Efforts will continue to reduce the number of vulnerable structures in floodplain areas, and make any such at-risk properties less vulnerable, as funding, other resources, and the informed cooperation of property owners permits. Included in these efforts will be 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.
3. Communication Disruption – Continued reductions in communication infrastructure downtime will be sought and maintained, when possible.
4. Other hazard mitigation efforts – Other cost-effective or convenient hazard mitigation opportunities will be considered and sought, as opportunities and resources permit, to address any of the hazards considered within this plan to be significant in the region and/or its jurisdictions.

Action Plan and Priorities

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. Also 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 in general. More detail was then provided with regard to specific projects and locations where pressing action was deemed necessary, in a more focused way. 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.

1. 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.
2. Flood risk/vulnerability reduction: riverine flooding (447), urban flooding (411), dam failures (384/354), shoreline flooding/erosion (342), cumulative score—1584
3. Lessen communication disruptions: electrical failure (504), communications failure (444), cumulative score—948
4. Address other hazard mitigation concerns 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.)

Local jurisdictions that have structures in a floodplain would clearly have an interest in flood mitigation, but other jurisdictions also tend to have areas potentially at-risk from other flood-related issues such as dam failures, urban flooding, and infrastructure failure. All communities in the region are at risk from weather hazards, and all are likely to share a keen interest in better warning technology and reliable communications infrastructure.

The following more specific categories of hazard mitigation activities were identified and prioritized on this basis:

1. Severe Weather
 - a. Survey needs and add sirens to regions as needed.
 - b. 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.)
2. Flooding
 - a. Purchase eligible properties that are vulnerable to flooding, as funds become available.
 - b. Take measures to mitigate flood damage and reduce vulnerability to existing structures.
 - c. 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.
3. Communications Disruption
 - a. Identify infrastructure vulnerabilities.
 - b. Work with local utilities to develop a plan.
 - c. Implement measures identified in the plan.
4. Enhance, Strengthen, and Maintain Emergency Notification Systems Throughout the Region
5. All Communities to Consider NFIP Participation in Kent County
6. Area Master Plan Updates to Consider Hazard Mitigation Concepts and Actions
7. Other hazard mitigation strategies (specific to each hazard type, vulnerable system, or location)

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 strategies and actions:

1. “Communications” – Actions to bolster the dependability of emergency communication systems.
2. “Emerg. Notificatn.” – Actions to strengthen and maintain emergency notification systems.
3. “Consider NFIP” – Giving consideration to the potential benefits of active NFIP participation.
4. “Master plan cons.” – 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 Weath. pr.” – 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. “Infrastr. 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 Prepar.” – Fire-related actions such as prevention and awareness activities, evaluating staffing, training, and resource needs, consideration of fire-related regulations, evaluation of equipment and water supplies, wildfire risks, firebreak and FIREWISE protective activities.

Please note that 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. More detail on these strategies will appear later in the document.

Important organizational note:

The table is followed by a presentation of all the action items that had appeared in the 2006 edition of this plan, but should not be mistaken for the current and updated list of mitigation strategies, which follow it in later sections (and new community subsections) of the plan. Rather, this initial listing of 2006 hazard mitigation actions is included only for the purpose of providing a review of the previous plan and a brief summary of the current status of the actions that had been listed in that plan. The original listing of action items in 2006 was considered to be a bit inadequate for the vast assemblage of communities represented in the current plan—each of which now has been provided with a separate subsection that it will be able to review and update in future editions of this regional plan. Since there is a 5-year update cycle, mandated by federal regulations in order to preserve community eligibility for hazard mitigation project grants from FEMA, and this revised update was completed in early 2012, this means that each community will be expected by early 2017 to review, provide a brief description of the status/progress on the listed actions at that time, and (if necessary) make adjustments to its subsection and associated actions and priorities in order to reflect any accomplishments and changes in resources, risks, development trends, or other circumstances that may have affected the communities needs, concerns, and vulnerabilities during the time that had elapsed.

General Hazard Mitigation Objectives by Jurisdiction (community subsections have more items and detail)

	Communications	Emerg. Notificati	Consider NFIP	Master plan cons.	Flood mitigation	Severe Weath. pr.	Infrastr. Strength.	Fire Prepar.
Ada Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Algoma Township (K) NFIP	Y	Y		Y		Y	Y	Y
Allendale Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Alpine Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Blendon Township (O) NFIP	Y	Y		Y		Y	Y	Y
Bowne Township (K)	Y	Y	Y	Y		Y	Y	Y
Byron Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Caledonia (K)	Y	Y	Y	Y		Y	Y	Y
Caledonia Township (K) NFIP	Y	Y		Y		Y	Y	Y
Cannon Township (K) NFIP	Y	Y		Y		Y	Y	Y
Cascade Township (K) NFIP	Y	Y		Y		Y	Y	Y
Village of Casnovia (K)	Y	Y	Y	Y		Y	Y	Y
City of Cedar Springs (K)	Y	Y	Y	Y		Y	Y	Y
Chester Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Coopersville (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Courtland Township (K)	Y	Y	Y	Y		Y	Y	Y
Crockery Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of East Grand Rapids (K) NFIP	Y	Y		Y		Y	Y	Y
City of Ferrysburg (O) NFIP	Y	Y		Y		Y	Y	Y
Gaines Township (K)	Y	Y	Y	Y		Y	Y	Y
Georgetown Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Grand Haven (O) NFIP	Y	Y		Y		Y	Y	Y
Grand Haven Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Grand Rapids (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Grand Rapids Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Grandville (K) NFIP	Y	Y		Y		Y	Y	Y
Grattan Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Holland (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Holland Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Hudsonville (O) NFIP	Y	Y		Y		Y	Y	Y
Jamestown Township (O) NFIP	Y	Y		Y		Y	Y	Y
Village of Kent City (K)	Y	Y	Y	Y		Y	Y	Y
Kent County (K) (part NFIP)	Y	Y	Y	Y	Y	Y	Y	Y
City of Kentwood (K) NFIP	Y	Y		Y	Y	Y	Y	Y
City of Lowell (K) NFIP	Y	Y		Y		Y	Y	Y
Lowell Township (K)	Y	Y	Y	Y		Y	Y	Y
Nelson Township (K)	Y	Y	Y	Y		Y	Y	Y
Oakfield Township (K)	Y	Y	Y	Y		Y	Y	Y
Olive Township (O) NFIP	Y	Y		Y		Y	Y	Y
Ottawa County (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Park Township (O) NFIP	Y	Y		Y		Y	Y	Y
Plainfield Township (K) NFIP	Y	Y		Y	Y	Y	Y	Y
Polkton Township (O) NFIP	Y	Y		Y		Y	Y	Y
Port Sheldon Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Rockford (K)	Y	Y	Y	Y		Y	Y	Y
Robinson Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Village of Sand Lake (K)	Y	Y	Y	Y		Y	Y	Y
Solon Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Sparta (K) NFIP	Y	Y		Y		Y	Y	Y
Sparta Township (K) NFIP	Y	Y		Y		Y	Y	Y
Spencer Township (K)	Y	Y	Y	Y		Y	Y	Y
Village of Spring Lake (O) NFIP	Y	Y		Y		Y	Y	Y
Spring Lake Township (O) NFIP	Y	Y		Y		Y	Y	Y
Tallmadge Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y
Tyrone Township (K)	Y	Y	Y	Y		Y	Y	Y
Vergennes Township (K)	Y	Y	Y	Y		Y	Y	Y
City of Walker (K) NFIP	Y	Y		Y		Y	Y	Y
Wright Township (O) NFIP	Y	Y		Y		Y	Y	Y
City of Wyoming (K) NFIP	Y	Y		Y		Y	Y	Y
City of Zeeland (O) NFIP	Y	Y		Y		Y	Y	Y
Zeeland Township (O) NFIP	Y	Y		Y	Y	Y	Y	Y

Status of Mitigation Strategies from the Original 2006 Plan

(new Mitigation Strategies follow in later sections)

The following descriptions represent all of the actions originally presented in the 2006 hazard mitigation plan for the region. Each item now includes a brief description of its current status in 2011. Additional considerations for this updated 2011 plan follow later in this document, under the community subsections, which contain hazard mitigation listings prioritized for each receiving or implementing jurisdiction/agency.

FLOODING

Action Item 1a. Purchase property vulnerable to flooding as funds become available.

Specific Hazard(s) Addressed: Riverine Flooding

Specific Vulnerability(ies): Property Damage

Jurisdiction: Robinson Township

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Six flood-prone parcels were purchased by the Michigan Department of Transportation. Grant funding enabled the further purchase of 2 parcels on Limberlost Lane and 16 parcels on Van Lopik.

Action Item 1b. Purchase property vulnerable to flooding as funds become available.

Specific Hazard(s) Addressed: Riverine Flooding

Specific Vulnerability(ies): Property Damage

Jurisdiction: Plainfield Township

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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, Abridador 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 kick in the other 25 percent.

Township Planner Peter Elam said 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. But they 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 stretch the purchases out still farther. 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. The four properties, one of which is uninhabitable, would become part of the 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.

Action Item 1c. Take measures to mitigate flood damage and reduce vulnerability to existing structures
Specific Hazard(s) Addressed: Riverine Flooding
Specific Vulnerability(ies): Property Damage
Jurisdiction: Ottawa County
Primary Responsibility: Ottawa County
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: To be considered when funding is available.
Cost(s): 8 wood frame structures @ \$40,000 = \$320,000 (Based on average property values)
Benefit(s): Less Potential for flood damage.
Anticipated Funding Source(s): 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.

Action Item 1d. Take measures to mitigate flood damage and reduce vulnerability to existing structures
Specific Hazard(s) Addressed: Riverine Flooding
Specific Vulnerability(ies): Property Damage
Jurisdiction: Kent County
Primary Responsibility: Kent County
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: 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 Source(s): 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 being awaited.

Action Item 1e. Purchase property to mitigate flood damage and reduce vulnerability to existing structure
Specific Hazard(s) Addressed: Riverine Flooding
Specific Vulnerability(ies): Property Damage
Jurisdiction: Ada Township
Primary Responsibility: Ada Township
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: To be considered when funding is available.
Cost(s): 1 residence @ \$180,000 (Based on actual property value)
Benefit(s): Less Potential for flood damage.
Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.
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.

Action Item 1f. Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in flood plains.
Specific Hazard(s) Addressed: Flooding
Specific Vulnerability(ies): Property Damage
Jurisdiction: Ottawa County
Primary Responsibility: Ottawa County
Initiatives Needed: Hire Code Enforcement Officer.
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): 1 Code Enforcement Officer for Ottawa County = \$90,000
Benefit(s): Better enforcement and less likelihood of future flood damage claims.
Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.
2011 Status: This strategy relied upon funding during times of very tight budgets. No known progress.

Action Item 1g. Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in flood plains.

Specific Hazard(s) Addressed: Flooding

Specific Vulnerability(ies): Property Damage

Jurisdiction: Kent County

Primary Responsibility: Kent County

Initiatives Needed: Hire Code Enforcement Officer.

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): 1 Code Enforcement Officer for Kent County = \$90,000

Benefit(s): Better wide enforcement and less likelihood of future flood damage claims.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: This strategy relied upon funding during times of very tight budgets. No known progress.

Action Item 1h. Proposing some improvements to the York Creek Watershed to reduce risk and impact of downstream flooding.

Specific Hazard(s) Addressed: Urban Flooding

Specific Vulnerability(ies): Property Damage

Jurisdiction: City of Walker (Note: More specifically, this should have stated Alpine Township.)

Primary Responsibility: City of Walker (Note: Actually implemented by Kent Co. Drain Commission)

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Unknown at this time.

Benefit(s): Less potential for flood damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Hazard mitigation funds were approved for this project in 2006. Three flood-prone structures in Alpine Township were voluntarily acquired, with the use of HMGP funds, so that their residents would no longer be vulnerable to flood impacts.

Action Item 1i. Replace culvert at 104th Avenue.

Specific Hazard(s) Addressed: Urban Flooding

Specific Vulnerability(ies): Property Damage

Jurisdiction: City of Zeeland

Primary Responsibility: City of Zeeland

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Bridge Span - \$500,000

Benefit(s): Less potential for flood damage.

Anticipated Funding Source(s): 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.

SEVERE WEATHER

Action Item 2a. Survey needs and add sirens to regions as needed.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Thunderstorm, tornado

Jurisdiction: Ottawa County

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Survey \$ 10,000

68 Sirens @ \$18,500 = \$1,258,000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Since the previous edition of this plan, Ottawa has added 13 warning sirens to its system.

Action Item 2b. Survey needs and add sirens to regions as needed.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Thunderstorm, tornado

Jurisdiction: Kent County

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 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 Source(s): 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.

Action Item 2c. Survey needs and add sirens to regions as needed.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Thunderstorm, tornado

Jurisdiction: City of Grand Rapids

Primary Responsibility: City of Grand Rapids

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Survey \$ 10,000

9 Sirens @ \$18,500 = \$166,500

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Federal Mitigation 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.

Action Item 2d. Investigate and acquire new warning technology as it becomes available.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Personal Injury

Jurisdiction: Ottawa County

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Reverse 911 system \$100,000; 6 Short-range AM/FM Transmitter Systems \$300,000 (\$50K each)

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s) Federal Mitigation grants as well as other funding sources if available.

2011 Status: A "reverse 9-1-1" 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. Grant funds have been used to purchase the satellite-based EM Net system for Ottawa County.

Action Item 2e. Investigate and acquire new warning technology as it becomes available.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Personal Injury

Jurisdiction: Kent County

Primary Responsibility: Kent County
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 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): Less potential for personal injury.
Anticipated Funding Source(s): 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.

Action Item 2f. Investigate and acquire new warning technology as it becomes available.
Specific Hazard(s) Addressed: Severe Weather
Specific Vulnerability(ies): Personal Injury
Jurisdiction: City of Grand Rapids
Primary Responsibility: City of Grand Rapids
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): 1 Short-range AM/FM Transmitter
Systems @ \$50,000 \$ 50,000
Benefit(s): Less potential for personal injury.
Anticipated Funding Source(s): 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. 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.

Action Item 2g. Educate township residents on the risks of extreme temperature. Identify the at-risk residents and aid them in installing the equipment necessary to survive.
Specific Hazard(s) Addressed: Severe Weather
Specific Vulnerability(ies): Extreme Temperature
Jurisdiction: Chester Township
Primary Responsibility: Chester Township
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$3000-\$5000
Benefit(s): Less potential for personal injury.
Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.
2011 Status: Ottawa County purchased NOAA WX radios for at-risk communities/residents.

Action Item 2h. Identify additional emergency shelter sites and adding back-up power and infrastructure to these sites.
Specific Hazard(s) Addressed: Severe Weather
Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter Weather
Jurisdiction: Chester Township
Primary Responsibility: Chester Township
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$40,000 for one generator.
Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

Action Item 2i. Add generators for City Hall and Public Safety Buildings.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter Weather

Jurisdiction: City of Zeeland

Primary Responsibility: City of Zeeland

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): 2 Generators @ \$40,000 = \$80,000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

Action Item 2j. Additional training with our emergency service people.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter Weather.

Jurisdiction: Georgetown Charter Township

Primary Responsibility: Georgetown Charter Township

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown, Staff Overtime

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

Action Item 2k. Continuing Education Classes

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter, Weather

Jurisdiction: Zeeland Charter Township

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown \$3000-\$5000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

Action Item 2l. Table top exercises and communication planning.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter, Weather

Jurisdiction: Zeeland Charter Township

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Establish a protocol for exercises and annual review of communications planning.

Implementation Tasks and Schedule: This should be done on an ongoing basis with annual reviews.

Cost(s): This will be done during regular business hours with current staff.

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Regular Township Operating Budget.

2011 Status: 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.

Action Item 2m. 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.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Drought

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): \$50,000 - \$100,000

Benefit(s): Reduce potential for fire damage

Anticipated Funding Source(s): 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.

Action Item 2n. Purchase a four wheel drive medical-rescue apparatus for fire department. Keep listing of private individuals with snowmobiles available for use in emergency.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Winter Weather

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): 4WD Rescue Vehicle \$30,000

Benefit(s): Reduce potential for personal injury

Anticipated Funding Source(s): 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.

Action Item 2o. Education, advanced snow removing equipment, and shelters with generators.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Winter Weather

Jurisdiction: Spring Lake Twp / City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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.

INFRASTRUCTURE FAILURE

Action Item 3a. Identify infrastructure vulnerabilities.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Communications Disruption

Jurisdiction: Kent & Ottawa Counties

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Regional Survey \$50,000

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): 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.

Action Item 3b. Work with local telephone and cable utilities to develop a plan for dealing with the communication disruptions.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Communications Disruptions

Jurisdiction: Kent & Ottawa Counties

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Plan \$120,000

Benefit(s): Higher security through less potential for long-term interruption of communications.

Anticipated Funding Source(s): 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.

Action Item 3c. Implement measures identified in the plan.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Communications Disruption

Jurisdiction: Kent & Ottawa Counties

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown (to be determined after development of plan)

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Available hazard mitigation grants as well as Homeland Security grants have been used to address some of the strategies in this plan. The counties will endeavor to pursue additional funds as they become available, to continue to address these strategies.

Action Item 3d. Secure funding for a low band radio system and Ham radio system.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Communications Disruption

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2011 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 communications.

Anticipated Funding Source(s): 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.

Action Item 3e. Upgrade the current radio console & repeater as it is 30 years old and parts are not available. Dedicated generator for the repeater & console that would activate when there is a power interruption. Additional radios on campus freq. to be used by staff.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Communications Disruptions

Jurisdiction: Allendale Township

Primary Responsibility: Grand Valley State University

Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 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 communications.
Anticipated Funding Source(s): 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.

Action Item 3f. Maintaining and upgrading our 2-way radio communication system to optimize its capability if needed as primary communication system.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Communications Disruption
Jurisdiction: Kent County
Primary Responsibility: Kent County Road Commission
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: To be considered when funding is available.
Cost(s): Unknown \$10,000-\$15,000
Benefit(s): Higher security through less potential for long term interruption of communications.
Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.
2011 Status: This strategy was accomplished, in part, by using grant funds from the Department of Homeland Security to supplement local funding. These funds were used to upgrade radios to meet narrow-band mandates, as well as to ensure interoperability.

Action Item 3g. In process of using Dept. of Homeland Security funding for an inter-operable radio system.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Communications Disruptions
Jurisdiction: Kent County
Primary Responsibility: Kent County Sheriff
Initiatives Needed: This project is currently underway.
Implementation Tasks and Schedule: This project is scheduled for completion by 2007.
Cost(s): \$1,400,000 (already funded)
Benefit(s): Higher security through less potential for long term interruption of communications.
Anticipated Funding Source(s): Homeland Security Grant Funding
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.

Action Item 3h. Communications tower is needed to assure coordination for public safety purposes at OCRC N. Holland garage.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Communications Disruption
Jurisdiction: Ottawa County
Primary Responsibility: Ottawa County Road Commission
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$25,000-\$30,000
Benefit(s): Higher security through less potential for long term interruption of communications.
Anticipated Funding Source(s): 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.

Action Item 3i. Large portable generators for buildings with quick disconnect to operate buildings if they are out of power. A very large diesel generator that will be able to operate our main power building.

Smaller portable lighting systems for areas on campus. A back-up lighting system for our stadium. On site generator for the police department in the event of power failure.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Electrical Failure
Jurisdiction: Allendale Township
Primary Responsibility: Grand Valley State University
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$100,000-\$125,000.
Benefit(s): Safer operations with lower potential for security breach.
Anticipated Funding Source(s): 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.

Action Item 3j. Standby generators for the fire department.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Electrical Failure
Jurisdiction: Holland Township
Primary Responsibility: Holland Township
Initiatives Needed: Funding Source
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$40,000
Benefit(s): Safer operations with lower potential for security breach.
Anticipated Funding Source(s): 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.

Action Item 3k. 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.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Electrical Failure
Jurisdiction: Ottawa County
Primary Responsibility: Ottawa County Road Commission
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$50,000
Benefit(s): Safer operations with lower potential for security breach.
Anticipated Funding Source(s): 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.

Action Item 3l. Provide emergency stand-by power to Station 1 to provide communication for the Fire Department and the Sheriff Department as communication is essential. To provide emergency stand-by power for Station 2 to provide communication for the Fire Department and the Sheriff Department as communication is essential. To provide stand-by power to various addresses.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Electrical Failure
Jurisdiction: Spring Lake Township
Primary Responsibility: Spring Lake Township Fire Department
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$40,000

Benefit(s): Safer operations with lower potential for security breach.
Anticipated Funding Source(s): 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.

Action Item 3m. Possible take over of private systems and changing to public authority. Possibly tie all three private systems together.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Water System Failure

Jurisdiction: Cannon Township

Primary Responsibility: Cannon Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown

Benefit(s): Less potential for loss of water due to power failure.

Anticipated Funding Source(s): 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.

Action Item 3n. 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.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Water System Failure

Jurisdiction: Plainfield Charter Township

Primary Responsibility: Plainfield Charter Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 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 Source(s): Federal Mitigation 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.

Action Item 3o. Portable generator for pumping station.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Sanitary Sewer Failure

Jurisdiction: Bowne Township

Primary Responsibility: Alto Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Unknown \$40,000-\$50,000

Benefit(s): Less potential for a wastewater spill.

Anticipated Funding Source(s): 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.

Action Item 3p. Permanent stand-by power for sewer system.

Specific Hazard(s) Addressed: Infrastructure Failure

Specific Vulnerability(ies): Sanitary Sewer Failure

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$40,000-\$50,000
Benefit(s): Less potential for a wastewater spill.
Anticipated Funding Source(s): 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.

Action Item 3q. Continuing evaluation of providing emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Sanitary Sewer Failure
Jurisdiction: Grand Haven Township
Primary Responsibility: Grand Haven Township Fire/Rescue
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$40,000-\$50,000
Benefit(s): Less potential for a wastewater spill.
Anticipated Funding Source(s): 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.

Action Item 3r. Standby generators for lift stations.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Sanitary Sewer Failure
Jurisdiction: Holland Township
Primary Responsibility: Holland Township
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$40,000-\$50,000
Benefit(s): Less potential for a wastewater spill.
Anticipated Funding Source(s): 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.

Action Item 3s 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 hydrant installed into the dune land part are to control and extinguish possible dune land fire and to prevent possible erosion from burnt dune grass.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Sanitary Sewer Failure
Jurisdiction: Spring Lake Township Fire Department
Primary Responsibility: Ottawa County
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): \$10,000 for hydrant, \$30,000 for line adjustment
Benefit(s): Less potential for a wastewater spill.
Anticipated Funding Source(s): 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.

Action Item 3t. Additional pump stations alarms and generators.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Sanitary Sewer Failure
Jurisdiction: Spring Lake/Ferrysburg Police

Primary Responsibility: Ottawa County
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Alarms \$10,000, Generators \$40,000
Benefit(s): Less potential for a wastewater spill
Anticipated Funding Source(s): 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.

Action Item 3u. Additional standby power, generators and portable pumps.
Specific Hazard(s) Addressed: Infrastructure Failure
Specific Vulnerability(ies): Sanitary Sewer Failure
Jurisdiction: Zeeland Charter Township
Primary Responsibility: Zeeland Charter Township Fire Department
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$40,000-\$50,000.
Benefit(s): Less potential for a wastewater spill.
Anticipated Funding Source(s): 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.

PUBLIC HEALTH EMERGENCY

Action Item 4a. Upgrade of the public health and hospital emergency communications systems.
Specific Hazard(s) Addressed: Public Health Emergency
Specific Vulnerability(ies): Natural Epidemic
Jurisdiction: Zeeland Township
Primary Responsibility: Zeeland Charter Township Fire Department
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: By 2011 or sooner if funding is available.
Cost(s): Unknown \$10,000-\$15,000
Benefit(s): Less potential for spread of disease.
Anticipated Funding Source(s): 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.

GEOLOGICAL EVENTS

Action Item 5a. A sewer system is needed at Crockery Lake.
Specific Hazard(s) Addressed: Geological Events
Specific Vulnerability(ies): Shoreline Flooding and Erosion
Jurisdiction: Chester Township
Primary Responsibility: Chester Township Fire Department
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: To be considered when funding is available.
Cost(s): Unknown
Benefit(s): Less erosion potential.
Anticipated Funding Source(s): 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.

Action Item 5b. Additional storm water management of our ravine areas.
Specific Hazard(s) Addressed: Geological Events
Specific Vulnerability(ies): Landslides
Jurisdiction: Allendale Township
Primary Responsibility: Grand Valley State University
Initiatives Needed: Secure Funding
Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown

Benefit(s): Less erosion potential.

Anticipated Funding Source(s): 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.

FIRE

Action Item 6a. Expanding public education and awareness.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Alpine Township

Primary Responsibility: Alpine Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): \$3,000-\$5,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6b. ATV set up to fight fire in wooded area and increase public education.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Cannon Township

Primary Responsibility: Cannon Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): \$30,000-\$40,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6c. Identify and develop additional rural water supplies. Purchase new four wheel drive brush truck for fire department.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): \$25,000-\$30,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6d. Enforce burning permit requirements with additional staff enforcement time.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Courtland Township

Primary Responsibility: Courtland Township Fire Department

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.
2011 Status: No known request was made for funding beyond local funds. No known progress.

Action Item 6e. Control of all burning through permits and increased enforcement.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Georgetown Charter Township

Primary Responsibility: Georgetown Charter Township

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.

2011 Status: No known request was made for funding beyond local funds. No known progress.

Action Item 6f. Additional pump station at the river to assist with removal of water. Water could be transferred by additional water lines to the east side of the campus to assist the fire department. This would aid in the fire suppression in the ravines. Additional tanker trucks could be purchased and stored if the lines were not available. Trucks could fill at the pumping station, drive to the area of the fire.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Allendale Township

Primary Responsibility: Grand Valley State University

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): \$100,000-\$125,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6g. Control of all burning through permits and increased enforcement.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Oakfield Township

Primary Responsibility: Oakfield Township Fire Department

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.

2011 Status: No known request was made for funding beyond local funds. No known progress.

Action Item 6h. Provide information regarding fire safety to the homes that are most at risk.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Wildfire

Jurisdiction: Plainfield Charter Township

Primary Responsibility: Plainfield Charter Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Approximately \$2000 for brochures

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6i. Continue upgrading of fire department equipment and apparatus.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Urban and Structural Fire

Jurisdiction: Chester Township

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Unknown \$50,000-\$75,000.

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6j. Sprinkle all buildings on campus. Additional pumper purchased to assist in fire suppression.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Urban and Structural Fire

Jurisdiction: Allendale Township

Primary Responsibility: Grand Valley State University

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: No known request was made for funding beyond local funds. No known progress.

Action Item 6k. Specialized fire fighting equipment, new radios, additional inspections

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Urban and Structural Fire

Jurisdiction: Spring Lake Twp /City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): Unknown \$75,000-\$100,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

Action Item 6l. A full-time Township Ordinance Enforcement Officer.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Other Fires

Jurisdiction: Plainfield Charter Township

Primary Responsibility: Plainfield Charter Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2011 or sooner if funding is available.

Cost(s): One Code Enforcement Officer at \$75,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available

2011 Status: This strategy depends upon funding during times of very tight budgets. It was considered to be ineligible for subsidy under federal hazard mitigation funds. No known progress.

Action Item 6m. The extension of water lines to the US-31 highway right-of-way for large scale incident where haz-mat and gas tanker accidents are possible.

Specific Hazard(s) Addressed: Fire

Specific Vulnerability(ies): Other fire

Jurisdiction: Spring Lake Township

Primary Responsibility: Spring Lake Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available

2011 Status: No known request was made for funding beyond local funds. No known progress.

Please note: The preceding status listing has been reorganized in the community subsections that follow later in this plan, with many additional details provided there for the needs, actions, and priorities of local communities within the region. Priorities are listed there for the individual communities (and in some cases, implementing agencies). The next few pages provide an overview of plan implementation and maintenance. Then the subsections describing local community needs/actions will follow.

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.

Public Participation

The updated HMP will remain available on city and county websites. Input will be directed to the emergency management director of each organization. By being accessible from County (and local) emergency management web sites, this 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

As future plan proposals are developed, they will be made available to the public and other interested parties through meetings, public announcements, or web site postings. Once an updated proposed plan is developed, local jurisdictions will consider adopting the plan through resolution as long as they choose to participate in the regional hazard mitigation plan.

Integration of Hazard Mitigation Considerations into other Planning Mechanisms

When approved, copies of this plan will be made available to each local jurisdiction that has land use regulatory authority. Since each jurisdiction has agreed to participate in the use of this HMP through local resolution, local planning departments in each jurisdiction will consider the applicability of hazard mitigation principles within their periodic comprehensive plan updates and ongoing related activities, so as to promote the incorporation of this HMP into existing planning mechanisms.

Coordinating local communities will utilize the HMP or consider it in future planning. Local jurisdictions, by agreeing to participate in this regional hazard mitigation plan, will consider the action plan presented herein when contemplating land use decisions and policies. For example, those local flood-prone properties that have been identified should have local land use and development/building regulations updated with regard to future construction on these sites.

\Local Community Subsections

All the following communities have expressed specific concerns or ideas/needs for hazard-related actions, as follows. In many of these listings, implementation detail is not provided to the same extent that it is in the region's hazard mitigation action list, already presented in this document. Local and county emergency management personnel, and those of relevant departments, coordinate upon these issues. Such coordination produced this list of community-specific concerns, and these ideas and concerns are meant to enhance the local relevance of hazard mitigation action list in this plan (not replace or contradict that list). Nor are the local ideas and needs necessarily eligible for federal hazard mitigation grant funds, but they are appropriate to in some way 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 which have been identified as relevant for one or more of the community's hazard mitigation concerns have been marked as "HIGH priority," and given a ranking within that community's list of potential hazard mitigation strategies. 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, and especially between each community and the corresponding county emergency management office, is expected for the majority of the HIGH priority projects listed hereafter. Since the status of activities identified in the 2006 plan has already been addressed in a previous section, projects that have already been completed will often not be included in these new community lists, so that more consideration can be given to new, 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) in the sections that follow. Various actions that have been labeled as Medium priority (or as lower priority) may nevertheless 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 merely considered to be preliminary ideas, or that address only lower-priority hazards in an area, have tended to be assigned as lower priority—not because they are considered unworthy or unimportant, but rather to encourage efforts toward higher priority hazard mitigation and preparedness strategies that have been judged to be particularly important. 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 with which to plan for and implement the strategies under consideration. A comparative lack of detail in some of the following community subsections should not be assumed to indicate a lack of need, lack of concern, or lack of willingness on the part of that community. Rather, it may merely indicate a scarcity of detailed assessment information, or limits upon the amount of local staff time and analytic resources available to that community, or a temporary lack of consensus about the political, economic, and technical feasibility of particular strategies that the community may be considering.

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, lower) 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 relatively undeveloped conceptual state. Most of these types of lower priority listings have not been assigned a numeric priority.

Ada Township (Kent County) NFIP, 2010 population 13,142 (up 33% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: HIGH priority – Riverine Flooding

Purchase property to mitigate flood damage and reduce vulnerability to existing structures

Primary Responsibility: Ada Township

Implementation Tasks and Schedule: 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.

#2: Medium priority – 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 time frame will likely take a year or two, if funds are available.

#3: Medium priority – Emergency Communications:

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.

#4: Medium priority – Master Plan Consideration:

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.

#5: Medium priority – Infrastructure Strengthening:

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority - Fire Preparedness:

Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, FIREWISE protection techniques, and risk assessment detail.

#7: lower priority – Other Fire Hazards Strategy:

Burning ordinance examination could be relevant for hazard mitigation.

Lower priority supplemental information, concerns, and strategies:

Hazardous Materials Strategy: Emergency Warning sirens are in place to notify the public, and the fire department is trained to a hazardous material operations level.

Transportation Hazards Strategy: The Fire Department is trained to handle these types of incidents.

Algoma Township (Kent County) NFIP, 2010 population 9,932 (up 31% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration:

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The new master plan process is scheduled for preparation and completion during 2012. During this process, the Algoma Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification:

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Severe Weather Preparedness:

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening:

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness:

Consideration of additional fire-related public awareness and training activities.

Lower priority supplemental information, concerns, and strategies:

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems. As details develop, this strategy's priority may be elevated to Medium or HIGH.

Allendale Township (Ottawa County) NFIP, 2010 population 20,708 (up 59% from 2000)

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 oriented toward protecting most of the township's population, since most of that population is connected with the University. University enrollment (2011-2012) included 24,662 students (both graduate and undergraduate) and nearly 2,000 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 under the charge of the University. The separate list of University actions and concerns follows this initial list for the township:

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies for Allendale Township:

#1: HIGH Priority – Master Plan Consideration:

Allendale Township is currently updating its 2003 master plan, and this plan should include a consideration of hazard mitigation concepts and strategies. Primary responsibility rests with the township, although coordination with Ottawa County Emergency Management is likely, and the implementation timeline for this would proceed through 2012.

#2: Medium priority – Emergency Notification:

Develop actions to strengthen and maintain emergency notification systems serving the township beyond the Grand Valley State University campus. (As more details are worked out, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Flood Mitigation:

Study potential flood areas for consideration of future flood mitigation field projects.

#4: Medium priority – Severe Weather Preparedness:

Identify any warning system needs in the township, beyond those already being dealt with by Grand Valley State University.

#5: lower priority – Infrastructure Strengthening:

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance, in addition to those potential improvements already studied/proposed for the Grand Valley State University campus.

#6: lower priority – Fire Preparedness:

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. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental information, concerns, and strategies:

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

Prioritized Hazard Mitigation Strategies for Grand Valley State University (in Allendale Township)

#1: HIGH Priority – Electrical Failure

Large portable generators for buildings with quick disconnect to operate buildings if they are out of power. A very large diesel generator that will be able to operate our main power building. Smaller portable lighting systems for areas on campus. A back-up lighting system for our stadium. On site generator for the police department in the event of power failure.

Primary Responsibility: Grand Valley State University

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$100,000-\$125,000.

Benefit(s): Safer operations with lower potential for security breach.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: This strategy depends upon funding during times of tight budgets. No known progress has occurred.

#2: HIGH Priority – Urban and Structural Fire Hazards

Sprinklers in all buildings on campus. Purchase of additional pumper to assist in fire suppression.

Primary Responsibility: Grand Valley State University

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: No known request was made for funding outside of normal university funds. No known progress has occurred.

#3: HIGH Priority – Communication Disruptions Actions

Upgrade the current radio console & repeater as it is 30 years old and parts are not available. Dedicated generator for the repeater & console that would activate when there is a power interruption. Additional radios on campus freq. to be used by staff.

Primary Responsibility: Grand Valley State University

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown, \$3,000-5,000

Benefit(s): Higher security through lessened potential for long term interruption of communications.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: This strategy depends upon funding during times of tight budgets. No known progress has occurred.

#4: HIGH Priority – Wildfire Hazard

Additional pump station at the river to assist with removal of water. Water could be transferred by additional water lines to the east side of the campus to assist the fire department. This would aid with fire suppression in the ravines. Additional tanker trucks could be purchased and stored if water lines are not available. Trucks could then fill at the pumping station and drive to the area of the fire.

Primary Responsibility: Grand Valley State University

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$100,000-\$125,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources, if available.

2011 Status: This strategy depends upon funding during times of tight budgets. No known progress has occurred.

#5: HIGH Priority – Landslides

Additional storm water management of our ravine areas.

Primary Responsibility: Grand Valley State University

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown

Benefit(s): Reduced erosion potential.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: This strategy depends upon funding during times of tight budgets. No known progress has occurred.

#6: Medium Priority – Severe Winter Weather (Snow, Ice, Blizzard)

Heavy equipment is used to move snow. Additional purchase of front loaders to move snow. Sidewalk de-icing equipment to aid in clearing sidewalks. De-icing equipment and additional snowblowers for aid in the removal of snow from roofs. Snow melting devices to turn snow into water when storage of snow is not available. Satellite weather station to warn of impending weather.

#7: Medium Priority – Electrical Failure Hazard

Large portable generators for buildings (with quick disconnect) to operate buildings if they are out of power. Needed: A very large diesel generator that would be able to operate the main power building (GVSU Facilities Building), smaller portable lighting systems for various areas on campus, a back-up lighting system for the stadium, and an on-site generator for the police department, in the event of power failure.

#8: Medium Priority – Tornado Hazard

An additional siren needs to be installed on the South side of campus. A cell phone automatic call system could be used for students to warn them about the weather conditions. Voice annunciated alarms could be in the buildings that are connected to our fire alarm system. Bunkers or fallout shelters could be located near high density areas. Education for foreign exchange students about the weather in Michigan, as they may not know about tornados.

#9: Medium Priority – Riverine Flood Hazard

The boat house road is occasionally washed out due to flooding of the river. Gravel is currently added to the road bed to raise the level. It would be better to raise the roadbed level higher to eliminate the flooding problem. In addition, the boat house structure needs to be raised above the flood stage.

#10: Medium Priority – Communication Disruption Mitigation Strategies

Upgrade the current radio console and repeater—now 30 years old (replacement parts not available). Obtain a dedicated generator for the repeater and console that would activate when there is a power interruption. Additional radios on a campus frequency could be used by staff, in the event of an emergency.

#11: Medium Priority – Severe Weather Hazards

Training international students in emergency response. Adding a generator for the Grand Valley State University (GVSU) Facilities Building on campus. The interior of campus buildings could have alert and notification systems added. An exterior campus alert and notification system could also be added.

#12: Medium Priority – Thunderstorm Hazards (Hail, Lightning, Winds)

Additional lightning protection to the utilities grid. A lightning strike to that area could cause power failure to the university. Brick all housing buildings on campus to reduce damage from high winds. Metal roofs installed on all housing units to replace the asphalt shingles. Provide shelters at outdoor sporting event areas, including the golf course, to cover spectators from hail and offer protection from severe weather.

#13: Medium Priority – Urban Flood Hazard

Use new stormwater techniques including porous pavement for parking lots and roadways. Additional porous pavement, water gardens, and inground water retention ponds and cisterns. Cisterns could also be used for fire fighting as they would be a source of water.

#14: Medium Priority – Intentional Acts

Training in (and changing) some of the security measures on the campus. The security of the power plant is of the greatest concern. Windows and any openings, including side ventilation louvers, need to be secure. The building needs to be walled off from vehicle bombs. Hatches to our tunnel system need to be made more secure. Openings in the tunnel hatches could be used by saboteurs to cripple or destroy the heating/cooling and electrical power to most buildings on the campus. The power substation that feeds power to the university needs additional security and/or an alarm system. A back-up or secondary power

plant should be explored in the event of a failure of the primary unit. All police staff need to have civil disobedience training and a county wide program should be instituted. All employees of the university should have ID badges when working. There is a need to explore options involving a critical incident command center and equipment necessary to operate needs.

#15: Medium Priority – Transportation Hazards

Additional training of staff and response personnel.

#16: Medium Priority – Hazardous Materials Hazard

Train staff to recognize dangers. Haz-mat bags for law enforcement officers. Providing gas masks (and training) to staff in storage areas on campus.

#17: Medium Priority – Urban and Structural Fires Strategy

Sprinkler system installation in all buildings on the GVSU campus. NOTE: Since the 2006 plan, an additional pumper was purchased to assist in fire suppression.

#18: Medium Priority – Water System Failure

Storage of water on the campus in large containers that could be used in the event of water system shutdown.

#19: Medium Priority – Sanitary Sewer Failure Hazard

With the exception of two areas on campus, the system is gravity-fed. These areas need lift pumps and portable generators may be needed to run the lifts.

#20: Medium Priority – Extreme Temperature Hazards

Additional sensors that indicate hot or cold areas in the buildings. Purchase of portable heating or cooling units that could offer additional service, if required.

#21: Medium Priority – Wildfires Mitigation Strategies

Allendale Fire Department provides fire protection for the buildings and grounds. An additional pump station at the river could assist with removal of water. Water could be transferred by additional water lines to the east side of the campus to assist with fire. These would aid in fire suppression in the ravines. Additional tanker trucks could be purchased and stored if the lines are not available. Trucks could then fill at the pumping station drive and the area of the fire.

#22: Medium Priority – Drought Hazard:

Grand Rapids water is used for the campus system. A pumping station located at the Grand River could pump water for irrigation and wildfires.

#23: Medium Priority – Landslides Mitigation Strategy

Additional storm water management and slope controls in ravine areas.

Lower priority Input, Concerns, and Strategies of the Grand Valley State University DPS:

Electrical Failure Hazard: We currently have a back-up 68 KVA generator that is portable, and multiple grounding systems for our electrical grid.

Tornado Hazard: The tornado siren has been installed in the middle of campus. A hue and cry plan for tornado warnings is available.

Communications Failure Hazard: We have a back-up generator for our campus radio repeater.

Thunderstorm Hazards (Hail, Lightning, Winds): Lightning protection systems are installed on all buildings and high mast lights. Nearly all the wiring on campus is underground.

Transportation Hazards: Police officers and emergency medical personnel are aware of campus conditions.

Urban and Structural Fire Hazard: The vast majority of the buildings on campus have sprinkler systems installed. Allendale fire provides the firefighting service for the university. Sprinkle all buildings on campus. An additional pumper was purchased to assist in fire suppression.

Water System Failure: Grand Rapids water is currently used. Possible use of the Fieldhouse pool water for drinking (after treatment). A dedicated generator would need to be purchased to keep the filtration system running. Portable water filters then could be used to refine the water for consumption.

Public Health Hazard: Potential to close the campus and have residents go home.

Sanitary Sewer Failure Hazard: Allendale sanitary is our current provider.

Extreme Temperature Hazards: Staff check the buildings, 24 hours a day and 7 days a week, for leaky pipes potentially at risk from freezing. Some of the buildings have alarms in some areas, to indicate any water flow from a burst pipe. Classes are cancelled if weather conditions are too threatening.

Alpine Township (Kent County) NFIP, 2010 population 13,336 (down 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: HIGH Priority – Urban Flooding

Identify specific new improvements to the York Creek Watershed to reduce risk the impact of downstream flooding.

Primary Responsibility: Kent County Drain Commission

Initiatives Needed: Detailed study of flood impacts and hydrology

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown at this time.

Benefit(s): Lessened potential for flood damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Hazard mitigation funds were approved for this project in 2006. Three flood-prone structures in Alpine Township were voluntarily acquired, with the use of HMGP funds, so that their residents would no longer be vulnerable to flood impacts.

#2: HIGH Priority – Wildfire Mitigation

Expanding public education and awareness.

Primary Responsibility: Alpine Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$3,000-\$5,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: No known progress beyond normal activities.

#3: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The last master plan was completed in December 2007. 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.

#4: Medium priority – All Severe Weather (Snow, Ice, Blizzard, Tornado, Thunderstorm, Hail, Wind)

Work with Kent County Emergency Management to conduct spring tests of sirens and provide public education on weather effects. Support tests of broadcasting stations to enable notification of the public when hazardous conditions occur. Add three additional sirens for public notification. Continue/expand public education, working with and supporting the efforts of local news media.

#5: Medium priority – Electrical Failure Hazard

Work with local electric company to maintain facilities. Support tree trimming efforts. Support public education as appropriate. Continue and expand existing efforts. Increase public education.

#6: Medium priority – Riverine Flood Hazard

Flooding currently has a localized and somewhat "flash flood" nature, but does affect certain areas. 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.

#7: Medium priority – Communications Failure Hazard

Seek and promote facility maintenance and upgrades. Provide public education whenever possible.

#8: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#9: Medium priority – Urban Flood Hazard

Public education. Enforcing stronger stormwater 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 .

#10: Medium priority – Intentional Acts

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.

#11: Medium priority – Urban and Structural Fire Hazard

Public education. Presentations at schools and local shopping malls, etc. Enforcement of current zoning and building ordinances to guard against the spread of fire.

#12: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#13: Medium priority – Extreme Temperature Hazards

Work with news media and public education to inform people about conditions and precautions that can be taken and used to eliminate possibilities of problems.

Lower priority supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Transportation Hazards: The Fire Department is ready to respond. New rescue vehicle purchased. Possess Jaws of Life and other life-saving equipment. Purchase equipment and provide training for consistently improved results and preparedness.

Hazardous Materials Hazard: Continue to work with LEPC on updating agricultural and industrial site information dealing with hazardous chemicals. Promote public education.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

Public Health Hazard: Be prepared to work with County Health officials and news media to contain hazard and minimize contamination. Public education and awareness. Inspect questionable areas (with standing water, etc.) and follow-up on significant findings.

Drought Hazard: Public education and awareness. Expand current programs to improve public education.

Blendon Township (Ottawa County) NFIP, 2010 population 5,772 (up 1% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The last master plan was completed in 2009, and thus is scheduled for update by 2014. 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.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities.

Lower priority supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

Bowne Township (Kent County), 2010 population 3,084 (up 12% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Sanitary Sewer Failure

Portable generator for pumping station.

Jurisdiction: Bowne Township

Primary Responsibility: Alto Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$40,000-\$50,000

Benefit(s): Lessened potential for a wastewater spill.

Anticipated Funding Source(s): 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.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A township master plan had been adopted in 2006, and is probably being worked on as this hazard mitigation plan is being finalized. During their next master plan process, the Bowne Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#3 Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: Medium priority – Hazardous Material Hazard: Pre-plan for all Haz-Mat known locations. (Suggestion provided by the Alto Fire Department)

#8: Medium priority – Sanitary Sewer Failure Hazard

Attach temporary generator to pumping station, we have a very small and simple public sewer system. (Suggestion provided by the Alto Fire Department)

#9: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional information, strategies, input, and concerns from the Alto Fire Department:

Communications Failure Hazard: Fire station is staffed whenever the phone service goes out.

Water System Failure: No public water system available.

Public Health Hazard: Medical problems are handled by Kent County EMS.

Hazardous Material Hazard: 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.

Transportation Hazards: Alto FD has a fully equipped rescue squad and personnel trained to the EMT-P, EMT-B and MFR levels, with monthly continuing education.

Intentional Acts: Preparedness; assist police if necessary.

Extreme Temperature Hazards: Nothing in place to prevent high temperatures—focus on citizen education.

Thunderstorm Hazards (Hail, Lightning, Wind): Generator at the fire station. In the event of widespread power outages, chainsaws are available for clearing downed trees from area roads.

Severe Winter Weather (Snow, Ice, Blizzard): A generator is at the fire station in the event of widespread power outages from heavy ice or snow falls. Chainsaws are available for cutting up and removing trees.

Tornado Hazard: Emergency generator at fire station, to temporarily house persons displaced by tornados and bad weather. Tornado siren in place. Weather conditions monitored at various points in the township.

Drought Hazard: Alto FD has two grass fire trucks, in case drought and dry conditions increase the risk of grass and brush fires.

Shoreline Flooding and Erosion Hazard: No Lake Michigan shoreline.

Wildfire Hazard: Public education—distributing pamphlets. Display fire trucks and rescue vehicles when possible. Continue more of the same—expanding public education and awareness.

Wildfire Hazard: 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. Alto FS has two grass fire fighting trucks.

Urban and Structural Fire Hazard: Fire prevention/education at the local elementary school, ongoing firefighter training, keeping the Alto FD fire apparatus up to date.

Other Fire Hazards: Only leaves and brush burning permits are issued.

Dam Failure Flood Hazard: No dams in the township.

Riverine Flood Hazard: Help to evacuate flooded areas until the water recedes. Evacuees could temporarily be taken to the fire station.

Urban Flood Hazard: Help to evacuate flooded areas until the water recedes. Evacuees could temporarily be taken to the fire station.

Electrical Failure Hazard: Back-up generator at our fire station for temporarily housing those displaced by power outages.

Byron Township (Kent County), 2010 population 20,317 (up 16% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The last master plan was completed in 2007, and so the next version will probably be made soon. During their next master plan process, the Byron Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium Priority – Flood Hazards: Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority - Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority - Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental information

Hazardous Materials Hazard: SOGs for hazardous materials handling/response

Public Health Hazard: KEMS Protocols

Sanitary Sewer Failure Hazard: Byron/Gaines Water Authority Plans

Water System Failure: Byron/Gaines Water Authority Plans

Electrical Failure Hazard: SOGs for electrical emergencies

Urban Flood Hazard: Local Emergency Planning Committee plans

Urban and Structural Fire Hazard: SOGs for Structure Fires

Wildfire Hazard: SOGs for brush fires

Village of Caledonia (Kent County), 2010 population 1,511 (up 37% from 2000) – population included in Caledonia Township

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

Flood Hazards: Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. Master plan development appears to have been done by the township around 2007 (although a date of the web-posted plan was not found), suggesting that a new plan may be developed soon. During the next planning process, the Caledonia Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority - Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Caledonia Township (Kent County) NFIP, 2010 population 12,332 (up 38% from 2000) – population figure includes the Village of Caledonia

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community’s master plan and associated zoning maps. Master plan development appears to have last been completed around 2007 (although a date of the web-posted plan was not found), and had included the Village of Caledonia. Nearly 5 years have gone by, suggesting that a new plan may be developed soon. During the next planning process, the Caledonia Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities.

Lower priority supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

Cannon Township (Kent County) NFIP, 2010 population 13,336 (up 10% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: HIGH Priority – Water System Failure

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 Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown

Benefit(s): Lessened potential for loss of water due to power failure.

Anticipated Funding Source(s): 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.

#2: HIGH Priority – Wildfire Mitigation

ATV set up to fight fire in wooded area and increase public education.

Primary Responsibility: Cannon Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$30,000-\$40,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#3: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A Cannon Township master plan exists from 2003, and under a 5-year update cycle, should be coming due for update by 2013. During the update process, the Cannon Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies. The township also has a two member Risk Committee that would be ideal for implementing this strategy.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather

Provide fire and rescue and shelter at both fire stations and the Township Hall, for residents in need to be served by the power generator there. Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental concerns

Shoreline Flooding and Erosion Hazard: Stormwater and watershed ordinances.

Wildfire Hazard: Fire Dept. has two 4x4 vehicles for use in wildfire events. All-terrain vehicle set up to fight fire in wooded area and increase public education

Urban and Structural Fire Hazard: Fire Dept. with 4 engine, 2 tanker, grass rig, and 2 rescue. Update and add to the department's vehicles, stations, and members.

Dam Failure Flood Hazard: Considered to be a low hazard; no suggestions made.

Electrical Failure Hazard: Generators are in place at two fire stations and township hall.

Communications Failure Hazard: Fire Dept. portable radios. Install a base station & repeater system to allow the township to communicate.

Water System Failure: All systems are private at this time. Possible change to public authority? Possible tying of all three private systems together?

Sanitary Sewer Failure Hazard: County-controlled infrastructure.

Transportation Hazards: Fire rescue Hazmat operations, through Fire Department continual training.

Thunderstorm Hazards (Hail, Lightning, Wind): Provide fire & rescue, and shelter for residents at both of the fire stations and the Township Hall with the generator set up.

Extreme Temperature Hazards: Provide shelter for residents at both of the fire stations and the Township Hall with the generator set up.

Tornado Hazard: Provide shelter for residents at both of the fire stations and the Township Hall with the generator set up. Thinking about early warning alert system or sirens.

Cascade Township (Kent County) NFIP, 2010 population 17,134 (up 13% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Comprehensive Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A comprehensive plan from 1998-1999 is posted online, and was produced by a consultant that has since been involved in hazard mitigation planning. A new comprehensive planning process for Cascade Township should give consideration to hazard mitigation concepts and concerns, and adjust the comprehensive plan to accommodate viable hazard-related strategies. The township's planning department should be involved in this process.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities.

Lower priority supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

***Cascade Township Fire Department Strategies, Input, and Concerns

Transportation Hazards: Department and other agencies working together. Mutual aid between fire departments. No specific strategies at this time.

Water System Failure: Work with the city of Grand Rapids or use tankers from other departments.

Dam Failure Flood Hazard: An emergency plan was provided by the personnel who run the Cascade Dam, and can be followed if needed.

Tornado Hazard: A building is available in the township for people to go to if something should happen. Personnel are available to assist residents in the township. Need to look into possible projects to help, township-wide. Nothing more specific has been identified at this time.

Severe Winter Weather (Snow, Ice, Blizzard): Personnel are available to assist if needed. No specific preventive/mitigation measures identified at this time. A Cascade Dam plan can be used if something should happen to the dam due to ice, snow, etc.

Public Health Hazard: Work with the health department and other agencies.

Hazardous Materials Hazard: Haz Mat Teams for Tri-Com, and the cities of Grand Rapids and Wyoming.

Extreme Temperature Hazards: Few preventive measures in place at this time. No specific hazard mitigation strategies at this time - will look at things that can be improved.

Thunderstorm Hazards (Hail, Lightning, Wind): Personnel are available to assist if something should happen.

Village of Casnovia (Kent County) 2010 population 319 (up 2% from 2000) – population included with Tyrone Township

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium Priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. During the plan update process, consideration should be given to hazard mitigation concepts and concerns, and the master plan should be adjusted to accommodate viable hazard-related strategies.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Cedar Springs (Kent County) 2010 population 3,509 (up 11% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium Priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#2: Medium priority – Master Plan Consideration

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 update process, the Cedar Springs Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#4: Medium priority – Severe Weather Preparedness: Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening: Identify potential. Coordinate as needed to bolster the dependability of emergency communication systems improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Chester Township (Ottawa County) NFIP, 2010 population 2,017 (down 13% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Extreme Temperature, Tornado, and Severe Winter Weather Hazards

Identify additional emergency shelter sites and adding back-up power and infrastructure to these sites.

Primary Responsibility: Chester Township

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$40,000 for one generator.

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

#2 HIGH Priority – Winter Weather Hazard

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 Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): 4WD Rescue Vehicle \$30,000

Benefit(s): Reduce potential for personal injury

Anticipated Funding Source(s): 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.

#3 HIGH Priority – Communications Disruption

Secure funding for a low band radio system and Ham radio system.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 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 communications.

Anticipated Funding Source(s): 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.

#4 HIGH Priority – Urban and Structural Fire Hazards

Continue upgrading of fire department equipment and apparatus.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$50,000-\$75,000.

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#5 HIGH Priority – Extreme Temperature Hazard

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 Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$3000-\$5000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Ottawa County purchased NOAA WX radios for at-risk communities/residents.

#6 HIGH Priority – Sanitary Sewer Failure

Permanent stand-by power for sewer system.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#7 HIGH Priority – Shoreline Flooding and Erosion Hazard

A sewer system is needed at Crockery Lake.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown

Benefit(s): Less erosion potential.

Anticipated Funding Source(s): 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.

#8 HIGH Priority – Wildfire Hazard

Identify and develop additional rural water supplies. Purchase new four wheel drive brush truck for fire department.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$25,000-\$30,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#9 HIGH Priority – Drought Hazard

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.

Primary Responsibility: Chester Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$50,000 - \$100,000

Benefit(s): Reduce potential for fire damage

Anticipated Funding Source(s): 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.

#10: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The last master plan update process was in 2008, so a new process should occur in the near future. During that process, the Chester Township Zoning and Planning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#11: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

- #12: Medium priority – Severe Weather Preparedness: Identify any warning system needs in the township. Identify additional emergency shelter sites and adding back-up power and infrastructure to these sites.
- #13: Medium priority – Infrastructure Strengthening
Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.
- #14: Medium priority – Severe Winter Weather: Purchase a four wheel drive medical-rescue apparatus for fire department. Keep listing of private individuals with snowmobiles available for use in emergency.
- #15: Medium priority – Extreme Temperature
Educate township residents on the risks of extreme temperature. Identify the at-risk residents and aid them in installing the equipment necessary to survive. Identify additional emergency shelter sites and adding back-up power and infrastructure to these sites.
- #16: Medium priority – Drought: 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.
- #17: Medium priority – Shoreline Flooding and Erosion: A sewer system is needed at Crockery Lake
- #18: Medium priority – Wildfire: Identify and develop additional rural water supplies. Purchase new four wheel drive brush truck for fire department.
- #19: Medium priority – Urban and Structural Fire: Purchase new tanker pumper and continue upgrading of fire department equipment and apparatus.
- #20: Medium priority – Communications Disruption: Secure funding for a low band radio system and Ham radio system.
- #21: Medium priority – Sanitary Sewer Failure: Permanent stand-by power for sewer system
- #22: Medium priority – Communications Disruption: Secure funding for a low band radio system and Ham radio system. 3,000-5,000.
- #23: lower priority – Fire Preparedness
Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

****Chester Township Fire Department Strategies, Input, and Concerns**

Thunderstorm Hazards (Hail, Lightning, Wind): 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. Make available weather radios for areas in which sirens may not be heard.

Extreme Temperature Hazards: 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.

Tornado Hazard: 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: Add warning sirens to populated areas of the township. Identify additional emergency shelter sites and add backup power and infrastructure to these sites. Make available weather radios for areas in which sirens may not be heard.

Drought Hazard: 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 (Snow, Ice, Blizzard): 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 and Erosion Hazard: 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. Actions: A sewer system is needed at Crockery Lake.

Wildfire Hazard: Burning 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. Purchase new four wheel drive brush truck for fire department.

Urban and Structural Fire Hazard: 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: Burning 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 Hazard: 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 Flood Hazard: 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 Hazard: 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 Hazard: 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 radio system. Secure funding for Ham radio system.

Sanitary Sewer Failure Hazard: 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 Hazard: 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 Hazards: 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.

Intentional Acts: Response by Ottawa County Sheriff's Department and by fire department once site is secured.

City of Coopersville (Ottawa County) NFIP, 2010 population 4,275 (up 9% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. During that update process, the Coopersville Planning and Zoning Department (and/or any consultant being used) should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5 lower priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Courtland Township (Kent County), 2010 population 7,678 (up 32% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Wildfire Hazard

Enforce burning permit requirements with additional staff enforcement time.

Primary Responsibility: Courtland Township Fire Department

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.

2011 Status: No known request was made for funding beyond local funds. No known progress.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A Courtland Township master plan was completed in 2007, by a consulting firm that has been involved in hazard mitigation planning in Michigan. This suggests that an updated plan is currently being worked on. During the update process, the Courtland Township Planning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#3: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Supplemental information and strategy ideas to address hazards:

Extreme Temperature Hazards: First responders – 20

Urban and Structural Fire Hazard: Pumpers, tankers, county mutual aid, automatic aid from Oakfield township. Prevention plans for businesses.

Wildfire Hazard: Brush trucks or grass rigs with water. Pumper and tanker trucks. Manpower, foam, backpacks with water. Burning permits required.

Other Fire Hazards: Operation level first responders. DNR. Removing these areas from the township. Knowing where these areas are located. County foam trailer located at Alpine Fire Dept.

Urban Flood Hazard: Porta-pumps.

Electrical Failure Hazard: Generators. Can supply water and heat at fire station.

Communications Failure Hazard: PT radios, cell phones.

Transportation Hazards: Operation level first responder. Grand Rapids Hazmat team, Young Environmental. Ongoing training.

Hazardous Material Hazard: Operation level first responder. Grand Rapids Hazmat team, Young Environmental. Ongoing training.

Crockery Township (Ottawa County) NFIP, 2010 population 3,960 (up 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

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 give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of East Grand Rapids (Kent County) NFIP, 2010 population 10,694 (down 1% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A city master plan is online from 2002, but it is not clear whether an updated has been started. During such a process, the East Grand Rapids Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities.

Supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

City of Ferrysburg (Ottawa County) NFIP, 2010 population 2,892 (down 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Winter Weather Hazards

Education, advanced snow removing equipment, and shelters with generators.

Jurisdiction: Spring Lake Twp / City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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.

#2 HIGH Priority – Urban and Structural Fires

Specialized fire fighting equipment, new radios, additional inspections

Jurisdiction: Spring Lake Twp /City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$75-\$100,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#3 HIGH Priority – Sanitary Sewer Failure

Additional pump stations alarms and generators.

Jurisdiction: Spring Lake/Ferrysburg Police

Primary Responsibility: Ottawa County

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#4: Medium priority – Master Plan Consideration

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 update process, the Ferrysburg Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#5: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#6: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#7: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#8: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional hazard information/ideas, in conjunction with Spring Lake Township:

Severe Winter Weather: Education, advanced snow removal equipment

Hazardous Materials Hazard: Hazmat team, security media and education. Reverse 911 system and additional hazmat equipment.

Urban and Structural Fire: Specialized fire fighting equipment, new radios, additional inspections

Sanitary Sewer Failure: Additional pump stations alarms and generators

***Ferrysburg/Spring Lake Police Strategies, Input, and Concerns

Sanitary Sewer Failure Hazard: Generators, media and Health Dept. Additional generators, pump stations, alarms and generators.

Hazardous Material Hazard: Hazmat team, security media and education. Reverse 911 system and additional hazmat equipment.

Transportation Hazards: Media, education, hazmat, mobile medical teams. Additional medical equipment.

Intentional Acts: Education, media and DARE. Riot shields, rifles, helmets, OC equipment and reverse 911 system.

Extreme Temperature Hazards: Media, local shelters, Health Department, Hospitals, and grail System. Reverse 911 system

Electrical Failure Hazard: Generators. Additional grid protectors.

Communications Failure Hazard: Nextels, radios, cell phones. Nextels for everyone in the Dept.

Water System Failure: Tied into GR, media and education. More security, alarms, and surveillance equipment.

Drought Hazard: Use of media. Watering bans. Need specialized fire fighting equipment.

Severe Winter Weather (Snow, Ice, Blizzard): Media, snow removal equipment, generators, education and shelters. Education, advanced snow removing equipment, reverse 911 system and shelters with generators.

Shoreline Flooding and Erosion Hazard: Sea walls, education, media. Generators, pumping stations, pumps, and generators.

Wildfire Hazard: Media and education. Specialized fire fighting equipment.

Urban and Structural Fire Hazard: Inspections, education, media and mutual aid. Specialized fire fighting equipment, new radios, additional inspections.

Gaines Township (Kent County), 2010 population 25,146 (up 25% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. There was a township master plan update in 2008. During the next update process, the Gaines 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.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Georgetown Township (Ottawa County) NFIP, 2010 population 46,985 (up 13% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Extreme Temperatures, Tornadoes, and Severe Winter Weather Hazards

Additional training with our emergency service people.

Primary Responsibility: Georgetown Charter Township

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown, Staff Overtime

Benefit(s): Lessened potential for personal injury.

Anticipated Funding Source(s): 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.

#2 HIGH Priority – Wildfire Hazard

Control of all burning through permits and increased enforcement.

Primary Responsibility: Georgetown Charter Township

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.

2011 Status: No known request was made for funding beyond local funds. No known progress.

#3: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A new master plan was just completed in 2010. During the next plan update process, the Georgetown Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental information and potential strategies:

Extreme Temperature, Tornado, and Severe Winter Weather: Additional training with our emergency service people.

Wildfire: Control of all burning through permits and increased enforcement.

Flood Mitigation: Study potential flood areas for consideration of future flood mitigation field projects.

Drought Hazard: No preventive measures are in place.

Tornado Hazard: When a Thunderstorm or Tornado watch is issued, Emergency Services are activated. Updating and improving the siren program in Georgetown Twp.

Severe Winter Weather (Snow, Ice, Blizzard): Measures that are in place include good communication between emergency management and all of the area's utility providers.

Wildfire Hazard: A large fire of this type is not likely to happen, since development patterns promote early detection and limits on a fire's spread. Control of all burning can be handled by permits. All state DNR burning bans should be followed.

Urban and Structural Fire Hazard: Inspections during the construction of any structure. Following all guidelines, whether state codes or local codes. Continued training on residential fire fighting.

Other Fire Hazards: No burning of trash, leaves, garbage, or dirty burning materials. Enforcement of all burning ordinances.

Thunderstorm Hazards (Hail, Lightning, Wind): 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 Hazard: Generator backup at the Grandville sewage plant. Flooding problems: sandbagging or possible diversion of water.

Water System Failure: Receive water from the City Of Wyoming. In the event of a crisis in Wyoming, contact Grand Rapids for additional help

City of Grand Haven (Ottawa County) NFIP, 2010 population 10,412 (down 7% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The last master plan was completed in 2010. During the next master plan update process, the Grand Haven Planning and Community Development Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: Medium priority – Sanitary Sewer Failure

Continuing evaluation of providing emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Grand Haven Township (Ottawa County) NFIP, 2010 population 15,178 (up 14% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: HIGH Priority – Sanitary Sewer Failure

Continuing evaluation of providing emergency power to sewer lift stations by portable generators or the provision of emergency power to lift stations.

Primary Responsibility: Grand Haven Township Fire/Rescue

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#2: Medium Priority – Communications Failure Hazard

Primary Responsibility: Grand Haven Township Fire/Rescue

OCCDA has initiated a back-up to the main dispatch facility at the Emergency Operations Center (EOC) in the Emergency Management Division at the Ottawa County Fillmore facility. In addition, back-up radio capabilities are in place throughout the County. (Further information can be obtained from Ottawa County Central Dispatch Authority.)

#3: Medium Priority – Water System Failure

Primary Responsibility: Grand Haven Township Fire/Rescue

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). Continue to evaluate capacity and demand.

#4: Medium priority – Master Plan Consideration

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 update process, the Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#5: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#6: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#7: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#8: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

***Grand Haven Township Fire/Rescue Strategies, Input, and Concerns

Shoreline Flooding and Erosion Hazard: The lake level and lakeshore dune erosion activity are monitored.

Wildfire Hazard: 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 Hazard: 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.

City of Grand Rapids (Kent County) NFIP, 2010 population 188,040 (down 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Thunderstorm and Tornado Hazards

Survey needs and add sirens to regions as needed.

Primary Responsibility: City of Grand Rapids

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner, if funding is available.

Cost(s): Survey \$ 10,000

9 Sirens @ \$18,500 = \$166,500

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Federal Mitigation 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.

#2 HIGH Priority – Severe Weather Hazards

Investigate and acquire new warning technology as it becomes available.

Primary Responsibility: City of Grand Rapids

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): 1 Short-range AM/FM Transmitter

Systems @ \$50,000 \$ 50,000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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. Grant funds have also been used to purchase the City Watch notification system for Kent County (the system is also being 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.

#3: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A 2002 master plan has been posted online. During the next master plan update process, the Grand Rapids Planning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects.

#7: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#8: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Grand Rapids Township (Kent County) 2010 population 16,661 (up 19% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's comprehensive plan and associated zoning maps. Since a comprehensive plan was completed in 2007, a new plan should be scheduled for preparation and completion in the near future. During the update process for the comprehensive plan, the Grand Rapids Township Planning and Zoning Department should give consideration to hazard mitigation concepts and concerns, and adjust the plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future).

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities.

Lower priority supplemental concerns

Fire Preparedness: Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Emergency Communications: Coordinate as needed to bolster the dependability of emergency communication systems.

City of Grandville (Kent County) NFIP, 2010 population 15,378 (down 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A Granville 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.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional hazard information and mitigation ideas:

Severe Winter Weather: Advanced snow removal/transportation equipment

Tornado: Promote community messaging systems

Severe Winter Weather: 3M board for EOC

Thunderstorm Hazard: AM transmitter

Urban and Structural Fire: Installation of fire stops in older buildings downtown. Standpipes for the critical dune area. Smaller all-wheel drive fire apparatus.

Wildfire: Wildland fire-fighting gear.

Riverine Flooding: Dredge the Grand River to provide extra flow capacity (better able to accommodate ice floes). Rebuild the Warber Drain to increase its capacity. Promote community messaging systems. 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.

Water System Failure: Promote community messaging systems.

Natural Epidemic: Promotion of community messaging system throughout the city.

Hazardous Material Release: Improved HazMat response equipment and training for personnel

Intentional Acts: Cameras for security. Cameras and fencing for the power plant

All Human Induced Hazards, Pipeline ruptures, and/or for a Hazardous Material Release: Additional 800 MHz radios for emergency use.

Hazardous Material Release: Emergency preparedness education for citizens

Intentional Acts: Promote community messaging systems.

Hazardous Material Release and Intentional Acts: AM transmitter

Sanitary Sewer Failure Hazard: Pipeline to Wyoming from our plant.

Public Health Hazard: Kent County Health Department protocol. Training.

Hazardous Material Hazard: Hazardous materials team from the Wyoming Fire Department. Continued training.

Transportation Hazards: EMS-trained fire personnel, mutual aid from local departments.

Intentional Acts: Local police agency, Kent County Sheriff Department, and the Michigan State Police.

Other Fire Hazards: Continuous training. Contracted hazardous materials team from Wyoming Fire.

Urban and Structural Fire Hazard: Fire Department response. Continuous training

Urban Flood Hazard: Department of public works and fire department have sand and bags if needed.

Electrical Failure Hazard: Fire department call out and local emergency management team

Communications Failure Hazard: Maintain three different locations for emergency communications.

Maintained and checked by private communications contractor.

Water System Failure: Secondary system with Wyoming.

Grattan Township (Kent County) 2010 population 3,621 (up 2% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The previous master plan was completed in 2007, and a new master plan update process is scheduled for 2012. During this process, the Grattan Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Holland (Ottawa County) NFIP, 2010 population (in Ottawa County only) 26,035 (down 7% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The city has referred to continually updating its 1992 master plan. The Holland Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness, Extreme Temperatures

1. Identify any warning system needs in the township. 2. 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. 3. Provide enhancements to emergency shelters to include generators and access to supplies in case of brownouts or widespread power outages. 4. Prepare to mobilize transportation services in periods of extreme cold.

#4: Medium priority – Severe Winter Weather

1. Provide advanced warning and public service announcements on how to prepare for a predicted event. 2. Create a network or watch program that provides for checks on vulnerable populations. 3. 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.

#5: Medium priority – Tornado

1. Continue to test emergency warning sirens and supplement current system with other means of notification. 2. Implement NIXEL or other form of all hazard electronic notification system in addition to outdoor warning sirens. 3. Identify and supply emergency shelters for post event needs of the public. 4. Educate and prepare all City of Holland Public Safety, Transportation Services and Parks personnel to respond safely and effectively to a areas impacted by a tornado strike. 5. Educate and prepare damage assessment personnel.

#6: Medium priority – Thunderstorm Hazards

1. Educate, 2. Provide effective notification and warning 3. Provide information on actions the public can take to prevent or reduce damage from wind. 4. Educate the public about emergency shelters and how to seek appropriate shelter. 5. Provide information and support for the installation of lightning strike prevention systems for structures. 6. Identify flood prone areas and vulnerable populations.

#7: Medium priority – Urban Flooding

1. 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). 2. 18th and 19th Between Central and Columbia Ave Area is prone to flooding; a mitigation strategy needs to be developed. 3. Improve or replace crossing to improve drainage Crossing on Azalea at South Shore Drive Crossing on Azalea at South Shore Drive. Improvements to drain to prevent flooding. 4. 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. 6. 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. 7. 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. 7. Pine Avenue North of West 7th Street: Address flooding problems and critical infrastructure threats as a result to the HBPW Power Generating Station. 8. 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. 9. East branch of the Weller Drain—beginning south of West 32nd Street on the west 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 as a result of the current. 10. Study potential flood areas, to generate future flood mitigation field projects.

#8: Medium priority – Transportation Accident

On site Foam storage system crash fire rescue equipment

#9: Medium priority – Hazardous Material Release

1. Develop and implement an effective leak detection program which includes education and monitoring. 2. Continue to educate public safety responders about pipeline safety and response on an annual basis.

#10: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#11: Medium priority – Urban and Structural Fire

1. Continue to deliver and enhance fire prevention inspections and fire and life safety education programs. 2. Inspect and maintain all fire alarm and sprinkler systems as required by code. 3. Advocate, incentive and promote the installation of automatic sprinkler systems in public and private occupancies. 4. Continue to provide and maintain an adequate and effective public safety response to fires.

#12: Medium priority – Water System Failure

1. 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. 2. 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

#13: Medium priority – Natural Epidemic

Work in collaboration to provide prevention and education as well as, early response efforts led by Ottawa & Allegan County Health Departments.

#14: Medium priority – Sanitary Sewer Failure

1. Provide 15 backup generators at sewage lift stations. Projected cost is \$40,000 per station. 2. Extend and replace a force main from the west end (Old Orchard to Myrtle), to alleviate wet weather issues. 3. Provide and implement a grant program to assist residents in removing footing drains and sump pumps from the sanitary sewer. 4. 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.

#15: Medium priority – Shoreline Erosion/flooding

1. Provide early warning assistance as needed. 2. Develop automatic community wide flood assistance program to assist residents after an event. 3. Provide maintenance and improvements on all drains to Lake Macatawa. 4. Educate residents on basement flood prevention strategies and improvements that can be made to prevent or minimize basement flooding.

#16: Medium priority – Wildfire

1. Implement FireWise program where appropriate. 2. Manage burn practices and fuel load management. 3. Consideration of additional fire-related public awareness and training activities. 4. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

#17: low priority – Drought

1. Educate and prepare residents to implement no-burn policies. 2. Develop water conservation policies in preparation for drought events.

Holland Township (Ottawa County) NFIP, 2010 population 35,636 (up 23% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Electrical Failure

Standby generators for the fire department.

Primary Responsibility: Holland Township

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$40,000

Benefit(s): Safer operations with lower potential for security breach.

Anticipated Funding Source(s): 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.

#2 HIGH Priority – Sanitary Sewer Failure

Standby generators for lift stations.

Primary Responsibility: Holland Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#3: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan was completed in 2006, and therefore a new update should be completed in the near future. During the plan update process, the Community Development Department (Planning) of the township should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Flood Mitigation

Study potential flood areas to generate future flood mitigation field projects.

#8: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental concerns

Thunderstorm Hazards (Hail, Lightning, Wind), Intentional Acts, Nuclear Power Plant Hazard, Hazardous Material Hazard, Tornadoes: Installation of warning sirens.

Sanitary Sewer, Water, and Electrical Failures: Standby generators for lift, pump, and fire stations.

City of Hudsonville (Ottawa County) NFIP, 2010 population 7,116 (down 1% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan was completed in late 2007, so an updated master plan process should be either ongoing or scheduled for the near future. During that update process, the Hudsonville Planning/Zoning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Jamestown Township (Ottawa County) NFIP, 2010 population 7,034 (up 39% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township completed a general development plan in 2006, so an update should be underway at the present time or in the near future. During such an update process, the township should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Village of Kent City (Kent County) 2010 population 1,057 (down 1% from 2000) – population included in Tyrone Township

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community’s master plan and associated zoning maps. During any future planning process for a community master plan, the Village of Kent City should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Kent County (part NFIP) 2010 population 602,622 (up 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Thunderstorms, tornados

Survey needs and add sirens to regions as needed.

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 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 Source(s): 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.

#2 HIGH Priority – Severe Weather Hazards

Investigate and acquire new warning technology as it becomes available.

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 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 Source(s): 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.

#3 HIGH Priority – Riverine Flooding

Take measures to mitigate flood damage and reduce vulnerability to existing structures

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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 being awaited.

#4 HIGH Priority – Flood Hazards

Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in flood plains.

Primary Responsibility: Kent County

Initiatives Needed: Hire Code Enforcement Officer.

Implementation Tasks and Schedule: By 2016 or sooner, if funding is available.

Cost(s): 1 Code Enforcement Officer for Kent County = \$90,000

Benefit(s): Better wide enforcement and less likelihood of future flood damage claims.

Anticipated Funding Source(s): 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.

#5 HIGH Priority – Communications Disruption

Identify infrastructure vulnerabilities that could cause communication disruptions.

Specific Vulnerability(ies): Communications Disruption

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner, if funding is available.

Cost(s): Regional Survey \$50,000

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): 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.

#6 HIGH Priority – Communications Disruption

Work with local telephone and cable utilities to develop a plan for dealing with the communication disruptions.

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner, if funding is available.

Cost(s): Plan \$120,000

Benefit(s): Higher security through less potential for long-term interruption of communications.

Anticipated Funding Source(s): 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.

#7 HIGH Priority – Communications Disruption

Implement measures identified in the plan.

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown (to be determined after development of plan)

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Available hazard mitigation grants as well as Homeland Security grants have been used to address some of the strategies in this plan. The counties will endeavor to pursue additional funds as they become available, to continue to address these strategies.

#8 HIGH Priority – Communications Disruption

Maintaining and upgrading Kent County's 2-way radio communication system to optimize its capability if needed as primary communication system.

Primary Responsibility: Kent County Road Commission

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown \$10,000-\$15,000

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: This strategy was accomplished, in part, by using grant funds from the Department of Homeland Security to supplement local funding. These funds were used to upgrade radios to meet narrow-band mandates, as well as to ensure interoperability.

#9 HIGH Priority – Communications Disruption

In process of using Dept. of Homeland Security funding for an inter-operable radio system in Kent County.

Primary Responsibility: Kent County Sheriff

Initiatives Needed: This project is currently underway.

Implementation Tasks and Schedule: This project was originally scheduled for completion by 2007, but is perhaps better considered to be an ongoing activity, as described in the “2011 Status” description, below.

Cost(s): \$1,400,000 (already funded)

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): Homeland Security Grant Funding

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.

#10: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the master plan and associated zoning maps throughout the county’s numerous 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. The various involved local agencies should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies, on a schedule that is appropriate for each jurisdiction.

#11: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#12: Medium priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects. In addition, consideration will be given to decide whether additional Kent County communities should participate in the National Flood Insurance Program (NFIP). Not all of the residents in some communities are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 from all types of potential flood problems (riverine flooding, urban flooding, basement flooding) when making this important decision.

#13: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#14: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#15: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Information from the Kent County Drain Commissioner’s input:

Dam Failure Flood Hazard: The Grass Lake (Lake Bella Vista) Emergency Action Plan is in place.

Input, Concerns, and Strategies from the Kent County Emergency Management Office:

Hazardous Materials Hazard: Kent County has a very strong LEPC. This group of volunteers meets monthly to review plans, plan exercises and discuss community outreach activities. Kent County LEPC has completed 239 off-site response plans for facilities with Extremely Hazardous Substances and will update these plans yearly. All special-needs groups which could be affected by a release from one of these sites have been provided with at least one shelter-in-place kit and have been informed by the LEPC that they should develop a plan for their own facility on what they would do in a chemical emergency. The Kent County LEPC has also developed two videos, one for adults and another for children, on what to do in a chemical emergency and what is required to shelter in place. The Kent County LEPC also provides a workshop to different groups in the county each year to educate them on SARA Title III. The LEPC has produced numerous brochures which are used to educate the community. In May of each year, one of our off-site response plans are exercised. These locations are moved throughout the county so that different Fire Departments and HazMat teams can participate and train.

Potential Actions: Continue to identify new sites in the community which need off site response plans and develop these plans. Keep the CAMEO database current with all of our special needs groups as well as all the SARA Title III 302 sites. Exercise a plan in May and promote Chemical Awareness Week. Select a group to target for specific SARA Title III training. Provide first-responders with a checklist to use if they come upon a HazMat incident, whether it involves a fixed site or a transportation incident.

Transportation Hazards:

Potential Actions: Training of first responders on Haz Mat response. Outreach to the community on what to do in a Chemical Emergency. Checklist for First Responders.

Intentional Acts: Appropriate actions: Continue the public education process.

Extreme Temperature Hazards: Kent County Emergency Management visits many special-needs groups and businesses each year to assist them with the selection of safe sheltering locations. We also provide them with educational materials regarding tornadoes, chemical releases, and other severe weather issues. We also provide all special needs groups in Kent County excluding the City of Grand Rapids with free NOAA weather radios which are preprogrammed and equipped with SAME. Potential Actions: Provide free NOAA weather radios to any new special needs groups. Continue with site visits and education. Provide yearly Skywarn training. Do as many community outreach activities as requested.

Thunderstorm Hazards (Hail, Lightning, Wind):

Weather service "watches" give the public works agencies time to make preparations for mobilizing personnel and equipment. Early warning/detection systems give the agencies notification that the hazard has occurred. Being prepared is the best mitigation for this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Intentional Acts: The Local Planning Team has held exercises involving this hazard. Advance preparation is the best way to reduce vulnerabilities from this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Transportation Hazards: The county emergency management center has practiced for a transportation incident in the county. Advance preparation is the best way to reduce vulnerabilities from this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Hazardous Materials Hazard: The local LEPC has drawn up response plans for all the sites in the county as well as a generic "transportation" incident. Advance preparation is the best way to reduce vulnerabilities from this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Tornado Hazard: Weather service "watches" give the public works agencies time to make preparations for mobilizing personnel and equipment. Early warning/detection systems give the agencies notification that the hazard has occurred. Advance preparation is the best way to reduce vulnerabilities from this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Input, Concerns, and Strategies from the Kent County Road Commission:

Severe Winter Weather (Snow, Ice, Blizzard): Weather service "watches" give the public works agencies time to make preparations for mobilizing personnel and equipment. Early warning/detection systems give the agencies notification that the hazard has occurred. Advance preparation is the best way to reduce vulnerabilities from this hazard. The Road Commission and other public works agencies strive to keep their equipment updated and in good operating condition. The agencies actively participate in the local emergency planning/training. These exercises maintain good communication between the agencies so they can work cooperatively during an actual hazard event.

Riverine Flood Hazard: NOAA has early warning notification systems in place.

Communications Failure Hazard: The Road Commission continues to maintain their 2-way radio system. This would be our primary means of communication in an emergency situation where the regular telephone and cellular telephone systems would be overloaded. Maintaining and upgrading our 2-way radio communication system to optimize its capability if needed as the primary communication system.

Input, Concerns, and Strategies from the Kent County Sheriff Department:

Wildfire Hazard: We rely on reports from the public when these events occur. Also, townships require burning permits for open burning.

Urban and Structural Fire Hazard: We rely on established building codes, as well as the appropriate storage of hazardous and combustible chemicals.

Other Fire Hazards: State and local guidelines and codes. Unaware of any mitigation plans.

Dam Failure Flood Hazard: We have an Emergency Action Plan on each of the dams in our county. These plans are subject to periodic updates.

Electrical Failure Hazard: State and local codes and guidelines.

Communications Failure Hazard: We have a reciprocal back-up agreement with the City of Grand Rapids for communications services, we also have the ability to have our 9-1-1 calls diverted to any law enforcement agency in the state. We also have MEPS radio that can be used to communicate. This is a statewide system. We also have RACES, which is an amateur radio volunteer group to assist with back up communications. We are in the process of using Dept. of Homeland Security funding for an interoperable radio system for our county.

Water System Failure: Use of health department and local media to inform and educate the public about hazards and recommended safeguard procedures.

Public Health Hazard: National Strategic Stockpile of pharmaceuticals distribution plan is under development. The draft was published in June of 2004, pending finalization.

Hazardous Materials Hazard: Kent County Emergency Action Plan (EAP) updates.

Transportation Hazards: Kent County EAP updates.

Nuclear Power Plant Hazard: Kent County EAP updates.

Intentional Acts: Kent County EAP updates

Extreme Temperature Hazards: We have neighborhood watch groups that can be activated to check the well-being of special-needs groups. We work with local media concerning efforts to notify the public when conditions such as this exist, or are predicted. We rely on local media as an avenue to inform and educate the public regarding their response to such events. We receive NWS information as well as the "Optiquist" weather monitor in our communications division. Proposed Action: Continued coordination with media and Skywarn training for responders. We are in the process of surveying our local jurisdictions for the status of their sirens.

City of Kentwood (Kent County) NFIP, 2010 population 48,707 (up 8% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

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

Public Facilities/Government Buildings

Fire Stations (3)

Justice Center

City Hall

Library

Water/Sewer Structures

Roads

Community Activities Center

Public Works Facilities

Electrical Power and Utilities

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 Accidents
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 focusing on 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.

5. Public Participation and the Planning Process

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.

City of Lowell (Kent County) NFIP, 2010 population 3,783 (down 6% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan for the city was completed in late 2007, suggesting that an update process may be forthcoming during 2012. During any such update process, the Lowell City Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lowell Township (Kent County) 2010 population 5,949 (up 14% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A 2008 master plan was completed for the township, and during any forthcoming update process, the Lowell Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Sanitary Sewer Failure Hazard

Potential Action: Attach temporary generator to pumping station, we have a very small and simple public sewer system. (Suggested by the Alto Fire Department)

#6: Medium priority – Infrastructure Strengthening

Identify other potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional Input, Concerns, and Strategies from the Alto Fire Department:

Communications Failure Hazard: We staff our fire station whenever the phone service goes out.

Water System Failure: No public water system is available.

Public Health Hazard: Turn all medical problems over to KCEMS.

Hazardous Material Hazard: Pre-plan for all Haz-Mat known locations. All of our firefighters are trained to the Operational level. All hazardous materials incidents are turned over to Youngs environmental. We will assist with evacuations. If we can safely do so we will identify the hazardous material.

Transportation Hazards: We have a fully equipped rescue squad and personnel trained to the EMT-P, EMT-B and MFR levels, with monthly continuing education.

Intentional Acts: Standby and assist police if necessary.

Extreme Temperature Hazards: Activities must focus upon education, preparedness, and response.

Thunderstorm Hazards (Hail, Lightning, Wind): There is a generator at the Alto fire station. In the event of widespread power outages, we have chainsaws for clearing roads of downed trees.

Severe Winter Weather (Snow, Ice, Blizzard): There is a generator at the Alto fire station in the event of widespread power outages (e.g. from heavy ice or snow falls). In cases involving downed trees, we have chainsaws for cutting up and removing them.

Tornado Hazard: 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.

Drought Hazard: For drought and dry conditions that increase the risk of grass and brush fires, we have two grass fire trucks.

Wildfire Hazard: Public education. Distribute pamphlets. Display fire trucks and rescue vehicles when possible. Continue to 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. We have 2 grass fire fighting trucks.

Urban and Structural Fire Hazard: Fire prevention education at the local elementary school. Ongoing firefighter training. Keeping the department's fire apparatus up to date.

Other Fire Hazards: No burning permits issued, other than for leaves and brush.

Dam Failure Flood Hazard: No dams in our jurisdiction.

Riverine Flood Hazard: Help evacuate flooded areas until waters recede. Evacuees can temporarily be taken to the fire station.

Urban Flood Hazard: Help evacuate flooded areas until the water recedes. Evacuees can temporarily be taken to the fire station.

Electrical Failure Hazard: Back up generator at the Alto fire station for temporarily housing people displaced due to power outages.

Nelson Township (Kent County) 2010 population 4,764 (up 14% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan for the township was developed in 2007, suggesting that a new master plan update may be scheduled for work during 2012. During this process, the Nelson Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Oakfield Township (Kent County) 2010 population 5,782 (up 14% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Wildfire Hazards

Control of all burning through permits and increased enforcement.

Primary Responsibility: Oakfield Township Fire Department

Initiatives Needed: Develop Program

Implementation Tasks and Schedule: To be completed with existing staff and overtime during peak fire seasons.

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): To be completed with existing staff resources.

2011 Status: No known request was made for funding beyond local funds. No known progress.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. Although it was not clear when the last master plan was developed for the township, during any subsequent planning processes, the Oakfield Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#3: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#6: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#7: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Input, Concerns, and Strategies from the Oakfield Township Fire Department:

Extreme Temperature Hazards: 20 first responders available

Electrical Failure Hazard: Provision of generators, water, heat

Urban Flood Hazard: Use of Porta Pumps.

Other Fire Hazards: Operation level first responders, locating vulnerable areas in the township, reducing these areas (with grant assistance), DNR Foam trailer (available in the Alpine Township Fire Department).

Urban and Structural Fire Hazard: Fire Department pumper and tanker, County mutual Aid, automatic mutual aid from Courtland Township. Investigation/prevention plans for businesses.

Wildfire Hazard: Brush trucks or grass rigs with water/pumper and tanker trucks and manpower. Use of burning permits.

Hazardous Materials Hazard: Operation level first responder. Use of G.R. Hazmat Youngs Environmental.

Transportation Hazards: Operation level first responder. Use of G.R. Hazmat Environmental.

Nuclear Power Plant Hazard: Operation-level first responder. Use of G.R.Hazmat Youngs Environmental.

Communications Failure Hazard: Radios - PTs - Cell Phone

Intentional Acts: Operation level first responder. Use of G.R. Hazmat Environmental

Olive Township (Ottawa County) NFIP, 2010 population 4,735 (down 1% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan for the township was recently completed in 2009. During a future update process, the Olive Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust its master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Ottawa County (Ottawa County) NFIP, 2010 population 263,801 (up 11% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Thunderstorms, tornados

Survey needs and add sirens to regions as needed.

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Survey \$ 10,000

68 Sirens @ \$18,500 = \$1,258,000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Since the last edition of this plan, Ottawa County has added 13 warning sirens to its system.

#2 HIGH Priority – Severe Weather Hazards

Investigate and acquire new warning technology as it becomes available.

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Reverse 911 system \$100,000; 6 Short-range AM/FM Transmitter Systems \$300,000 (\$50K each)

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s) Federal Mitigation grants as well as other funding sources if available.

2011 Status: A "reverse 9-1-1" 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. Grant funds have been used to purchase the satellite-based EM Net system for Ottawa County.

#3 HIGH Priority – Riverine Flooding

Take measures to mitigate flood damage and reduce vulnerability to existing structures

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): 8 wood frame structures @ \$40,000 = \$320,000 (Based on average property values)

Benefit(s): Less Potential for flood damage.

Anticipated Funding Source(s): 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.

#4 HIGH Priority – Flood Hazards

Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in flood plains.

Primary Responsibility: Ottawa County

Initiatives Needed: Hire Code Enforcement Officer.

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): 1 Code Enforcement Officer for Ottawa County = \$90,000

Benefit(s): Better enforcement and less likelihood of future flood damage claims.

Anticipated Funding Source(s): 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.

#5 HIGH Priority – Communication Disruptions

Identify infrastructure vulnerabilities.

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Regional Survey \$50,000

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): 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.

#6 HIGH Priority – Communication Disruptions

Work with local telephone and cable utilities to develop a plan for dealing with the communication disruptions.

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Plan \$120,000

Benefit(s): Higher security through less potential for long-term interruption of communications.

Anticipated Funding Source(s): 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.

#7 HIGH Priority – Communication Disruptions

Communications tower is needed to assure coordination for public safety purposes at the OCRC North Holland garage.

Primary Responsibility: Ottawa County Road Commission

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$25,000-\$30,000

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): 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.

#8 HIGH Priority – Communication Disruptions

Implement measures identified in the plan.

Primary Responsibility: Kent & Ottawa Counties

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown (to be determined after development of plan)

Benefit(s): Higher security through less potential for long term interruption of communications.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Available hazard mitigation grants as well as Homeland Security grants have been used to address some of the strategies in this plan. The counties will endeavor to pursue additional funds as they become available, to continue to address these strategies.

#9 HIGH Priority – Electrical Failures

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 Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$50,000

Benefit(s): Safer operations with lower potential for security breach.

Anticipated Funding Source(s): 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.

#10: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the master plan and associated zoning maps throughout the county's numerous 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. The various involved local agencies should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies, on a schedule that is appropriate for each jurisdiction.

#11: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#12: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#13: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#14: lower priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects.

#15: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional hazard information, concerns, and input:

Thunderstorm, Tornado: Siren Survey: Survey completed; project complete. The addition of sirens: Sirens were added to county system according to what the survey had suggested. Sirens were upgraded to 2-way sirens. Project complete.

Extreme Temperature, Tornado, Severe Winter Weather: Reverse 911 system (\$100,000): Purchased City Watch; Project complete. 6 Short-range AM/FM Transmitter Systems @ \$50,000 \$300,000 - one AM transmitter was purchased and was deemed to be sufficient; project complete.

Riverine Flooding: Take measures to mitigate flood damage and reduce vulnerability to existing structures (specifics may vary) - Identify and enforce existing building and zoning regulations to limit and manage new construction and alterations in flood plains by hiring a code enforcement officer.

Communications Disruption: Identify infrastructure vulnerabilities. Work with local telephone and cable utilities to develop a plan for dealing with the communication disruptions. Implement measures identified in the plan.

Input, Concerns, and Strategies of the Ottawa County Road Commission:

Urban Flooding: 88 locations were identified for potential changes involving physical constructions to improve flow and prevent ice build-up. Dams, detention ponds, constructed floodplain areas, and development standards and specifications. Application of our development standards and specifications for all future developments.

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 stormwater 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: 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.

Communications Disruption: A communications tower is needed to assure coordination for public safety purposes at the Ottawa County Road Commission's North Holland garage. A portable 75 kw generator to provide backup power for facilities operated by OCRC Public Utilities – sanitary sewer lift stations and water metering stations during power outages. OCRC Public Utilities currently operates approximately 30 lift/metering stations and has none of the necessary back-up generators.

Dam Failure Flood Hazard: Ottawa County has seven dams that had been given a "High Hazard" designation. There are Emergency Action Plans for six of them, and a seventh plan is in the process of being written. Actions: Continuous monitoring, reporting, and maintaining/repairing of these dams, as required by MDEQ.

Riverine Flood Hazard: Ottawa County has over 25 dams, several regional and local detention ponds, bypass drains, and excavated areas along flood-prone streams, to create additional space for floodwater handling. Also, there are the "Development Standards and Specifications" of the drain commissioner. The Upper MACC Recreation Project is designed to act as a floodplain.

Electrical Failure Hazard: 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 the Ottawa County Road Commission's 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.

Intentional Acts: Security fencing and lighting for the following OCRC Public Utility above groundwater installations: Olive-Blendon Water Tank at 96th Ave & Polk St.; Metering Station at 96th Ave. and New Holland St.; Crockery Township on 120th Avenue, north of M-104.

Communications Failure Hazard: A communications tower is needed to assure coordination for public safety purposes at the Ottawa County Road Commission's North Holland garage – Section 4 of Holland Township.

Park Township (Ottawa County) NFIP, 2010 population 17,802 (up 1% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan was developed in 2004, and may be scheduled for update at the present time or in the near future. During any such update process, the Park Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Plainfield Township (Kent County) NFIP, 2010 population 30,952 (up 3% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Riverine Flooding

Purchase property vulnerable to flooding as funds become available.

Jurisdiction: Plainfield Township

Primary Responsibility: Kent County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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, Abridador 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 kick in 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. But they 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 stretch the purchases out still farther. 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. The four properties, one of which is uninhabitable, would become part of the 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.

#2 HIGH Priority – Water System Failure

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 Tasks and Schedule: By 2016 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 Source(s): Federal Mitigation 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.

#3 HIGH Priority – Wildfire Hazards

Provide information regarding fire safety to the homes that are most at risk.

Primary Responsibility: Plainfield Charter Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Approximately \$2000 for brochures

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#4 HIGH Priority – Other Fire Hazards

A full-time Township Ordinance Enforcement Officer.

Primary Responsibility: Plainfield Charter Township

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): One Code Enforcement Officer at \$75,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available

2011 Status: This strategy depends upon funding during times of very tight budgets. It was considered ineligible for subsidy under federal hazard mitigation grant funds. No known progress.

#5: Medium priority – Master Plan Consideration

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. During that process, the Plainfield Township Planning Commission and Office of Community Development will continue to give consideration to an expanded array of hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#6: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#7: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#8: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#9: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional hazard-related information and considerations:

Communications Failure Hazard: The Township utilizes several different cell phone carriers.

Intentional Acts: Plans are in place to protect our infrastructure. The Fire Department is participating in training activities.

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.

Sanitary Sewer Failure Hazard: The system is maintained by an authority and has been inspected with video cameras.

Hazardous Material Hazard: Inspections, and training for handling these types of events. All potential users, storers or shippers of Hazardous Materials are sent questionnaires on a regular basis. The Fire Department has received training to assist in these types of emergencies.

Transportation Hazards: Training by the Fire Department.

Electrical Failure Hazard: Fire stations have backup generators.

Urban Flood Hazard: Part of the Kent County Drain Commission.

Riverine Flood Hazard: Zoning. Possible purchase of structures within the floodway.

Dam Failure Flood Hazard: Possible purchase of structures within the floodway.

Other Fire Hazards: We allow the burning of any scrap materials and these occupancies would be inspected regularly. A full-time Township Ordinance Enforcement officer.

Severe Winter Weather (Snow, Ice, Blizzard): Outdoor warning sirens

Tornado Hazard: The township has 9 outdoor warning sirens

Drought Hazard: Sprinkler bans

Wildfire Hazard: The PFD has surveyed our urban wildland interface and has identified critical areas. We control burning through local ordinance; permits are only issued in areas where adequate clearances may be met; including areas near woods. We also respond to illegal burns, issuing citations where appropriate. We have considered providing information regarding fire safety (clear zones, etc.) to the homes that are most at risk, dependent upon funding availability.

Urban and Structural Fire Hazard: The Plainfield FD has an active prevention division that inspects new and existing occupancies; multi-family, commercial, industrial, and public assembly. The division provides training as well.

Polkton Township (Ottawa County) NFIP, 2010 population 2,423 (up 4% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township's latest master plan was completed in 2009. During the next plan update process, the Polkton Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Port Sheldon Township (Ottawa County) NFIP, 2010 population 4,240 (down 4% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township has a master plan from 2003, which should now be due for update. During such an update process, the Port Sheldon Township Planning Commission and Planning and Zoning Department should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Rockford (Kent County) 2010 population 5,719 (up 24% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. 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.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Robinson Township (Ottawa County) NFIP, 2010 population 6,084 (up 9% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Riverine Flooding

Purchase property vulnerable to flooding as funds become available.

Primary Responsibility: Ottawa County

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): Federal Mitigation grants as well as other funding sources if available.

2011 Status: Six flood-prone parcels were purchased by the Michigan Department of Transportation.

Grant funding enabled the further purchase of 2 parcels on Limberlost Lane and 16 parcels on Van Lopik.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township had produced and adopted a FEMA-approved flood mitigation plan, but it is not clear whether a recent master plan is in place or is being updated soon. 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.

#3: Medium priority – Flood Mitigation

Purchase property vulnerable to flooding as funds become available 130,000 x 54. 2 homes on Limberlost 16 properties on Van Lopik and an additional 6 purchased by MDOT. Six homes have been elevated. Elevate homes prone to flooding when loans for homeowners become available. Purchase property along river and remove approximately 30 homes. Turn the area into a riverside park or raise all homes above the 100-year floodplain. Further study potential flood areas and develop specific future flood mitigation field projects.

#4: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#5: Medium priority – Urban Flood Hazard

Blacktop and raise Buchann St. near and east of 112th Ave above the high water level. Also, 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.

#6: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#7: Medium priority – Infrastructure Strengthening and the Public Health Hazard:

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 (of all kinds) to increase its hazard-resistance.

#8: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Village of Sand Lake (Kent County) 2010 population 500 (up 2% from 2000) – population included in Nelson Township

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

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 process to develop an updated master plan, the Sand Lake Village Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Solon Township (Kent County) 2010 population 5,974 (up 29% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

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 process to develop an updated master plan, Solon Township should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening: Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness: Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Village of Sparta (Kent County) NFIP, 2010 population 4,140 (down 1% from 2000) – population included in Sparta Township

Hazard Priorities: High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community’s master plan and associated zoning maps. A village master plan was developed in 2010. During the next process to develop its master plan, the Sparta Village Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Sparta Township (Kent County) NFIP, 2010 population 9,110 (up 2% from 2000) – population includes the Village of Sparta

Hazard Priorities: High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

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 process to develop an updated master plan, the Sparta Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area’s infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Spencer Township (Kent County) 2010 population 3,960 (up 8% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

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 plan update process, the Spencer Township Planning and Zoning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Village of Spring Lake (Ottawa County) NFIP, 2010 population 2,323 (down 8% from 2000) – population included in Spring Lake Township

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Riverine Flooding

Dredge the river from the railroad bridge east to 104th.

#2: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan was developed in 2006, and therefore an update should be occurring soon. During such an update process, the Spring Lake Village Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Spring Lake Township (Ottawa County) NFIP, 2010 population 14,300 (up 9% from 2000) – population includes the Village of Spring Lake

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: HIGH Priority – Severe Winter Weather

Education, advanced snow removing equipment, and shelters with generators.

Jurisdiction: Spring Lake Twp / City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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.

#2: HIGH Priority – Electrical Failure

Provide emergency stand-by power to Station 1 to provide communication for the Fire Department and the Sheriff Department as communication is essential. To provide emergency stand-by power for Station 2 to provide communication for the Fire Department and the Sheriff Department as communication is essential. To provide stand-by power to various addresses.

Primary Responsibility: Spring Lake Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$40,000

Benefit(s): Safer operations with lower potential for security breach.

Anticipated Funding Source(s): 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.

#3: HIGH Priority – Urban and Structural Fire Hazard

Specialized fire fighting equipment, new radios, additional inspections

Jurisdiction: Spring Lake Twp /City of Ferrysburg

Primary Responsibility: Spring Lake/Ferrysburg Police

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$75-\$100,000

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): 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.

#4: HIGH Priority – Sanitary Sewer Failure

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 hydrant installed into the dune land part are to control and extinguish possible dune land fire and to prevent possible erosion from burnt dune grass.

Primary Responsibility: Ottawa County

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): \$10,000 for hydrant, \$30,000 for line adjustment

Benefit(s): Less potential for a wastewater spill.

Anticipated Funding Source(s): 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.

#5: HIGH Priority – Sanitary Sewer Failure

Additional pump stations alarms and generators.

Jurisdiction: Spring Lake/Ferrysburg Police

Primary Responsibility: Ottawa County

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#6: HIGH Priority – Other Fire Hazards

The extension of water lines to the US-31 highway right-of-way for large scale incident where haz-mat and gas tanker accidents are possible.

Primary Responsibility: Spring Lake Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: To be considered when funding is available

Cost(s): Unknown

Benefit(s): Reduce potential for fire damage.

Anticipated Funding Source(s): Federal Mitigation grants as well as other funding sources if available

2011 Status: No known request was made for funding beyond local funds. No known progress.

#7: Medium priority – Other Fire

The extension of water lines to the US-31 highway right-of-way for large scale incident where haz-mat and gas tanker accidents are possible.

#8: Medium priority – Electrical Failure

Provide emergency stand-by power to Station 1 to provide communication for the Fire Department and the Sheriff Department as communication is essential. To provide emergency stand-by power for Stations 1 and 2 to provide essential communication for the Fire Department. Spring Lake Township Fire Department concerns and strategies: We currently have three portable generators that have to be re-located from lift station to lift station. To provide on-site stand-by power at these addresses (listed in order of general priority):

Priority 1: 17854 174th, 18290 Swiss Drive, 18125 West Spring Lake Road, 17724 Fruitport Road, 339 North Lake, 15844 Leonard Road, 18550 Fruitport Road.

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.

#9: Medium priority – Sanitary Sewer Failure

Strategies of the Spring Lake Township Fire Department: Sewer lift station bypass valves installed at 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 have exposed line and made it subject to boat damage with sewer flowing into the waterways. Dry Hydrant installed into the dune land park to control and extinguish possible dune land fire and to prevent possible erosion from burnt dune grass and also to also keep from scouring residential areas. Sewer lift station bypass valves installed at various location to prevent further damage from power outages or other events.

#10: Medium priority – Water System Failure

Strategy from the Spring Lake Township Fire Department: The extension of water lines to the US-31 highway right-of-way for large scale incident where haz-mat and gas tanker accidents are possible.

#11: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A township master plan was developed in 2008. During the next plan update process, the Spring Lake Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#12: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#13: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#14: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#15: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Township hazard-related strategies in conjunction with the City of Ferrysburg:

Severe Winter Weather: Education, advanced snow removal equipment

Hazardous Materials Hazard: Hazmat team, security media and education. Reverse 911 system and additional hazmat equipment.

Urban and Structural Fire: Specialized fire fighting equipment, new radios, additional inspections

Sanitary Sewer Failure: Additional pump stations alarms and generators

Input, Information, and Strategies from the Spring Lake/Ferrysburg Police:

Drought Hazard: Use of media. Watering bans. Need specialized fire fighting equipment.

Severe Winter Weather (Snow, Ice, Blizzard): Media, snow removal equipment, generators, education and shelters. Education, advanced snow removing equipment, reverse 911 system and shelters with generators.

Shoreline Flooding and Erosion Hazard: Sea walls, education, media. Generators, pumping stations, pumps, and generators.

Wildfire Hazard: Media and education. Specialized fire fighting equipment.

Urban and Structural Fire Hazard: Inspections, education, media and mutual aid. Specialized fire fighting equipment, new radios, additional inspections.

Intentional Acts: Education, media and DARE. Riot shields, rifles, helmets, OC equipment and reverse 911 system.

Communications Failure Hazard: Nextels, radios, cell phones. Nextels for everyone in the Dept.

Transportation Hazards: Media, education, hazmat, mobile medical teams. Additional medical equipment.

Water System Failure: Tied into GR, media and education. More security, alarms, and surveillance equipment.

Sanitary Sewer Failure Hazard: Generators, media and Health Dept. Additional generators, pump stations, alarms and generators.

Public Health Hazard: Media education and Hazmat teams. Additional Hazmat equipment.

Electrical Failure Hazard: Generators. Additional grid protectors.

Extreme Temperature Hazards: Media, local shelters, Health Department, hospitals, and grill system. Reverse 911 system.

Tallmadge Township (Ottawa County) NFIP, 2010 population 7,575 (up 10% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township has a master plan and its zoning map was revised in 2008. During the next master plan update process, the Tallmadge Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems. Additional note from the Wright-Tallmadge Fire Department: Weather alerts through radio and television.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

#6: lower priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects.

Tyrone Township (Kent County) 2010 population 4,731 (up 10% from 2000) – population includes the Villages of Casnovia and Kent City

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A township master plan was developed in 2002, so an update process may soon be underway. During such an update process, the Tyrone Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Vergennes Township (Kent County) 2010 population 4,189 (up 16% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A master plan was developed in 1999 and thus is probably due for review and update in the near future. During the next master plan update process, the Vergennes Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Flood Hazards

Consideration will be given to decide whether the community should participate in the National Flood Insurance Program (NFIP). Not all residents are eager to participate, due primarily to concerns about the potential costs to those who might heavily 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 (riverine flooding, urban flooding, basement flooding) when making this important decision.

#3: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#4: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#5: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#6: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Walker (Kent County) NFIP, 2010 population 23,537 (up 8% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: High priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The new master plan process is scheduled for preparation and completion during 2012. During this process, the Walker Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Walker Fire Department Input, Concerns, and Strategies:

Extreme Temperature Hazards: 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.

Thunderstorm Hazards (Hail, Lightning, Wind): 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 Hazard: 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.

Earthquake Hazard: Our building department would refer to construction codes based on the projected risks for this occurring in Walker. Again as with any disaster we have an emergency operations plan that is all-hazards and could be utilized if an earthquake occurred

Severe Winter Weather (Snow, Ice, Blizzard): 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.

Drought Hazard: We would ban open burning or any other open fires during a drought. Through our emergency operations plan we could get resources such as water to be distributed as necessary.

Tornado Hazard: 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 Hazard: 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.

Riverine Flood Hazard: Our risk for this type of flooding is quite low. We don't have any preventive measures in place. We do have an emergency operating plan that is an all hazards plan and could be used for this type of disaster.

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.

Dam Failure Flood Hazard: We do not have any dams in our area. We do have procedures in our emergency operations plan that could be utilized to deal with a flood situation.

Urban Flood Hazard: 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 stormwater system. We also have ordinances and codes that address stormwater 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 Hazard: 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 Hazard: In the event of a failure of our communications system, both Kent County and Grand Rapids can assist us. All of our key staff people have cell phones and many have Nextel. 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

Public Health Hazard: Through our emergency operations plan we have a protocol for these emergencies that would be administered by the Kent County Health Dept. The city of Walker does not have its own health department.

Sanitary Sewer Failure Hazard: Our sanitary sewer system is owned and maintained by Grand Rapids Water and Sewer Dept. Any failures 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 haz mat response plans and survey our city to find any new occupancies that have hazardous materials on their premises

Wright Township (Ottawa County) NFIP, 2010 population 3,147 (down 4% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. The township's master plan was updated in 2008. During the next update process, the Wright Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems. Extra note from the Wright-Tallmadge Fire Department: Weather alerts through radio and television.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Lower priority supplemental concerns

Hazardous Material Hazard: Use of Ottawa Co. Haz-Mat team

Communications Failure Hazard: Numerous cell phones available.

Electrical Failure Hazard: Generators for Twp Offices and Fire Station

Other Fire Hazards: Burn permits issued thru Fire Dept.

Urban and Structural Fire Hazard: Fire prevention programs thru schools and day care.

Wildfire Hazard: Burn permits through the Fire Dept.

City of Wyoming (Kent County) NFIP, 2010 population 72,125 (up 4% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures, Dam Failures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides

Prioritized Hazard Mitigation Strategies:

#1: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's comprehensive plan and associated zoning maps. During the next plan update process, the Wyoming Planning and Development Department should give consideration to hazard mitigation concepts and concerns, and adjust the comprehensive plan to accommodate viable hazard-related strategies.

#2: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#3: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#4: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#5: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

City of Wyoming Fire Department Input, Concerns, and Strategies:

Wildfire Hazard: 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 Hazard: 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 (Snow, Ice, Blizzard): 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 Hazard: The City of Wyoming provides fire safety education and code enforcement inspections. The City is also served by a combination fire department.

Urban Flood Hazard: As mentioned previously, the Red Cross has pre-determined evacuation sites if needed.

Electrical Failure Hazard: All the essential service buildings in the City of Wyoming are equipped with automatic back up 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 Hazard: The City of Wyoming Fire Department provides employee right-to-know information to all its employees. Has plans established according to OSHA Title 9 guidelines. The Wyoming Fire Department also operates a Hazardous Materials Response team.

Transportation Hazards: The Wyoming Fire Department operates a Hazardous Materials Response Team which is trained in transportation incidents and is equipped with equipment to mitigate this type of situation.

Nuclear Power Plant Hazard: The department's hazardous materials team does have a small amount of detection equipment.

Water System Failure: The City of Wyoming has its own water and public works facilities with emergency action plans in place.

Sanitary Sewer Failure Hazard: The City of Wyoming has its own Sanitary Sewer department with emergency plans in place.

Thunderstorm Hazards (Hail, Lightning, Wind): The Red Cross currently has predetermined evacuation sites for any residents that may be displaced by a flood and/or severe storms.

Extreme Temperature Hazards: The Wyoming Fire Department has several cooling vest which can be worn by personnel in extreme heat conditions. These vest are most used in Hazardous Materials incidents while using a fully encapsulated suit. The department also has polices that provide rehab equipment/supplies to an incident scene.

City of Zeeland (Ottawa County) NFIP, 2010 population 5,504 (down 5% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Severe Winter Weather, Tornados, Extreme Temperatures, etc.

Add generators for City Hall and Public Safety Buildings.

Primary Responsibility: City of Zeeland

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: 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 Source(s): 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.

#2 HIGH Priority – Urban Flooding

Replace culvert at 104th Avenue.

Primary Responsibility: City of Zeeland

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Bridge Span - \$500,000

Benefit(s): Less potential for flood damage.

Anticipated Funding Source(s): 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.

#3: Medium priority – Extreme Temperature, Tornado, Severe Winter Weather

Add generators for the City Hall and Public Safety Buildings.

#4: Medium priority – Electrical Failure

Provide an emergency generator to power the building in the event of power loss so the city administration can function and occupy the building whenever necessary, 21 South Elm Street. Install an emergency power generator as a secondary power source when a power failure occurs 227-103rd Avenue. Install natural gas generator at the police/fire/EOC building for EOC operation 29 West Main Avenue. 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. 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. Develop a plan to recover from a major power failure in Zeeland. Determine critical power needs to support hospital, home medical needs, waste treatment plant, and others, for the Entire City of Zeeland. Install an emergency power generator as a secondary power source when a power failure occurs, 115 Carlton Avenue. Portable generator for Street Maintenance Facility, 600 East Roosevelt.

#5: Medium priority – Thunderstorm Hazards (Hail, Lightning, Wind)

We would like to put in place generators for our City Hall and Public Safety Building. The estimated cost for these generators are \$40,000 per building.

#6: Medium priority – Urban Flooding

1. 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, an estimated cost of \$500,000 is appropriate. This should help eliminate some "upstream" flooding that we have experienced in the past.

2. Cleaning ditch banks and ditching: 215 N. Centennial to 373 N. State, 245 S. Woodlawn Ct. to 279 So. Division, 250 South Jefferson, 277-104th Avenue, 420 East Riley, 475 No. Centennial to 555 No. State, 509 E. Washington to 215 N. Centennial.

3. Drain commissioner & engineers to review and update the flood plain maps: Huizenga subdivision.
4. Floodplain benching in vacant lot. Provide more stormwater 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 stormwater storage to avoid flooding, Parcel #70-16-24-400-050. Regional pond to provide more stormwater storage to avoid flooding, Parcel #70-17-17-101-023. Floodplain benching along ditch 1,500 ft.

#7: Medium priority – Intentional Acts:

8943 Riley (Generating facility): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

9984 Perry (Electric substation): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

Intentional Acts

UPDATED: 320 North Fairview (Electric substation): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

UPDATED: To install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.347 East Washington Generating facility.

UPDATED: To install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.3697-80th (Water tank) To install cameras, door and gate alarms and connect this all to the 24/7 dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.495 West Washington (Generating facility).

UPDATED: To install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.115 North Carlton (Water tank).

UPDATED: To install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power out

UPDATED: 347 East Washington (Generating facility): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

UPDATED: 3697-80th (Water tank): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

495 West Washington (Generating facility): Install cameras, door and gate alarms and connect this all to the 24/7 dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

UPDATED: 115 North Carlton (Water tank): Install cameras, door and gate alarms and connect this all to the 24/7 city dispatch center. Zeeland BPW needs security at the water tanks and substations and generating facilities to reduce the possibility of water contamination and power outages by unknown forces.

#8: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A new master plan update was completed in 2011. During the next plan update process, the Zeeland Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#9: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#10: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#11: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#12: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Zeeland Township (Ottawa County) NFIP, 2010 population 9,971 (up 31% from 2000)

Hazard Priorities:

High: Winter Weather, Electrical Failure, Tornado, Riverine Flooding, Communications Failure, Thunderstorm Hazards, Urban Flooding

Medium: Intentional Acts, Transportation Accidents, Hazardous Materials Release, Urban/Structural Fire, Water Structure Failure, Epidemic, Sanitary Sewer System Failure, Extreme Temperatures

Low: Nuclear Power Plant Accident, Shoreline Flooding/Erosion, Earthquake, Drought, Wildfires, Other Fires, Landslides, Dam Failures

Prioritized Hazard Mitigation Strategies:

#1 HIGH Priority – Severe Winter Weather, Tornados, Extreme Temperatures, etc.

Table top exercises and communication planning.

Specific Hazard(s) Addressed: Severe Weather

Specific Vulnerability(ies): Extreme Temperature, Tornado, Severe Winter, Weather

Jurisdiction: Zeeland Charter Township

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Establish a protocol for exercises and annual review of communications planning.

Implementation Tasks and Schedule: This should be done on an ongoing basis with annual reviews.

Cost(s): This will be done during regular business hours with current staff.

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): Regular Township Operating Budget.

2011 Status: 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.

#2 HIGH Priority – Severe Winter Weather, Tornados, Extreme Temperatures, etc.

Continuing Education Classes

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Funding Source

Implementation Tasks and Schedule: To be considered when funding is available.

Cost(s): Unknown \$3000-\$5000

Benefit(s): Less potential for personal injury.

Anticipated Funding Source(s): 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.

#3 HIGH Priority – Public Health Emergency (Natural Epidemic):

Upgrade of the public health and hospital emergency communications systems.

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: By 2016 or sooner if funding is available.

Cost(s): Unknown \$10,000-\$15,000

Benefit(s): Less potential for spread of disease.

Anticipated Funding Source(s): 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.

#4 HIGH Priority – Sanitary Sewer Failure

Additional standby power, generators and portable pumps.

Primary Responsibility: Zeeland Charter Township Fire Department

Initiatives Needed: Secure Funding

Implementation Tasks and Schedule: 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 Source(s): 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.

#5: Medium priority – Flood Mitigation

Study potential flood areas for consideration of future flood mitigation field projects.

#6: Medium priority – Master Plan Consideration

Give consideration to hazard mitigation needs and concepts in the next update of the community's master plan and associated zoning maps. A township master plan was updated in 2006, and therefore should soon be in the process of being updated again. During such an update process, the Zeeland Township Planning Commission should give consideration to hazard mitigation concepts and concerns, and adjust the master plan to accommodate viable hazard-related strategies.

#7: Medium priority – Emergency Notification

Develop actions to strengthen and maintain emergency notification systems (as detail is found, this strategy might be elevated to HIGH priority in the future). Coordinate as needed to bolster the dependability of emergency communication systems.

#8: Medium priority – Severe Weather Preparedness

Identify any warning system needs in the township.

#9: Medium priority – Infrastructure Strengthening

Identify potential improvements or projects to strengthen the area's infrastructure (of all kinds) to increase its hazard-resistance.

#10: lower priority – Fire Preparedness

Consideration of additional fire-related public awareness and training activities. Assess and/or address any possible shortfalls in fire mitigation actions, regulations, supplies, firebreak, staffing, FIREWISE protection techniques, and risk assessment detail.

Additional hazard information:

Extreme Temperature, Tornado, Severe Winter Weather: Continuing Education Classes. Table top exercises and communication planning. Establish a protocol for exercises and annual review of communications planning.

Sanitary Sewer Failure: Additional standby power, generators and portable pumps

Natural Epidemic: Upgrade of the public health and hospital emergency communications systems.

Zeeland Charter Twp Fire Department Input, Concerns, and Strategies:

Extreme Temperature Hazards: Training for cold weather emergencies. Additional education.

Thunderstorm Hazards (Hail, Lightning, Wind): Disaster training - Mass casualty. Maintain continuing education classes

Water System Failure: Water towers and loop water systems. Multiple water sources.

Transportation Hazards: EMS mass casualty plan. Exercises and continuing education.

Sanitary Sewer Failure Hazard: Back up power as needed. Additional power and pump plants.

Public Health Hazard: Public awareness through the OC Public Health Service. Upgrade of the public health and Hospital emergency communications systems.

Hazardous Material Hazard: Fire Dept Ottawa County Haz-mat Team. Education and Exercises.

Communications Failure Hazard: Committee in place to upgrade communications. Back up communications where possible.

Electrical Failure Hazard: Local wire service pruning maintenance and pole replacement, with underground infrastructure where applicable. Regular communication with the local power companies.

Urban Flood Hazard: Closing roads, media education, and assistance from Emergency Management. No current projects, outside of water management and other ditching projects.

Urban and Structural Fire Hazard: Fire training in the use of foam and other water enhancing operations. Continuing Education.

Riverine Flood Hazard: Currently monitored by NWS and local Emergency Management. Zeeland Township has ongoing water management practices in place.

Dam Failure Flood Hazard: Zeeland Twp has a Low downstream hazard. Training.

Other Fire Hazards: No tire farms are currently located in Zeeland Twp and the landfill is closely monitored. Good zoning and management

Earthquake Hazard: EMS and Fire service available. Members on the Tech rescue.

Drought Hazard: No current measures specific to this are in place in Zeeland Township

Tornado Hazard: Mass casualty training and incident command training. Tabletop exercises and communication planning.

Severe Winter Weather (Snow, Ice, Blizzard): Fire and EMS training. Education for the fire dept reference driving and cold weather awareness

Wildfire Hazard: The concern for wildfire in Zeeland Township is not a critical one, we have a small number of wildfires and the threat is met with the current fire dept resources. Continue to train and use the equipment we have on Staff.

Kent County Warning Systems – Sirens

ID#	Address	Jurisdiction	How Activated	Activated Individually?
1	Ada Dr SE & Alta Dale Ave SE	Ada Township	Kent County/Radio	Y
2	7200 Knapp St SE	Ada Township	Kent County/Radio	Y
3	Egypt Valley Ave NE & Pettis Ave NE	Ada Township	Kent County/Radio	Y
4	Pettis Ave NE & Knapp St NE	Ada Township	Kent County/Radio	Y
5	610 9 Mile Rd NW	Alpine Township	Kent County	N
6	1180 Buttrick Ave SE (Ada Park)	Ada Township	Kent County/Radio	Y
7	Ada Dr SE & W Village Trl SE	Ada Township	Kent County/Radio	Y
8	5255 Alpine Ave NW	Alpine Township	Kent County	N
9	6250 Bancroft Ave SE	Bowne Township	Kent County	N
10	2560 84th St SW	Byron Township	Kent County/Manual	Y
11	11 68th St SW	Byron Township	Kent County/Manual	Y
12	9111 Alanada Dr SE	Caledonia Township	Kent County	N
13	5770 76th St SE	Caledonia Township	Kent County	N
14	2865 Thornhills Ave SE	Cascade Township	Manual/Kent County/Radio	Y
15	2990 Buttrick Ave SE	Cascade Township	Manual/Kent County/Radio	Y
16	Laraway Lake Dr SE & Tammarron Dr SE	Cascade Township	Manual/Kent County/Radio	Y
17	Spaulding Ave SE & Abbeydale Dr SE	Cascade Township	Manual/Kent County/Radio	Y
18	4600 Whitneyville Ave SE	Cascade Township	Manual/Kent County/Radio	Y
19	3820 Thornapple River Dr SE	Cascade Township	Manual/Kent County/Radio	Y
20	7701 11 Mile Rd NE	Courtland Township	Kent County	N
21	10436 Courtland Dr NE	Courtland Township	Kent County	N
22	3501 68th St SE	Gaines Township-Dutton	GRFD	Y
23	NW Corner of Lakeside Dr SE & Lake Dr SE	East Grand Rapids	Kent County	N
24	2720 3 Mile Rd NE	Grand Rapids Township	Kent County	N
25	4433 Heather Ln SE	Grand Rapids Township	Kent County	N
26	4016 Antigo Ct SW	Grandville	GRFD/Radio	N
27	3100 Wallace Ave SW	Grandville	GRFD/Radio	N
28	3413 Wilson Ave SW	Grandville	GRFD/Radio	N
29	4264 Canal Ave SW	Grandville	GRFD/Radio	N
30	210 E Muskegon St NW	Kent City	Manual/Kent County/Radio	Y
31	248 N Main St NE	Cedar Springs	Kent County	Y
32	14101 Sparta Ave NW	Tyrone Township	Kent County/Radio	Y
33	13770 Fruit Ridge Ave NW	Tyrone Township	Kent County/Radio	Y
34	507 48th St SE	Kentwood	Manual/GRFD/Radio	Y
35	5755 Eastern Ave SE	Kentwood	Manual/GRFD/Radio	Y
36	4670 Kalamazoo Ave SE	Kentwood	Manual/GRFD/Radio	Y
37	1999 Wolfboro Dr SE	Kentwood	Manual/GRFD/Radio	Y
38	2901 44th St SE	Kentwood	Manual/GRFD/Radio	Y
39	4195 44th St SE	Kentwood	Manual/GRFD/Radio	Y
40	5450 East Paris Ave SE	Kentwood	Manual/GRFD/Radio	Y
41	2929 32nd St SE	Kentwood	Manual/GRFD/Radio	Y

42	3318 East Paris Ave SE	Kentwood	Manual/GRFD/Radio	Y
43	2451 Forest Hills Ave SE	Kentwood	Manual/GRFD/Radio	Y
44	5424 Wing Ave SE	Kentwood	Manual/GRFD/Radio	Y
45	1728 East Paris Ave SE	Kentwood	Manual/GRFD/Radio	Y
46	8460 Conservation St NE	Ada Township Grand Rapids	Kent County/Radio	Y
47	1836 East Belt Line Ave NE	Township	Kent County	N
48	3950 Hendershot Ave NW	Alpine Township	Kent County	N
49	841 Alpine Church St NW	Alpine Township	Manual	Y
50	148 Ridgeview Dr SE	City of Lowell	Kent County	N
51	116 N Division St	City of Lowell	Kent County	N
52	10300 14 Mile Rd NE	Oakfield Township	Kent County	Y
53	137 Lewis St NE	City of Rockford	Kent County/Radio	N
54	643 Northland Dr NE	City of Rockford	Kent County/Radio	N
55	223 Summit Ave NE	City of Rockford	Kent County/Radio	N
56	11 E Lake St NE	Sand Lake	Manual	Y
57	86 N Union St NW	Sparta	Kent County	N
58	407 S State St NW	Sparta	Kent County	N
59	12131 18 Mile Rd NE	Spencer Township	Manual/Kent County	Y
60	3650 5 Mile Rd NE	Plainfield Township	Kent County	Y
61	2500 5 Mile Rd NE	Plainfield Township	Kent County	Y
62	1345 Woodworth St NE	Plainfield Township	Kent County	Y
63	3943 West River Drive NE	Plainfield Township	Kent County	Y
64	5639 Pine Island Dr NE	Plainfield Township	Kent County	Y
65	7076 Pine Island Dr NE	Plainfield Township	Kent County	Y
66	6161 Belmont Ave NE	Plainfield Township	Kent County	Y
67	7923 Blemont Ave NE	Plainfield Township	Kent County	Y
68	4303 Kroes St NE	Plainfield Township	Kent County	Y
69	3733 7 Mile Rd NE	Plainfield Township	Kent County	Y
70	5357 Chauncey Dr NE	Plainfield Township	Kent County	Y
71	3131 Alpine Ave NW	City of Walker	Kent County/Radio	Y
72	1465 3 Mile Rd NW	City of Walker	Kent County/Radio	Y
73	2751 Elmridge Dr NW	City of Walker	Kent County/Radio	Y
74	3941 Leonard St NW	City of Walker	Kent County/Radio	Y
75	4243 Remembrance Rd NW	City of Walker	Kent County/Radio	N
76	280 Cummings Ave SW	City of Walker	Kent County/Radio	Y
77	2980 O'Brien St SW	City of Walker	Kent County/Radio	Y
78	4331 Burton St SW	City of Walker	Kent County/Radio	Y
79	1500 Burton St SW	City of Wyoming	Kent County/Manual	N
80	2545 Clyde Park Ave SW	City of Wyoming	GRFD	Y
81	230 32nd St SE	City of Wyoming	Kent County/Manual	Y
82	1250 36th St SW	City of Wyoming	Kent County/Manual	Y
83	2903 Byron Center Ave SW	City of Wyoming	Kent County/Manual	Y
84	4344 Byron Center Ave SW	City of Wyoming	Kent County/Manual	Y
85	961 52nd St SW	City of Wyoming	Kent County/Manual	Y
86	5500 Wilson Ave SW	City of Wyoming	Kent County/Manual	Y
87	2300 Gezon Parkway SW	City of Wyoming	Kent County/Manual	Y
88	5906 Averill Ave SW	City of Wyoming	Kent County/Manual	Y
89	4507 Division Ave S	City of Wyoming White Creek Country	Kent County/Manual	Y
90	15851 White Creek Ave NE	Est	Manual	Y
91	3592 17 Mile Rd NE	Cedarfield Inc	Kent County	
92	6500 McCords Ave SE	Caledonia Township	Kent County	N

APPENDIX

NOTE: The Power Point Presentation from Ottawa County Quadrant Meetings was not included here, due to its length and extensive use of graphics. Sign-in sheets appear below:

Ottawa County Pre-Hazard Mitigation Plan Meeting
 N. E. Quadrant, Coopersville City Hall
 August 12, 2010, 1:30 PM-3:30 PM

	Name	Agency/Jurisdiction	Phone	E-Mail
1	MIKE MUNCH	OTTAWA CO. DEPT COURT.	616-894-4528	munch.eri@ocwa.org
2	JEANNINE NUBERS	Coopersville Emergency Service	616-318-5582	jeanninenubers@yahoo.com
3	James Kueck	Ottawa County Sheriff's Office	(616) 897-2130	office @ city of coopersville.com
4	JAN REDDINS	CHESTER TOWNSHIP	616-894-5544	clerk @ chester-twp.org
5	SARA VAN HOEVEN	Off. Co. Road Comm.	616-880-7222	svanhoeven@ottawacore.com
6	Ann Becker	201st Twp	899-2164	joannebecker@provide.net
7	Keith Van Beur	OC Administrators Office	738-4642	krabecker@ottawac.org
8	Bill Smith	OC/H/Em	939-4052	billsmith@ottawac.org
9	Chris Suddler	" "	939-4052	csuddler@ottawac.org
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Ottawa County Pre-Hazard Mitigation Plan Meeting
 N. W. Quadrant, Grand Haven City Hall
 August 18, 2010, 10:00 PM-12:00 Noon

	Name	Agency/Jurisdiction	Phone	E-Mail
1	Chris Sadtler	Ottawa County EMD	738-4052	Csadtler@ottawacounty.org
2	Roger DeYoung	Spring Lake / Edrysburg	(616) 842-1889	Chiefdeyoung@SLEBA.org
3	Bill Syme	OSHEMD	738-4058	bsyme@ottawacounty.org
4	Roger DeYoung	Village of Spring Lake	(616) 842-1889	Chiefdeyoung@SLPMD.org
5	"	City of Ferrisburg	(616) " "	" "
6	Tacy Mulligan	Robinson Twp	846-2210	supervisor@robinson-twp
7	Tom Stuparis	GH-SL WWP	847-3486	stuparis@grandhaven.org
8	Julie Beaton	GH DPW	847-3493	beatona@grandhaven.org
9	Rick Yanko	GHDP5	842-3460	ryanko@grandhaven.org
10	Joe Boyle	GHDP5	842-3460	jboyle@grandhaven.org
11	John Koch	SLT	844-2100	jkoch@springlake-twp.org
12	Dennis Edwards	GHDP5	842-3460	dedwards@grandhaven.org
13	Steve Van Hooven	Ottawa County Road Commission	850-7222	svanhoovent@ottawacounty.org
14	Garry Deagen	Coastery Township	487-5458	Chief@CoasteryTwp.org
15	Mike Munch	Grand Co Drain Com. Assoc	94-4528	Munch@hioffshore.org
16				
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Ottawa County Pre-Hazard Mitigation Plan Meeting
 S. E. Quadrant, Hudsonville City Hall
 August 18, 2010, 1:30 PM-3:30 PM

	Name	Agency/Jurisdiction	Phone	E-Mail
1	LENN DEVOES	Town of S.D.	616-658-5997	ldevos@miottawa.com
2	Garber Dittman	GRAND PD	616-331-3355	gdittman@grandpd.com
3	Don Manning	Georgetown Tice	616-437-1034	Charanny@georgetown-mi.gov
4	Thomas Salgado	Georgetown	437-3766	fire7677@attolinet
5	MICHAEL KEefe	PLEURAGE	616 895-4544	MKeefe@attisco.net
6	Ally & Beerman	Leicht-Falmace Fire	616 677-1610	fire@falmace.com
7	David Dahl	Hudsonville EMD	616-430-2505	ddahl@hudsonville.org
8	Richard Mohr	Hudsonville Fire	616-669-0200x429	rmohr@hudsonville.org
9	TERRY WATSON	City Mgr. Hudsonville	616-667-0200x418	terry@hudsonville.org
10	BILL GILSONEN	FIRE CHIEF	616-772-5374	BGRUPEN@hudsonville.org
11	John Meriman	Holland Charter Township	616-395-0151	johnm@holland.mi.us
12	John Crumb	City of Hudsonville	616-469-0200	john@hudsonville.org
13	John Dittman	OCSD	616-738-4000	jordm@dmiottawa.org
14	Jim Salgado	OCSD	738-4000	jsalga@miottawa.org
15	MIKE BARKAN	OCSD	738-4000	mbarkan@miottawa.org
16	Tim Wrede	Township of Twp.	897-8376	timw@miottawa.org
17	Steve VanHoever	Off. Co. Road Comm.	850-7222	svanhoever@ottawacoc.com
18	Paul Cooper	OCJc	994-4530	paule@miottawa.org
19	Chris Sadtler	OCSD	738-4052	csadtler@miottawa.org
20	Bill Smith	OCSD	738-4050	bsmith@miottawa.org
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Ottawa County Pre-Hazard Mitigation Plan Meeting
 S.W. Quadrant, Holland City Hall
 August 6, 2010, 9:00 AM-11:00 AM

	Name	Agency/Jurisdiction	Phone	E-Mail
1	Bill Smith	OSHA 1811D	658-7760	bsmith@miottawa.org
2	Chris Sadtler	OSHA 1811D	738-4052	csadtler@miottawa.org
3	Mike Michalek	American Red Cross	396-6595	mmichalek@ottawareddcross.org
4	Ken Ruben	OCRC	850-7204	kruben@otcrwaocac.com
5	Steve VanHoven	OCRC	850-7222	svanhove@otcrwaocac.com
6	Gordon VanderYacht	Port Stedden Twp Site	886-1038	vandyacht@here.edu
7	Paul Geerlings	OCDC	994-4530	pgearing@miottawa.org
8	Paul Haeck	Holland BPO	355-1573	phaeck@hollandbpo.com
9	Howard Braumann	Port Stedden Twp	399-6121	hbraum@portsteddentwp.org
10	Todd Wilkin	Oliver	836-1021	ToddWilkin@oliver.ca
11	Tim Klunder	City of Holland	772-6400	tklunder@cityofholland.ca
12	Bob Syms	City of Holland	928-2405	jsyms@cityofholland.com
13	Chris Tinney	City of Holland	888-836-5448	ctinney@cityofholland.com
14	Walter Messer	City of Holland	616 218-2797	wmesser@cityofholland.com
15	Adeline Hambley	Ottawa County Inv. Health	616-393-5055	ahambley@miottawa.org
16	Lee Hoopman	Ottawa County Sheriff's	616 738-4041	lhoopman@miottawa.org
17	Al Keenan	Ottawa County Sheriff's	616 738-4000	akeenan@miottawa.org
18	Paul Sadows	Ottawa Co. Penitentiary	616-738-4852	psadows@miottawa.org
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Summary “Capabilities Assessment” for the Region

The assessment of which hazard mitigation actions are considered feasible is partially rooted in a knowledge of the local capabilities, resources, authorities, and personnel. Although this is well-known to many local leaders (and used to select and prioritize various actions), the following summaries are provided to help other agencies to have 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. The table on page 147 has already noted which communities are NFIP participants.

Kent County Resources and Authorities

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

Kent County Sheriff Dept.

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

- 172 Enforcement Deputies
- 1 main station
- 2 Substations
- Full complement of patrol vehicles
- Mobile Command Post
 - Fully operational communications vehicle
 - Satellite phones
 - Interoperable communications included
- Tactical Team / Fully equipped
 - 1 Commander
 - 22 Tactical Team Officers (5 snipers)
 - 7 Negotiators
 - 4 Tactical vehicles
- Dive Team/Underwater SAR/ ORV
 - 11 team members
 - 1-ROV
 - 7 boats
 - 2-PWC
 - Mule ORV
 - Quad Runner ORV
 - 2 Snowmobiles
- Scientific Support Unit
 - 7 trained personnel
 - Computer forensics
 - Evidence/Property management
 - Process scenes for forensic evidence
 - Process forensics in house
 - 1 marked crime scene response vehicle
 - 1 unmarked secondary crime scene response vehicle
 - 1 unmarked property/evidence van

Kent County Road Commission

<http://www.kentcountyroads.net/>

- Primary Construction 2012
- Maps
- Meetings
- Purchasing
- Facts
- Forms

- Policies
- Kent County Info
- Personnel and equipment
 - 250 employees
 - 102 dump trucks
 - 2 high rangers
 - 2 sign trucks
 - 1 tank truck
 - 1 highway tractor
 - 1 stump grinder
 - 5 brush chippers
 - 1 mini excavator
 - 4 skid steers
 - 8 motor graders
 - 4 loaders
 - 1 tractor backhoe
 - 1 bulldozer
 - 40 chain saws
 - 5 small pumps
 - 6 small generators
 - 1 paver - 5 rollers
 - 4 rubber tired excavators
 - 1 tracked excavator
 - 18 mowing tractors
 - 30 assorted trailers
 - 90+ front plows
 - 13 passenger cars
 - 4 suburban
 - 47 pick ups
 - 21 – 1 ton trucks
 - Miscellaneous road construction equipment / tools

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
- Department of Public Works Personnel / Vehicles
 - 49 Empolyees20 Pickups
 - 8 passenger cars
 - 1 video truck
 - 1 sewer truck
 - 3 roll off trucks
 - 3 tank trucks

- 3 portable generator sets 60-100kw
- 2 bulldozers
- 2 loaders
- 1 trash compactor

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 Development http://www.accesskent.com/YourGovernment/DrainCommisioner/drain_development.htm
- Stormwater Ordinance 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>

William R. Byl, Drain Commissioner
 1500 Scribner NW
 Grand Rapids, MI 49504
 Phone: (616) 336-3688
 Fax: (616) 336-3575

Mission Statement

The mission of the Kent County Drain Commissioner’s office is to improve and maintain storm water drainage for the public health, safety, convenience, and welfare of the citizens of Kent County and also to be an effective and efficient steward of our natural and fiscal resources.

Staff Contacts

- | | |
|--|---|
| • William R. Byl
Drain Commissioner | • Angie Latvaitis
Civil Engineer |
| • Douglas Spote
Deputy Drain Commissioner | • Amy J. Klapko
Drain Commissioner Assistant |
| • Bradley R. Boomstra, P.E.
Senior Engineer | • Rodney G. Kilts
Drain Maintenance Technician |

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

- 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

2011 Adopted Uses: \$661,921

2011 Adopted Revenues: \$141,520

Selected Performance Measures:

Performance Measure	2008 Actual	2009 Actual	2010 Actual	2011 Expected
Percent of drain permit request processed within 2 days	95.00%	95.00%	95.00%	90.00%
Percent of complaints/requests resolved within 90 days	98.00%	96.00%	92.00%	90.00%
Percent of responses to complaints/requests within 2 days	90.00%	93.00%	86.00%	90.00%
Drainage problems resolved	150	160	149	120
Drain permit applications reviewed	25	14	15	20

Department History of Uses

Uses	2008 Actual	2009 Actual	2010 Adopted	2011 Adopted
Personnel	\$459,675	\$474,076	\$481,953	\$497,374
Commodities	16,467	22,596	8,175	16,515
Contractual	77,032	67,549	67,994	70,312
Operating Capital	2,470	1,800	1,200	1,200
Special Projects	195,614	75,430	73,805	76,520
Total Uses	\$751,259	\$641,451	\$633,127	\$661,921
Personnel FTE	6.5	6.5	6.5	6.2

Significant Budget Issues

For the 2011 Budget Year, hours for the Administrative Intern were reduced by 0.3 FTEs.

Significant Accomplishments

As the designated authority for the maintenance of the legal lake level of Pine Lake, the County Drain Commissioner has removed and replaced 300 feet of lake outlet pipe to reduce seasonal fluctuation of the water level in the lake. The Drain Commissioner's Office inventoried the storm water controls on all the properties owned by the County.

History of Uses:

2008: about \$750,000

2009: about \$650,000

2010: about \$650,000

2011: about \$660,000

Current Projects:

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 web site at

http://www.accesskent.com/YourGovernment/DrainCommissioner/drain_development.htm

Model Stormwater Ordinance

The Drain Commissioner and many other individuals have worked on a Task Force to draft a model stormwater 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 stormwater web site:

http://www.accesskent.com/YourGovernment/DrainCommissioner/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>

Kent County Municipalities/Agencies

Ada Fire Department

Ada Fire Department major equipment

Pump Rating	Tank Size
Engine-1500	1000
Grass Rig-125	125
Tanker-1250	3000
Engine-1500	1000
MFR-Suburban	
MFR-Suburban	

Grass Rig-125	125			
Engine-1500	750			
Ada Station 1		6990 E. Fulton Ada 49301	676-2376, 676-2173	jduvall@ada.mi.us
Ada Station 2		7211 Knapp Ada 49301	676-2500	adamayor@aol.com

Airport Crash Fire Rescue

Pump Rating	Tank Size	
MINI-250	200	
Engine-1900	1500	
Engine-1800	2500	
Engine-1250	1500	
Rescue		
Airport CFR		5000 44th St SE Grand Rapids 49512 233-6079, 233-6394 bkimble@grr.org

Algoma Fire Department

Pump Rating	Tank Size	
Engine-1750	1000	
Engine-1750	1000	
Tanker-250	4200	
Tanker-1250	2500	
Heavy Rescue		
SUV		
Lt Rescue		
Grass Rig-250	250	
Grass Rig-250	75	
Algoma Station 1	1182 Fonger Rockford 49341	887-0754, 866-2649 algomafire@chartermi.net
Algoma Station 2	10820 Edgerton av NE Rockford 49341	866-2607, algomasup@chartermi.net
Algoma Station 3	10531 Algoma Rockford 49341	866-1583 mfalk@moonlightindustries.biz

Alpine Fire Department

Pump Rating	Tank Size	
Engine-1750	750	
Engine-1500	1000	
Heavy Rescue		
Grass Rig-250	250	
Lt Rescue		
Engine-1750	2000	
Tanker-500	3500	
Engine-1500	2000	
LT Rescue		
Foam Trailer		
Alpine Station 1	841 Alpine Church rd NW Comstock Park 49321	784-5750, 785-9115 alpinefd@alpinetwp.org
Alpine Station 2	3859 7 Mile Alpine	784-9590
Alpine Station 3	610 9 Mile Alpine	647-0335

Alto Fire Department

Pump Rating	Tank Size
Grass Rig-200	250
Tanker-500	4500
Tanker-200	4500
Med-Rescue	
Engine-1750	1250
Engine-1750	1250
Engine-1750	1250

Grass Rig-100 250
 Rescue/Medic
 Cascade Station 12865 Thornhills av SE Grand Rapids 49546 949-1320, 285-2330
jsigg@cascadetwp.com
 Cascade Station 22990 Buttrick Ada 49301 682-9681, 682-9680

Cedar Springs Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1250	1000
Rescue-250	300
Rescue	n/a
Grass Rig-100	150
Engine-1500	1000

Cedar Springs PO Box 310 66 N. Main Cedar Springs 49319 696-1221, 696-8837
csfire@cmedic.net
jgrossfd@cmedic.net
shawn.holtrop@kentcountymi.gov

Courtland Township Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1250	1000
Tanker-350	3800
Med. Rescue	
Med. Rescue	
Grass Rig-250	250
Grass Rig-250	250
Courtland Station 1	7480 14 Mile Rd NE Rockford 49341 866-3511, 866-3451 firechief@courtlandtwp.org
Courtland Station 2	9535 Myers Lake Rockford 49341

Cutlerville Fire Department

Pump Rating	Tank Size
Engine-2000	900
Engine-1000	750
Quint-2000	500
Rescue	
Rescue	230
Cutlerville	11 68th st SW Grand Rapids 49548 455-3830, 455-0221

Dutton Fire Department

Pump Rating	Tank Size
Grass Rig-250	250
Rescue	
Engine-2000	750
Tanker-750	3500
Engine-1000	1000
Dutton	3471 68th st SE Caledonia 49316 541-0119, 541-0120 russelljansen@yahoo.com

East Grand Rapids Fire Department

Pump Rating	Tank Size
Engine-1250	700
Engine-500	260

Aerial-1500 300
East Grand Rapids 770 Lakeside East Grand Rapids 49506 949-7010, 940-4829
clark@eastgr.org

City of Grand Rapids Resources and Authorities

<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>
- 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>

Car 5	100' Aerial Platforms/75' Ladders
Car 6	Rescues and Engine 8 CSR/Rope Rescue
Engine 2	RRT 61 Haz-Mat Response
Engine 3	Two Water Rescue Boats
Rescue 5	Two Personal Watercraft
Engine 6	Collapse Rescue Vehicle/Trailer
Engine 7	4 Brush Units
Engine 8	1 Mini-Engine (Parking Garage Fires)
Engine 9	5 Medical Squads
Rescue 10	Air Delivery Vehicle- Scott SCBA Cylinders
Engine 11	All Apparatus 1500 GPM Pumps
Ladder 1	All Engine 500 gal H2O or more
Ladder 4	
Platform 2	
Platform 3	
Engine 1	
Engine 4	
Engine 12	
Engine 13	
Engine 14	
Engine 15	
Engine 16	
Truck 5	
Truck 6	

City Of Grand Rapids 1755 Leonard st NE Grand Rapids 451-9677
jvansolk@grand-rapids.mi.us

115 Franklin st SW Grand Rapids 245-8186 gszotko@ci.grand-rapids.mi.us
 500 Bridge st NW Grand Rapids 459-5992 dcarley@ci.grand-rapids.mi.us
 2541 Kalamazoo av SE Grand Rapids 243-5235 gszotko@grcity.us
 1181 Monroe Grand Rapids 456-3906
 2941 Burton st SE Grand Rapids 942-5111
 38 LaGrave Ave SE Grand Rapids 456-3907
 1154 Covell Av NW Grand Rapids 453-9603
 2251 Plainfield av NE Grand Rapids 361-1783
 1734 S. Division av SE Grand Rapids 243-0792
 1002 Chester st SE Grand Rapids 458-2226

Grand Rapids Township Fire Department

Pump Rating	Tank Size
Engine-1750	750
Engine-1250	1000
Engine-1250	1000
Mini-pumper-250	260
500	250
Grass Rig-30	100

Grand Rapids Township Station 1 1836 East Beltline av NE Grand Rapids 49525 361-7391ext 232
 361-6620 deputychief@grandrapidstwp.org
 Grand Rapids Township Station 2 2728 3 Mile rd NE Grand Rapids 49525 364-9183
chief@grandrapidstwp.org
 Grand Rapids Township Station 3 4433 Heather Lane Grand Rapids 49525 942-4019
bversluys@grandrapidstwp.org

Grandville Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1250	1000
Engine-1250	500
Aerial-1500	300
Mini pumper-500	280
Suburban-EMT	
Suburban-EMT	

Grandville 3161 Wilson av SW Grandville 49418 530-6211, 534-4926
fire@cityofgrandville.com
veldhouseh@cityofgrandville.com
maym@cityofgrandville.com

Grattan Township Fire Department

Pump Rating	Tank Size
Engine-1000	1000
Engine-750	750
Tanker-750	3000
Med. Rescue	
Grass rig	250
Grass rig	250
Grass rig	250
Tanker-1500	3000

Grattan 12134 Old Belding Rd Belding 48809 691-7404, 691-7510 grattanfirechief@comcast.net
louathkl@aol.com
grattan24@comcast.net

Kent City Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1000	750
Rescue	n/a
Grass Rig-250	300
Tanker-500	3500
Grass Rig-250	300
Rescue	n/a
Kent City	28 E. Muskegon Kent City 49330 678-4330, 675-7615 reford@wmis.net kentcityfire@gmail.com

Kentwood Fire Department

Pump Rating	Tank Size
Engine-1500	500
Engine-1500	500
Engine-1500	500
Engine-1750	500
Engine-2000	500
1500	300
Grass Rig	150
Grass Rig	150
Trailer	Haz-Mat
Trailer	Tech Res
Kentwood Station 1	4774 Walma Kentwood 49546 554-0800, 554-0799 carrj@ci.kentwood.mi.us
Kentwood Station 2	4151 Embassy Kentwood 49546 949-1780
Kentwood Station 3	5340 Eastern Kentwood 49508 534-7117

Lowell Fire Department

Pump Rating	Tank Size
Engine-1250	1200
Rehab truck	
Engine-1000	1000
Engine-1250	1250
Grass Rig-100	200
Rescue	
Heavy Rescue	
Lowell	301 E. Main Lowell 49331 897-8135, 897-4086 lowellfire@hotmail.com

Oakfield Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1250	1000
Tanker	3000
Med. Rescue	
Grass Rig-250	250
Grass Rig	
Oakfield	10300 14 Mile Rd NE Rockford 49341 754-5122, 754-0989 firechief@courlandtwp.com

Plainfield Fire Department

Pump Rating	Tank Size
Engine-1750	640
Engine-1750	640

Engine-1500	500
Engine-1500	500
Aerial-2000	300
Rescue	
Grass Rig-300	200
Grass Rig-300	200
Plainfield Station 1	6145 Belmont Belmont 49306 364-1184 chief@plainfieldfire.org
Plainfield Station 3	4343 Plainfield Grand Rapids 49525 361-2895, 364-1187 donbig@plainfieldfire.org mckellars@plainfieldfire.org

Rockford Fire Department

Pump Rating	Tank Size
Engine-1500	790
Engine-1250	1000
Telisquirt-1250	500
Rescue	
Grass Rig-120	210
Rockford	PO Box 561, 7 S. Monroe St Rockford 49341 866-1553, 866-7182 mreus@rockford.mi.us vincent@rockford.mi.us

Sand Lake Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Engine-1250	1000
Grass Rig-75	250
Med. Rescue	
Engine-1000	1000
Tanker	5000
Tanker	5000
Grass Rig-75	250
Sand Lake Station 1	32 5th St Sand Lake 49343 636-8854 fire@villageofsandlake.org
Sand Lake Station 2	7163 120th Ave 636-8510 ed_holtzlander@amyway.com

Solon Township Fire Department

Pump Rating	Tank Size
Engine-1250	1000
Tanker	2500
Grass Rig-85	105
Engine-1000	300
Grass Rig-115	225
Engine-1250	1000
Tanker	5000
Rescue Boat	
Solon	2305 19 Mile rd NE Cedar Springs 49319 696-0020, 696-1709 fire@solontwp.org

Sparta Township Fire Department

Pump Rating	Tank Size
Engine-1500	1000
Engine-1500	1000
Aerial-2000	200
Heavy Rescue	
Grass Rig-150	250
Tanker-750	4000

MFR-Suburban
 Sparta 43 N. State Sparta 49345 887-0900, 887-5055 chiefbolen@aol.com
 Sparta Main Office 36 Elmwood Sparta 49345 carlwood@ci.walker.mi.us

Spencer Township Fire Department

Pump Rating	Tank Size
Engine-1000	1000
Engine-1250	1250
Tanker	6000
Grass Rig-75	200
Med-Rescue	
Grass Rig-75	200
Tanker	1375
Rescue	
Rescue-SUV	

Spencer 12131 18 Mile rd NE Gowen 49326 984-2200, 984-2207
spencerfire32@charterinternet.com
spencerchief@charterinternet.com
rescue192003@yahoo.com

Walker Fire Department

Pump Rating	Tank Size
Aerial-1500	500
Engine-1250	1000
Engine-1500	1000
Engine-1250	1000
Aerial-1500	200
ADV	
Tanker-1500	4000
Engine-1500	1000
Engine-1500	1000

Walker Station 1 4343 Remembrance rd NW Walker 49544 791-6840, 791-6898
william.schmidt@ci.walker.mi.us

Walker Station 2 4211 Lake Michigan Dr Walker 49534 791-6366 robert.walker@ci.walker.mi.us

Walker Station 3 1470 Three Mile Rd Walker 49534 453-6769

City of Wyoming Fire Department

Pump Rating	Tank Size
Aerial-2000	500
1250	500
Aerial-2000	500
2000	400
Aerial-2000	300
2000	750
Aerial-2000	300

4x4 Pick up w/ plow

Special Incident Response Unit

Wyoming Station1 1500 Burton SW Wyoming 49509 530-7250, 249-3435 fd_info@ci.wyoming.mi.us

Wyoming Station2 4507 Division Wyoming 49509

Wyoming Station3 2300 Gezon Parkway Wyoming 49509

Wyoming Station4 1250 36th st SW Wyoming 49509

Ottawa County Section

"Capabilities, authorities and resources to implement hazard mitigation strategies."

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

Ottawa County

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](#)
- [County Clerk](#)
- [County Treasurer](#)
- [Departments](#)
 - [Communications](#)
 - [Equalization / Property Description & Mapping](#)
 - [Facilities Maintenance](#)
 - [Fiscal Services](#)
 - [Geographic Information System \(GIS\)](#)
 - [Human Resources](#)
 - [Information Technology \(IT\)](#)
 - [Insurance & Risk Management](#)
 - [Planning and Performance Improvement](#)
 - [Purchasing](#)
- [Drain Commissioner](#)

The Drain 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 Drain 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 Drain 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.

- [Elections](#)
- [Ottawa County Central Dispatch](#)
- [Ottawa County Road Commission](#)

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

- [Prosecuting Attorney](#)
- [Register of Deeds](#)
- [Sheriff's Office](#)
- [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**

*** Drain Commission:** *Notes from my meeting with the County Drain 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 Drain 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 Drain 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	Spring Lake Village/Ferrysburg Police
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/>

DEPARTMENTS:

Supervisor
Clerk
Treasurer
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.

DEPARTMENTS:

[City Manager](#)

[City Assessor](#)

[Building Department](#)

[City Clerk](#)

[Department of Public Works](#)

[Emergency Services/Rescue](#)

[Fire Department](#)

[Planning and Zoning Department](#)

[Recreation Department](#)

[Ottawa County Sheriff](#)

[City Treasurer](#)

[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/>

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).

Storm Water

<http://www.epa.gov/weatherchannel/stormwater.html>

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

DEPARTMENTS/SERVICES:

[Airport](#)

[Assessor](#)

[Cemetery](#)

[City Clerk](#)

[City Manager](#)

[Finance](#)

[Harbor Transit](#)

[Human Resources](#)

[Planning & Community Development](#)

[Public Safety](#)

[Public Works](#)

[Treasurer](#)

[Wastewater](#)

[Water Filtration](#)

Grand Haven Charter Township

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

Stormwater

Be Stormwater Savvy

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

Wastewater collection

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

The Pollution Control Department is a division of the Holland Area Wastewater Treatment Plant. The purpose of our program is to regulate the disposal of industrial wastewater into the sanitary wastewater collection system. Protect the physical structures and the safety of operation and maintenance personnel of the wastewater system (collection and treatment). Protect the health and safety of the public and the environment. Comply 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. The pipeline route is marked in the field with pipeline markers bearing the name and emergency telephone number of the Holland Board of Public Works.

This pipeline is a transmission line only, supplying natural gas to our three electric generating turbines at our 48th Street Generation Station. We do not supply natural gas to residences or businesses.

We inject an odorant into the gas before it enters the populated area of south Holland.

Holland Charter Township

<http://www.hct.holland.mi.us/>

Roads (administered by Ottawa County Road Commission)

Storm drainage system (administered by Ottawa County Drain 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>

Emergency Management Department

Severe weather monitoring and storm spotting

Emergency communications and resource coordination

Community warning and hazard mitigation

Departments:

- [*City Government*](#)
- [*City Commission*](#)
- [*City Manager*](#)
- [*City Clerk*](#)
- [*Assessing Department*](#)
- [*Finance Department*](#)
- [*Planning/Zoning Department*](#)
- [*Department of Public Works*](#)
- [*Emergency Management*](#)
- [*Fire Department*](#)
- [*Sheriff Department*](#)

Jamestown Township

<http://www.twp.jamestown.mi.us/>

Supervisor

After the Storm

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

<http://water.epa.gov/polwaste/nps/nps.cfm>

Olive Township

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

DEPARTMENTS:

Supervisor

Clerk

Treasurer

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.

DEPARTMENTS:

- [Assessing](#)
- [Building and Zoning](#)
- [Clerk](#)
- [Fire Department](#)
- [Recreation](#)
- [Treasurer](#)
- [Utilities](#)

See “News/Hot Topics” tab – “County Drains” for information pertaining to County Drain Commission project “Park West Drain”.

Polkton Township

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

Polkton Master Plan can be found under the “resources” tab on the side.

Port Sheldon Township

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

DEPARTMENTS:

Supervisor
Clerk
Treasurer
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/>

DEPARTMENTS:

Assessor's Office
Building & Zoning
Clerk's Office

Fire Department Main Page
Parks & Recreation
Robinson Township Cemetery
Supervisor's Office
Treasurer's Office
Trustees

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.

DEPARTMENTS:

Village Manager
Dept. of Public Works (DPW)
Clerk/Treasurer
Community Services
Parks & Recreation
Police

Master Plan: <http://springlakevillage.org/images/pdf/Master%20Plan%20-%20Finished%20Copy%20from%20CD.pdf>

Spring Lake Township

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

DEPARTMENTS:

- Assessing
- Building & Planning
- Cemetery
- Clerk
- Fire
- Law Enforcement
- Manager
- Parks & Recreation
- Treasurer & Finance
- 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.
department with 2 stations.

They share a fire

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 and area of a spill, clean out street drains, and clean streets of debris.

The City of Zeeland has an Emergency Management Department.

Master Plan: <http://ci.zeeland.mi.us/LinkClick.aspx?fileticket=Fmm%2bcInwwlM%3d&tabid=3463&mid=5506>

Zeeland Charter Township

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

DEPARTMENTS:

- Assessing
- Fire Department
- Rental Facilities
- Township Parks

Zeeland Charter Twp. MASTER PLAN: <http://www.zeelandtwp.org/Portals/0/Maps/finalMasterPlan.pdf>