

MACOMB COUNTY HAZARD MITIGATION PLAN



2020 – 2025

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Annual Review Form

2021 Annual Review

Comments:

Reviewed by: _____ Date: _____

2022 Annual Review

Comments:

Reviewed by: _____ Date: _____

2023 Annual Review

Comments:

Reviewed by: _____ Date: _____

2024 Annual Review

Comments:

Reviewed by: _____ Date: _____

1 Planning Process

The Planning Process section of this Plan will identify those methods used to update the Macomb County Hazard Mitigation Plan (**HMP**). This section explains the purpose and need for a HMP and the key stakeholders and their roles in the plan's review and update. Since this plan addresses issues that affect the whole of Macomb County, input from the public was sought after and incorporated. This section will explain the methods used to advertise the update of the plan and how the planning committee's efforts to reach out and involve the public in the updates. This section will present the results of those outreach efforts and will also identify all steps utilized leading up to the "Hazard Identification" portion of the process. The next chapter of this plan addresses methods used to identify, analyze, and rate the hazards found to exist in Macomb County.

This 2020-2025 Plan was reviewed and updated by and for the following jurisdictions, all of whom participated in the development of the original 2005-2010 plan and the ensuing two updates [2010-2015 and the 2015-2020 Plan]. The following communities participated in the development of the plan:

- County of Macomb
- Armada Township
- Village of Armada
- Bruce Township
- City of Center Line
- Chesterfield Township
- Clinton Township
- City of Eastpointe
- City of Fraser
- Harrison Township
- Lenox Township
- Macomb Township
- City of Mount Clemens
- City of New Baltimore
- Village of New Haven
- Ray Township
- City of Richmond
- Richmond Township
- Village of Romeo
- City of Roseville
- Shelby Township
- City of St. Clair Shores
- City of Sterling Heights
- City of Utica
- City of Warren
- Washington Township.

The City of Memphis is co-located within Macomb and St. Clair Counties. The City of Memphis is served under the planning authority of St. Clair County Emergency Management

and is therefore covered under the St. Clair County Hazard Mitigation Plan. Grosse Pointe Woods is co-located within Macomb and Wayne Counties. The City of Grosse Pointe Woods is served under the planning authority of Wayne County Emergency Management and is therefore covered under the Wayne County Hazard Mitigation Plan

1.1 PURPOSE OF HAZARD MITIGATION PLAN

This plan demonstrates the county's commitment to reduce risks to lives and property from natural and human-caused hazards. The planning process describes how the plan was prepared with the coordination and participation of various agencies. Laws, regulations, policies, and programs are reviewed as they relate to hazard events. Risk assessments document historical events and actual losses. Future event probabilities, vulnerabilities, and estimated losses are also taken into account. Public outreach activities gather local perspective of hazards and mitigation activities. A FEMA-approved plan meets the federal requirement necessary to apply for and receive disaster and non-emergency mitigation funding. The plan also provides coordination with local mitigation planning efforts to provide assistance on hazard mitigation actions, data sharing, and funding. The maintenance and revisions to the plan note the progress of mitigation actions, as well as changes in development, policies, funding, and county priorities.

Setting mitigation goals, objectives, and actions at the county level ensure that:

- A mitigation vision is set for Macomb County
- Local mitigation objectives and actions that have been developed are consistent with the county's overall vision
- Specific actions, appropriate at the county level, are established to facilitate greater hazard mitigation activity

Actions that are appropriate to a county-level hazard mitigation plan were identified for this update. Many of these actions focus on agency coordination, outreach, data development, and creation and identification of human-caused hazards.

1.2 PARTIES INVOLVED

The planning process involved a variety of individuals and committees including Macomb County Emergency Management, the Michigan State Police Emergency Management & Homeland Security Division (MSP EMHSD), the twenty five individual community administration and services offices that would be served under this plan along with twenty five municipal emergency management divisions/departments, 14 police, 20 fire and 2 public safety departments, 3 general care hospitals, multiple health and community service organizations, industrial and manufacturing facilities and county residents. Macomb County's Local Emergency Planning Committee (LEPC), which is a committee consisting of a variety of local officials, police, fire, public health professionals, education, hospital and community leaders as well as manufacturing representatives. The LEPC was utilized as the controlling authority on the review and update of the HMP and kept the community planning officials abreast of the issues regarding the update of the plan and its implementation. Please refer to Appendix E for meeting minutes for the Hazard Mitigation Plan related meetings.

1.3 PLANNER'S ROLES

1.3.1 Emergency Management

Macomb County Emergency Management was the lead agency for the review and update of this plan. The 2015-2020 Plan served as the baseline plan for this review.

When the 2015-2020 plan was updated and approved, it had met all the current requirements established by the federal government and State of Michigan and it had also addressed all deficiencies from the 2010-15 Plan that had been identified by the Federal Emergency Management Agency (FEMA) and the Michigan State Police-EMHSD.

1.3.2 Communities

All 25 communities in the county developed their own municipal committee to review and prepare community specific information for inclusion in the plan. The official kick-off meeting to begin the review and planning process for the 2020-2025 Plan update was held on October 4, 2018.

1.3.3 Macomb County Planning

The Macomb County Planning Department reviewed and revised the maps contained in this plan using data received from the local committees and plotting that information using their Geographic Information System (GIS) program. These maps allow for easy identification of critical information dealing with hazard areas and their impact on the community.

1.3.4 Macomb County Information Technology

The Macomb County Information Technology Department (IT) developed and maintained the county web site (<http://www.oemc.macombgov.org>) dedicated to presenting the Hazard Mitigation Plan to the public. This site was updated regularly throughout the planning process to keep the public informed of new information about the plan, provided methods to review and offer comments on the plan, and posted notices of public hearings on the plan to encourage public participation with the development of the plan.

1.4 PUBLIC INVOLVEMENT METHODS

In order to keep the entire county informed and educated on the plan revision and its status, various types of media were utilized to reach the residents, community officials and interested parties in Macomb County.

1.4.1 Newspapers

Press releases were sent to the local newspaper publishers within the county in January, 2019. These publications included The Macomb Daily, The Detroit Free Press, The Detroit News, The Bay and The Voice. The press releases included general information about the Hazard Mitigation Plan and discussed the public's role in the process. The main intent of the articles was to inform the public that the revision process would be taking place and to advertise two town hall meetings scheduled to allow for public comment on the proposed draft. (Please see Appendix A for a copy of the press release).

1.4.2 Town Hall Meetings

Two (2) town hall meetings were scheduled and conducted at differing locations within the county, one in the north end and the other in the south end. Residents, business owners and other interested parties of Macomb County were invited to attend a meeting located in their geographic region. Information regarding the date, time and locations of the meetings is displayed on page 11.

Attendees will be given information highlighting the history and importance of the HMP, historical and potential hazards affecting Macomb County, success stories in mitigating hazards,

and community and public involvement in the planning process. Attendees will be invited to view the county's HMP and will also be directed to the web site for further updates, information, and other ways to stay involved throughout the process. The information presented at the town hall meetings is included in Appendix B.

Meeting Date, Time, & Location

Council Chambers
Utica City Hall
7550 Auburn
Utica, MI

February 6, 2019 @ 07:00 PM

Council Chambers
Roseville City Hall
29777 Gratiot
Roseville, MI

February 7, 2019 @ 07:00 PM

1.4.3 Website

One of the most effective ways to gain widespread input is through the Internet. Utilizing the existing emergency management web site, the county created a number of pages dedicated to the HMP. The site, <http://www.oemc.macombgov.org/Planning Documents-Hazard Mitigation Planning> provided links to the following:

- Town Hall meeting dates and locations
- Planning Committee meeting dates and locations
- Current plan (2015-2020) and updated plan (2020-2025)
- Public Input
- Incident Report
- Comments/Questions Form
- Information Link (additional info sites)
- Community Survey

1.4.4 Community Surveys

In order to identify the potential hazards affecting the county and to gain sufficient knowledge on the vulnerability of the county to these hazards, the county elected to poll each of the 25 local communities using a Hazard Risk/Vulnerability Assessment Survey. This survey addressed issues pertinent to analyzing risks and vulnerabilities attributed to specific hazards, how these hazards could affect the community, and what mitigation actions could be utilized to lessen the impact from each hazard. The survey included sections on critical facilities/infrastructure, maps, historical hazard occurrences, hazard rating, and proposed mitigation projects.

The surveys were presented to each Emergency Management Liaison of the twenty three communities served under the Emergency Management Program of the county as well as to the two stand-alone Emergency Management Programs located in the county, Clinton Township and the City of Warren. These surveys were presented at the kick-off meeting held on October 4, 2018 at the Macomb Intermediate School District building, 44001 Garfield, Clinton

Township. Please refer to Appendix D for a sample letter, a copy of the community survey, and a list of community leaders and other officials who worked to complete and return the surveys.

1.5 RESULTS OF OUTREACH EFFORTS

Some of the efforts implemented for public involvement proved to be quite effective while others received little response. Several types of media were used to reach multiple demographics. A number of methods were used to accommodate those who prefer the internet or newspapers. In spite of the county's best efforts, public attendance and input was sparse.

Five newspaper publications were contacted by the Macomb County Public Information Official to inform them of the plan updates. Press releases were then sent to the respective contacts at the publications the same day, January 28, 2019. The Utica Town Hall meeting resulted in zero public attendance while the Roseville meeting had two residents in attendance.

1.6 PLAN PREPARATION

The official notice to proceed on the plan review was issued by the county on July 27, 2018 and details of the update were discussed at the Macomb County Emergency Management Liaison meeting held on August 23, 2018. The initial planning meeting to address the process for the new 2020-2025 plan was conducted at the kick-off meeting on October 4, 2018. The collective process to review and update the current plan was discussed during this meeting and the survey documents were then distributed to county departments and the 25 local jurisdictions.

The items discussed were public involvement methods, dates and times to hold future meetings, content of the web site, and information to include in press releases. Additionally, survey forms and community project lists were distributed for review and updates.

At the meeting, those tasks identified as being necessary to complete the update of the plan were distributed. The following is a list of those tasks that were discussed:

- Data necessary to update mapping and community trends was requested from the Macomb County Planning Department
- The Chief Elected Official of each community was sent a letter to inform them of the current update process and to encourage the participation from the whole community
- Forms that identified an analysis of the hazards and the hazard issues affecting that community.
- Each local community was asked to review their community goals and projects from the 2015-2020 plan and to update with a current project list.

During this time, the committee also reviewed the Michigan Hazard Mitigation Plan, dated 2014, for additional information and guidance in the development and review of the Macomb County Plan.

2 Hazard Assessment

This chapter identifies and prioritizes the hazards and risks relevant to Macomb County and its communities for mitigation action. The hazards are identified in a three-step process:

- 1) County Profile. The county profile summarizes the location, climate, population, development, and land uses of Macomb County, as well as unique features and issues of individual communities.
- 2) Hazard Identification. The hazards to which Macomb County is susceptible to were identified utilizing the MSP EMHSD Hazard Mitigation Plan of March, 2014 PUB-106 and the 2012 Michigan Hazard Analysis Pub. 103; historical record searches; public hearings; and community surveys.
- 3) Hazard Assessment. Each hazard was evaluated based on severity, exposure, frequency, types and extent of possible damage. To determine its potential impact on the county the hazard assessment includes an evaluation of the risk of occurrence and the vulnerability of the county and each community to each hazard. A vulnerability assessment supports the hazard assessment by comparing and contrasting geographically where hazards overlap in populations and identify where the highest priorities exist.

This process provides a credible method for focusing on the hazards that most threaten life safety and community property in Macomb County. In order to determine which proposed mitigation actions should be pursued, a risk assessment is performed. The risk assessment rates each hazard the county is susceptible to according to those hazard aspects such as frequency of occurrence, extent, and location. Once the hazards have been rated, they can then be prioritized to determine which ones are most threatening. The most threatening conditions are then addressed by identifying mitigation strategies.

The Michigan State Police (MSP) Emergency Management Homeland Security Division (EMHSD) published EMD PUB-103: 2012 Michigan Hazard Analysis, which identifies all the known hazards the State of Michigan is likely to experience. Historical evidence supports the fact that Macomb County has experienced or has the potential to experience all but a few identified hazards found in the EMD PUB-103. All hazards identified in that manual, except for the following: Fog, Celestial Impacts, Scrap Tire Fires and Catastrophic Incidents, are applicable to Macomb County. This was determined by reviewing the State's Plan, soliciting input from county and local officials, and researching historical disaster information.

The following pages give an overview of Macomb County and profile each hazard by identifying locations, magnitude/severity, historical occurrences, and probability for future occurrences. This section will also investigate the county's vulnerability. The county's vulnerability will be expressed in terms of:

- Hazard areas.
- Types and numbers of existing and future buildings, infrastructure, and critical facilities in hazard areas.
- Potential dollar losses.
- Land uses and development trends.

2.1 COUNTY PROFILE

Macomb County encompasses 484 square miles and ranks third in population in the State of Michigan, with a total of 875,292 residents (SEMCOG est.; July, 2018). The County is recognized as a leader in business and industry, and designated as a “Community of Economic Excellence” by the State. Despite its large population and urban characteristics, approximately 50 percent of the county’s land area is vacant or in agricultural use. The county’s location within the State of Michigan lends it to experience warm to hot weather and thunderstorms in the summer to cold weather and snow storms in the winter.

2.1.1 General Profile Information

Macomb County is part of the Greater Detroit Metropolitan Area, which is ranked 12th among the largest 100 metropolitan areas of the United States by the U. S. Census Bureau (2018 Est.). Integral to the Greater Detroit Metropolitan area, transportation, industry, commerce, recreation, infrastructure, communications, finance, and government facilities exist, which may be targets for domestic and international terrorism. Macomb County is the third largest county in Michigan within terms of population and state equalized value, behind the contiguous counties of Oakland and Wayne. Metropolitan Detroit shares 74 miles of international border with Ontario, Canada, accessed with border crossings by:

- Bridge from Port Huron to Sarnia, Ont.
- Underwater railroad tunnel from Port Huron to Sarnia, Ont.
- Bridge from Detroit to Windsor, Ont.
- Underwater tunnel from Detroit to Windsor, Ont.
- Ferry service (truck) from Detroit to Windsor, Ont.
- Ferry service from Marine City to Sombra, Ont.
- Ferry service from Algonac to Walpole Island, Ont.
- Underwater pipelines from Marysville and St. Clair to Sarnia, Ont.
- Overhead electrical transmission lines from St. Clair to Sarnia, Ont.
- Lake St. Clair and St. Clair River freezing allows pedestrian crossings
- Numerous public and private marinas and privately owned access points.

The Macomb County shoreline of Lake St. Clair makes up 32 miles of that international border.

The Interstate Highway System, Detroit Metropolitan-Wayne County Airport, the Port of Detroit and heavy rail systems transiting through Macomb County, provide easy access to county destinations from anywhere in the world.

Fifty percent of the land area in Macomb County is devoted to industrial, commercial and residential use. Appendix F shows a detailed map breakdown of land use within the county as of the year 2013. Significant trends can be seen in development throughout the county. Development is heavily concentrated in the southern region of the county and is spreading outward and upward along the major roads leading north. Population growth, supported through immigration, continues to expand. Projections by the Southeast Michigan Council of Government predict a population of 924,956 persons by the year 2045.

Macomb County is heavily industrialized with **133** industrial facilities reporting as manufacturing, storing, or using Extremely Hazardous Substances (EHS), as defined by Section

302 of the Superfund Amendments and Reauthorization Act (SARA). Led by major corporations such as Ford Motor, Fiat Chrysler, General Motors, Axalta, and General Dynamics, Macomb County is ultimately tied to the national and international community, both industrially and economically. Macomb County is also a major engineering and design center for U.S. industry. Annually, corporations in Macomb County receive millions of dollars in U.S. Department of Defense (DOD) contracts. Presently, the U.S. Government employs 7,520 workers in Macomb County. Additionally, long term defense contracts are serviced by regional military contractors to include military hardware vehicles, munitions and components to the U.S. military and foreign governments.

2.1.2 Infrastructure

Existing generalized sanitary sewer service and waste water treatment is provided by the Great Lakes Water Authority, which services approximately 60% of Macomb County. The Cities of Warren, Mount Clemens, and New Baltimore operate their own waste treatment plants. The remaining portions of Macomb County, primarily found in the northern half of the county, are served by individual septic systems. Also, the county's disposal system shares an international water system, Lake St. Clair and the Detroit River, as the disposal site for treated effluent. This treated effluent also affects the downstream States of Ohio, Pennsylvania, and New York, and the Canadian Province of Ontario.

Macomb County residents receive water from one of three public agencies or from private wells. The Great Lakes Water Authority serves 95% of the demand for public water in Macomb County drawing 70% of its water supply from an international body of water, Lake St. Clair, that is downstream of the St. Clair River, Lake Huron, and Lake Superior. The Cities of Mount Clemens and New Baltimore operate their own water systems. In the less urban areas of northern Macomb County, many residents rely upon private wells.

Macomb County has electrical power supplied to 100% of the populace by DTE Energy. Major transmission lines from generating plants serving southeastern Michigan crisscross through Macomb County. Substantial numbers of sub-transmission lines, power stations and substations exist throughout the county, necessary to serve consumers and provide electrical service to southeast Michigan.

Military facilities found in Macomb County include the U.S. Army Tank Automotive and Armaments Command (TACOM) and Selfridge Air National Guard Base (SANG). These military facilities service the U.S. Military throughout the nation and support U.S. protection of military forces overseas. The 127th Wing is stationed at SANG and the TACOM mission supports the U.S. Army in procurement, design and parts maintenance of armored and wheeled vehicles.

Macomb County is included in the Southeast Michigan U.S. Coast Guard Area Contingency Plan as an area of concern. Complex systems are in place supporting transportation, storage, and mining of natural gas and oil products.

Natural gas service is provided by Consumers Energy, Southeastern Michigan Gas Company (SEMCO) and DTE Energy. DTE Energy and SEMCO own and operate large gas storage fields in northern Macomb County. In addition, they serve natural gas to consumers regionally and in upstate Michigan. Pipelines serving oil and gas suppliers and producers in the U.S. and Canada are maintained by Sun Oil, Shell Oil, DTE Energy, Enbridge Energy, Great Lakes Gas Transmission Company and American Natural Resources. These pipelines are present throughout Macomb County as major transmission routes for oil, natural gas and gasoline.

The Interstate Highway System along with major U.S. and State of Michigan highways traverse Macomb County. Interstate 94 links Ontario, Canada with Southern Michigan, Indiana and Illinois forming a major corridor for the movement of people, goods, and services. Interstate 696 crosses the southern portion of Macomb County, linking I-94, I-75, and I-96. This thoroughfare services the Midwestern U.S. region by providing connection between the western areas of the region and the industrialized corridors of M-53 and M-97 and the commercial areas of M-102 (southern) and M-59 (middle). I-69, located north of Macomb County, connects Ontario, Canada to the Midwest United States and is connected to highways servicing Macomb County.

Buses operated by the Suburban Mobility Authority for Regional Transportation (SMART) link Macomb, Wayne and Oakland Counties.

General aviation in Macomb County is centered upon one privately owned-public use airport (Ray Community) and one State owned-public use airport (Romeo). The well-equipped airport in the county is Selfridge Air National Guard Base, a mixed-use military facility in Harrison Township.

Two heavy rail companies, CSX and Canadian Northern (CN) maintain 70 miles of main line rail tracks in Macomb County. Servicing international and national shippers, the companies transport heavy volumes of chemicals, vehicles, industrial supplies and manufactured products. Canadian Northern serves as the major shipper of chemicals (over 300 hazardous chemicals identified-identified on Page 280) to the U.S. from Canada, while CSX provides service to large defense contractors, including shipments of armored vehicles, military components and munitions.

There are three general and five specialty care hospitals. All three general care hospitals have full 24/7 emergency room operations with in-patient and out-patient care, receiving patients from the region. General care hospitals in Oakland, Wayne and St. Clair counties also receive and treat Macomb County residents.

Communications are consistent with commercial services provided by AT&T, Verizon, T Mobile and Sprint. Cellular telephone systems provide adequate coverage to the entire county. Emergency communications include an enhanced 911 system provided by AT&T. Central control systems and multiple central communications facilities serving commercial telephone service exist in Macomb County, linking regional, national and international networks.

Land mobile communications, including public safety services utilize the county's 800 MHz Interoperable Communications System which is linked to the Michigan Public Safety Communication System (MPSCS).

There are over 5,000 acres of public parks and 1,000 acres of local recreation land in Macomb County. The county ranks at the top in the State of Michigan in the number of marina facilities and small watercraft registered to private owners. Watercraft from neighboring states as well as international vessels utilize these facilities. Recreational activity utilizes the natural resources of the area, with emphasis on sports, fishing, boating and swimming supported by the extensive water resources. The Michigan Department of Natural Resources and Environment (DNR&E) issues on average more than 106,000 sport hunting and fishing licenses to county residents annually. The northern half of Macomb County has areas open to hunting. Numerous arms manufacturers and suppliers are available to support recreational hunting activities.

Macomb County local jurisdictions have utilized an outdoor early-warning siren system. Approximately 80% of the county has coverage. Some lesser-developed areas in the northern end of the county are still without total coverage. Appendix G shows a map of the siren coverage in Macomb County and also includes a map of the siren coverage radius at each site.

2.1.3 Future Trends

Macomb County has the room and reputation to accommodate future development. Appendix H shows a detailed map of the land that is undeveloped in the county as of 2013. The highest concentration of undeveloped land is located in the northern regions of the county. New and ongoing construction of full-service industrial parks, manufacturing plants, office centers, research and development facilities, retail centers and residential construction continue to expand the existing economic investment.

Industrial development in Macomb County is encouraged and supported, with 4,000 acres designated specifically for that purpose. The clustering of these sites along Macomb's industrial corridors allows firms to be close to both their suppliers and their customers.

Macomb has 63 industrial parks, with state of the art appeal for new businesses. Site considerations already addressed to ensure timely start up include internal roads, complete utility service, and access to major transportation arteries, security and safety. These industrial parks present challenges to public safety officials as they increase exposure to hazardous chemicals and the possibilities for chemical accidents. Careful zoning and enforcement of building and fire prevention codes will mitigate these hazards.

In a study undertaken by the Industrial Technology Institute at the University of Michigan, Macomb County and its neighbors, Oakland and Wayne, were named as strongholds for high growth, technology based firms. Macomb County was cited in the same study for its impressive "island of automation."

Although the county has become a popular choice for development, less than 50 percent of the county's land area still remains undeveloped. This provided Macomb County Emergency Management the opportunity to work with the county's northern community leaders to identify and mitigate hazards for future development planning purposes.

2.1.4 Census Data

Component	2010 Census	SEMCOG 2018	2045 Forecast
County Population	840,978	875,292	924,956

Source: SEMCOG

SEMCOG, July 2018 Population Count

Armada Village	1,551	Armada Township	3,616	Bruce Township	6,838
Center Line	9,153	Chesterfield Township	45,730	Clinton Township	102,865
Eastpointe	32,122	Fraser	14,316	Lenox Township	5,422
Harrison Township	26,287	Macomb Township	88,702	*Memphis	736
Mount Clemens	16,146	New Baltimore	11,798	New Haven Village	5,097
Ray Township	3,603	Richmond Township	3,588	Richmond	5,856
Romeo Village	3,562	Roseville	47,378	St. Clair Shores	59,932
Shelby Township	80,816	Sterling Heights	132,065	Utica	5,205
Warren	136,168	Washington Township	26,670		

*Memphis – denotes Macomb County Population Count only

Table 2.2 - Population by Age

Age Groups	2010 Census	SEMCOG 2018	2035 Forecast
Age 0-4	48,815	51,229	49,715
Age 5-19	144,840	165,496	131,403
Age 20-34	171,874	162,615	170,865
Age 35-64	355,269	361,805	334,757
Age 65+	120,180	134,147	248,823
Total Population	840,978	875,292	935,563

Source: SEMCOG

Table 2.3 - Households by Type

Households	2010 Census	SEMCOG 2018	2045 Forecast
With Children	105,088	104,046	97,527
Without Children	133,586	135,248	165,848

Source: SEMCOG

Table 2.4 - Housing Tenure

Tenure	2010 Census	SEMCOG 2015
Owner Occupied Units	253,468	246,158
Median Housing Value (In 2015 dollars)	\$172,830	\$157,700
Renter Occupied Units	78,199	89,861
Median Contract Rent (In 2015 Dollars)	\$828	\$861
Vacant Units	24,959	23,525
Average Household Size	2.51	2.50
Total Housing Units	356,626	359,902

Source: U.S. Census Bureau, 2006-2010 and 2011-2015 American Community Survey 5-Year Estimates
<https://semcog.org/community-profiles#Housing>

Table 2.5 - Household Incomes

Income Categories as Reported in Each Census	2010 Census	SEMCOG 2015
Less than \$10,000	17,920	19,870
\$10,000 to \$14,999	15,824	15,278
\$15,000 to \$24,999	34,330	36,084
\$25,000 to \$34,999	35,034	35,336
\$35,000 to \$49,999	52,154	47,537
\$50,000 to \$74,999	63,792	64,811
\$75,000 to \$99,999	48,880	48,823
\$100,000 to \$149,999	45,196	47,736
\$150,000 or more	19,800	24,895
Total Households	332,930	336,379
Median Household Income (In 2018 Dollars)	\$53,996	\$60,143
Households in Poverty	23,305	39,328
Persons in Poverty	47,814	106,546

Source: U.S. Census Bureau, 2006-2010 and 2011-2015 American Community Survey 5-Year Estimates

Table 2.6 - Housing Units by Structure Type

Structure Type	2010 Census	SEMCOG 2015
One-Family Detached	244,841	246,883
Town House/Attached Condo	34,961	36,608
Two-Family / Duplex	3,035	2,714

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Multi-Unit Apartments	60,079	61,058
Mobile Homes/Manufactured Housing	12,611	12,574
Other Units	0	65
Total Housing Units	355,547	358,902

Source: U.S. Census Bureau, 2006-2010 and 2011-2015 American Community Survey 5-Year Estimates, SEMCOG Development
<https://semcog.org/community-profiles#Housing>

Table 2.7 - Land Use / Land Cover

Land Use Type	2015 Acres
Single-Family	98,861.9
Multiple-Family	9,926.6
Retail and Office	9,226
Institutional	10,684.7
Industrial	14,297.8
Agricultural	80,319.9
Recreation/Open Space/Cemetery	19,442.4
Transportation/Communication/Utility	37,219.1
Water	5,233.3
Total Acres	276,077.96

Note: Land Cover was derived from SEMCOG's 2010 Leaf off Imagery. Source: SEMCOG

Density Type	2008	2010
Single-Family Land Use	2.46	2.52
Gross Residential Density	3.11	3.12

Table 2.8 – Jobs by Industry Sector

Type	2015	2025	2035	2045
Natural Resources, Mining & Construction	25,520	27,610	27,583	27,338
Manufacturing	65,306	61,574	54,200	49,345
Wholesale Trade	12,831	13,528	13,531	13,502
Retail Trade	49,520	49,407	46,174	43,619
Transportation, Warehousing & Utilities	12,365	12,746	13,021	13,508
Information & Financial Activities	35,538	35,882	35,619	35,652
Professional & Technical Services & Corporate HQ	38,665	43,458	46,438	49,616
Administrative, Support & Waste Services	31,034	34,174	36,431	38,970
Education Services	22,505	23,241	23,284	23,459
Healthcare Services	46,187	52,000	56,820	63,350
Leisure & Hospitality	37,386	39,453	40,194	41,008
Other Services	25,184	25,954	25,880	25,588
Public Administration	19,409	19,688	19,588	19,490

Source: SEMCOG Macomb County 2045 Forecast Summary <https://semcog.org/Portals/0/Documents/Plans-For-The-Region/Regional-Forecast/2045RegionalForecastSummary.pdf?ver=2018-08-07-100350-893>

2.2 HAZARD IDENTIFICATION

To identify and assess the hazards affecting Macomb County, a web-based survey was emailed to each of the 25 participating communities. This web-based survey included a “Risk and Vulnerability Analysis” table. Risk refers to the potential of certain hazards occurring within a community and an analysis as to what may happen if a hazard occurred. Vulnerability refers to the population’s capacity to anticipate, cope with, and recover from the impact of a hazardous event. A hazard risk/vulnerability assessment (HRVA) systematically evaluates the damage that could be caused by an identified potential disaster, the severity of the impact, and the available resources during a disaster to reduce population vulnerability and increase the capacity to cope with disasters.

All 29 identified threats/hazards were rated against three criteria: potential frequency, potential impact on life safety, and potential impact on property. Each criteria was given a score from 0-3: 0 = Unlikely/Negligible; 1 = Possible/Limited; 2 = Likely/Critical; 3 = Highly Likely/Catastrophic.

Hazard Risk and Vulnerability Score was determined by the following formula: Risk & Vulnerability = Potential Frequency * (Life Safety Impact + Property Impact). 50% of the score was derived from the answers given by local communities, and 50% of the score was derived from answers given by officials with a county-wide perspective. Risk = Frequency. Vulnerability = Life Safety Impact + Property Impact.

Using the formulas specified above, each threat/hazard was assigned a risk score, a vulnerability score, and a Risk & Vulnerability Score. Once scores were assigned, the hazards were ranked for risk, vulnerability, and risk & vulnerability, with the highest scoring hazards ranking toward the top and the lowest scoring toward the bottom.

The Risk & Vulnerability ranking, the Risk ranking, and the Vulnerability ranking tables can be found in Appendix D.

Additional information regarding Community Siren Locations, Flood Mapping Data, a Community Profile and finally a review and update to the Community Projects List were also part of the web-based survey.

Macomb County Risk and Vulnerability Assessment, 2019

Rank	Hazard	Score
1	Tornado	9.89
2	Structural Fires	8.07
3	Severe Wind	7.65
4	Snowstorm	6.22
5	Riverine Flooding	6.15
6	Ice & Sleet Storm	5.58
7	Hazmat – Transportation	4.44
8	Active Assailant	4.39
9	Terrorism/WMD Attack	4.31
10	Energy Emergency	4.13
11	Transportation Accidents	4.09
12	Hazmat – Fixed Site	4.02
13	Lightning	4.02
14	Public Health Emergency	4.01
15	Infrastructure Failure	3.94
16	Cyber Attack	3.76
17	Hail Storm	2.85
18	Extreme Temperature	2.76
19	Civil Disturbance	2.03
20	Shoreline Flooding	2.01
21	Pipeline Accident	1.83
22	Subsidence	1.59
23	Oil and Gas Well Accident	1.35
24	Wildfire	1.14
25	Earthquake	0.92
26	Drought	0.89
27	Dam Failure	0.64
28	Nuclear Attack	0.50
29	Nuclear Plant Accident	0.11

Macomb County Risk Assessment, 2019

Rank	Hazard	Score
1	Snowstorm	2.67
2	Structural Fires	2.54
3	Severe Wind	2.44
4	Lightning	2.38
5	Transportation Accidents	2.31
6	Tornado	2.15
7	Ice & Sleet Storm	2.10
8	Riverine Flooding	1.90
9	Hail Storm	1.79
10	Cyber Attack	1.63
11	Hazmat – Transportation	1.60
12	Energy Emergency	1.54
13	Active Assailant	1.42
14	Hazmat – Fixed Site	1.35
15	Infrastructure Failure	1.31
16	Public Health Emergency	1.31
17	Shoreline Flooding	1.15
18	Civil Disturbance	1.00
19	Terrorism/WMD Attack	0.83
20	Pipeline Accident	0.75
21	Subsidence	0.73
22	Extreme Temperature	0.69
23	Drought	0.67
24	Oil & Gas Well Accident	0.60
25	Wildfire	0.56
26	Earthquake	0.29
27	Dam Failure	0.27
28	Nuclear Attack	0.10
29	Nuclear Plant Accident	0.04

Macomb County Vulnerability Assessment, 2019

Rank	Hazard	Score
1	Nuclear Attack	5.42
2	Terrorism/WMD Attack	5.08
3	Tornado	4.46
4	Nuclear Plant Accident	3.77
5	Active Assailant	3.35
6	Earthquake	3.23
7	Structural Fires	3.10
8	Severe Wind	3.08
9	Public Health Emergency	2.98
10	Infrastructure Failure	2.96
11	Hazmat – Fixed Site	2.85
12	Riverine Flooding	2.83
13	Hazmat – Transportation	2.77
14	Energy Emergency	2.67
15	Ice & Sleet Storm	2.63
16	Pipeline Accident	2.44
17	Cyber Attack	2.33
18	Snowstorm	2.27
19	Civil Disturbance	2.13
20	Oil & Gas Well Accident	2.06
21	Subsidence	2.00
22	Wildfire	1.79
23	Transportation Accidents	1.77
24	Lightning	1.73
25	Dam Failure	1.69
26	Extreme Temperature	1.67
27	Hail Storm	1.60
28	Shoreline Flooding	1.48
29	Drought	1.31

2.3 RISK AND VULNERABILITY ASSESSMENT BY HAZARD

Sections 2.3.1 through 2.3.29 of this chapter profile all the hazards affecting Macomb County. Each hazard identified in the MSP EMD PUB-103 Michigan Hazard Analysis document was reviewed and analyzed for potential impact in the county. This profile portion of the Hazard Mitigation Plan provides the official definition of the hazard, describes the typical locations throughout the county that the hazard could occur, the maximum extent of damage the hazard has the potential to cause, historical occurrences, economic vulnerability, and the probability of future occurrences. The information provided in Sections 2.3.1 through 2.3.29 was largely taken from MSP EMD PUB 103 and is not footnoted further. References, information from various websites, and historical county information are cited in the body of the text.

The level of damage attributed to the past flood events had greatly reduced in scope in the last five years, not discounting the flood event of 2014 which received a Presidential Disaster Declaration following a hundred year rain event. Minor flood elevations which caused culverts to flood and overflow along with reported minor instances of basement flooding have been reported, but not to the extent of a local emergency declaration.

Consequently, the advanced analysis, which was last conducted in 2002 placed river flooding as the major threat in Macomb County. This advanced analysis identifies, in detail, these areas and the potential and historic dollar losses and damage to the structures within the hazard zone (floodplain), and has been updated for this plan. The detailed reports by community areas cites specific homes in danger of flooding. Since flooding was the only hazard in the county with definable boundaries, the locations in Table 3.1 are primarily intended for use with mitigating the flooding hazard. These locations can, however, be used to locate other critical facilities when developing additional mitigation projects for other hazards. The goals, objectives, and specific actions and projects addressing all hazards are included in the mitigation strategy section. FEMA has conducted an intensive study of current flood zones and probability of lake-storm surge effects for the county in 2012-2013 with additional meetings between FEMA and community leaders in both 2017 and 2018.

2.3.1 Active Assailant

Definition

Active Assailant is a new category of terrorist and criminal threat to this plan. Shooting attacks are a popular tactic for both terrorists and criminals. Firearms can be used to target a specific individual or to attack many people in a crowded place. Small arms such as pistols, rifles, and shotguns are easily available in the U.S., including semi-automatic weapons with large capacity magazines. Shootings at schools and workplaces are among the most common types of major criminal attack.

An important drawback to the use of firearms, particularly in a mass shooting, is that the attacker is not likely to escape. Therefore shootings are usually carried out by suicide attackers, those expecting to be arrested, or criminals who are acting impulsively and without thought to consequences.

Appropriate security measures and effective lock-down training can limit casualties in high-risk buildings such as schools. Rapid response by well-trained law enforcement officers and emergency medical personnel is also very important.

Location

Countermeasures against shooting attacks are difficult, since attackers usually choose unprotected public areas, otherwise identified as “soft targets”. Protection against attacks has to be balanced against the public’s need to use their schools, shopping malls, government buildings, and workplaces.

Hazard Extent

The magnitude of this hazard is relatively low. In most instances an active assailant event would be limited to a localized area such as a school, shopping mall or other location that would be heavily populated. Based on the historical data, resulting deaths are a possibility. Active assailant events have also historically monopolized law enforcement and rescue forces but do not usually result in extensive property damage. In 2018, the Macomb County Prosecutor announced that they had charged 51 individuals in Macomb County with making false threats of terrorism. Charges were being filed and prosecutions would take place. No acts of violence had been committed from these threats.

Historical Occurrences

Marjory Stoneman Douglas High School Shooting (2018)

On February 14, 2018, 19-year-old Nikolas Cruz, a former student, opened fire at the high school in Parkland, FL, killing 17 people and injuring 17 others. Cruz fled the scene on foot by blending with other students. He was arrested without incident about an hour later in nearby Coral Springs. He confessed to being the perpetrator, and he was charged with 17 counts of premeditated murder and 17 counts of attempted murder. This is now considered the deadliest high school shooting in U.S. history surpassing the Columbine High School shooting that killed 15 people.

Las Vegas-Mandalay Bay (2017)

On the night of October 1, 2017, a gunman opened fire on a crowd of concertgoers at the Route 91 Harvest music festival on the Las Vegas Strip in Nevada. Perpetrator Stephen Paddock, 64, of Mesquite, Nevada, fired more than 1,100 rounds from his suite on the 32nd floor of the nearby Mandalay Bay hotel, killing 58 people and leaving 851 injured from gunfire and the resulting panic. The shooting occurred between 10:05 and 10:15 p.m. PDT; about an hour later Paddock was found dead in his room from a self-inflicted gunshot wound. His motive remains unknown.

Highway Shootings (2012)

During October 2012, a man shot at cars as they drove along and near a Michigan highway corridor in Oakland, Ingham, Shiawassee, and Livingston counties, over the span of several days, between October 16-18, 2012. The first car was shot in Commerce Township on October 16th. On that same day, four more shootings occurred in Wixom. On the next day, another Commerce Township shooting took place near the same location as the first day. The northernmost shooting occurred in Perry on October 18th. On that same day, there were eight shootings near the I-96 exit in Webberville. There was also an October 18th shooting in Howell, and six shootings in Wixom. About a week later, on October 27th, two shootings occurred along Grand River and I-96 in the area of Fowlerville, and a driver on I-96 reported being injured by a bullet (the only such instance reported). Investigators were able to track down the perpetrator, Raulie Wayne Casteel, through Secretary of State records.

Sandy Hook School Shooting (2012)

On December 14, 2012, 20-year old Adam Lanza killed his mother in their shared home in Newtown, Connecticut. He then proceeded to Sandy Hook Elementary School where he murdered students and staff members. The attacker entered by shooting through a school window, bypassing the building's locked doors. Using a semi-automatic rifle, he killed twenty

children and six adults in less than 10 minutes. Two other adults were wounded. When police responded, the killer ended the attack by taking his own life.

Economic Vulnerability

Although property damages would be expected to be low, corollary effects such as lost businesses or clientele and mental health issues can be felt years after an event. Mass shootings are a first-line traumatic event that can potentially trigger post-traumatic stress disorder (PTSD) in people who are directly exposed. Children, in particular, are even more vulnerable; multiple studies have shown that childhood trauma has more lifelong and pervasive effects on young developing psyches, both in terms of their psychological worldview, and their physiological systems that handle stress and anxiety. On a secondary level, the threat of mass shootings throughout schools is also damaging to mental health; safety and security are always paramount to a child’s healthy psychological development, and this constant anxiety and sense of danger may result in the call for increased spending on security measures.

Probability of Future Hazards

Every 17 minutes, someone in the U.S. is killed by a gun. The incidence and prominence of mass shootings in America has increased over recent years, dominating media outlets and fueling the continual debate over gun control. The 1999 Columbine High School massacre, 2007 Virginia Tech shooting, and 2012 shooting at Sandy Hook Elementary School in Newton, CT, drew international attention. The 2012 movie theater shooting in Aurora, CO, the 2015 attack in San Bernardino, CA, and the 2016 shooting at Pulse nightclub in Orlando, FL, are among the deadliest mass shootings in U.S. history. The frequency and severity of these events have intensified societal focus on and criticism of U.S. gun culture. While it is understood that mental health complications and firearm access often expedite such events, at-risk individuals are in some cases inspired to act upon media exposure to details of similar episodes.

2.3.2 Civil Disturbances

Definition

A public demonstration, gathering, or a prison uprising, that results in a disruption of essential functions, by 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 participating 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.
- 6) A perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society.

Prison uprisings are normally the result of perceived injustice by inmates regarding facility rules, operating policies and/or living conditions, or insurrections started by rival groups or gangs within the facility.

Location

Several locations have been identified as sites for past or potential civil disturbances. The Detroit News facility in Sterling Heights was an area during the newspaper strikes that demanded police intervention. Macomb Community College has two campuses in Macomb County, which have been sites of anti-war demonstrations. U.S. Army Tank Command, Selfridge Air National Guard Base, and General Dynamics are among some of the installations with government contracts that have potential for political unrest.

Hazard Extent

The magnitude of this hazard is relatively low. In most instances a civil disturbance would be limited to a localized area. Based on the historical data, resulting deaths are a possibility, but typically for only a riot or prison uprising. Civil disturbances have also historically monopolized law enforcement forces and possessed a moderate property damage risk.

Historical Occurrences

Labor Disputes

Major labor disputes have occurred in virtually every decade in Michigan and Macomb County. However, some have been worse than others in their overall impact on the communities in which they have occurred. Unfortunately, some disputes have turned violent at times, requiring a response by law enforcement agencies to quell the disturbances and maintain order. An example of this occurred in Seattle, WA during the World Trade Organization Conference.

The most recent period of labor unrest in Macomb County has been the Detroit Newspaper Strike, which started in July 1995 and continued on through 1997. This strike had been marked by periods of sporadic violence. The strike negatively impacted many facets of the community and had required extensive use of law enforcement resources, especially by the

City of Sterling Heights, to supervise strike-related activities and maintain order before the two sides negotiated a final resolution to this long labor dispute. The most likely communities in Macomb County to experience labor disputes disturbances would be the cities of Warren and Sterling Heights based on historical data and the industrial base in both communities.

Prison Uprisings

Although violence is a fact of life in Michigan's prisons, large-scale, deadly prison uprisings are relatively rare. Macomb County has one state correctional institution within its boundaries; the Macomb Regional Facility, a medium security facility, located in Lenox Township and one major jail complex, the Macomb County Jail Facility, located in Mount Clemens. Macomb County also maintains a Juvenile Justice Center for adolescent offenders in Mount Clemens. Other local police departments within the county have smaller facilities for detaining prisoners.

One of the more notable uprisings occurred over the Memorial Day weekend in 1981 and involved the State Prison of Southern Michigan in Jackson, the Marquette Branch Prison in Marquette, and the Michigan Reformatory in Ionia. The Michigan Corrections Organization attempted to lock down prisoners over the Memorial Day weekend, which sparked the disturbances. The weekend damages across the three facilities totaled 109 inmates and 71 staff members injured, and \$5 million in physical damages to the facilities.

Political Unrest

The potential for political disturbances in Macomb County is high. The City of Warren is home for the South Campus of Macomb Community College. During the late 1960s, MCC students were very involved in the anti-war movement in the United States. Also located in Warren is a military installation, the US Army Tank Command, along with firms that have government military contracts. A large defense contractor, General Dynamics Land Systems, is located in the City of Sterling Heights. In Mount Clemens, the county seat, court rulings have sparked social protest, due to court decisions. Located in Harrison Township is Selfridge Air National Guard Base where protests over governmental policies have occurred in the past. The Center Campus of Macomb Community College can be found in Clinton Township. This is the largest community college campus in Michigan and the potential for political protest is possible.

Economic Vulnerability

Since Macomb County has not had a full-fledged civil uprising in its history, historical numbers on the economic impact cannot be gathered. There are many corollary effects from a civil disturbance that are not a direct result of the event. The incident may deter future development in an area and threaten future and existing businesses. The severity of the economic loss is related to the severity of the incident. Economic value of property damage, recovery costs, and loss of business can range from tens of thousands of dollars to millions of dollars, depending on the seriousness of the incident.

Probability of Future Hazards

Macomb County definitely possesses the potential for a civil disturbance based mainly on the types of facilities located within its borders (mentioned above). Historically, there have been more political unrest incidents and labor strikes than violent riots or prison uprisings. The likelihood of more political unrest is dramatically increased with the current situation in the Middle East and the conflict amongst political parties in the U.S. For instance, In August 2017 a rally held in Charlottesville VA led to a white nationalist driving a car into protesters, resulting in the death of protester Heather Heyer and causing injuries to 19 others. The incident became national news and Charlottesville became a symbol of political turbulence nationwide. However,

the probability, as determined by the web based survey completed by each community in Macomb County, is relatively low.

2.3.3 Cyberattack

Definition

Cyberattack is a new category of terrorist and criminal threat to this plan. Cyberattacks involve the use of computers, electronic devices, and/or the Internet to attack computer systems. Examples of some types of cyberattacks include computer viruses, which damage many infected computers, denial-of-service (DOS) attacks, which shut down a targeted website, and hacking attacks, which damage sensitive information. These attacks may be used as part of extortion schemes, to undermine public confidence in the target's security, as a form of technological vandalism, or as military sabotage. A significant cyber disruption event is defined as "an event that is likely to cause, or is causing, harm to critical functions and services across the public and private sectors by impairing the confidentiality, integrity, or availability, of electronic information, information systems, services, or networks; and/or threaten public safety, undermine public confidence, have a negative effect on the state economy, or diminish the security posture of the state."

Location

Cyber-attacks involve the use of computers, electronic devices, and/or the Internet to attack computer systems. The location and ability to conduct an attack is unlimited.

Hazard Extent

Early cyber-attacks were primarily conducted by amateur computer "hackers" operating individually or in small teams. More recently, well-organized groups of profit-driven professional cyber-attackers have developed. These teams of cyber-saboteurs can operate globally, attacking targets anywhere in the world through the Internet. Their customers include organized crime, national governments, and possibly terrorist organizations. These professional cyber-attackers can be very effective because they control large networks of "zombie" computers called "botnets." These are computers taken over without their owners' knowledge and controlled remotely, often for criminal purposes. Another possible source of cyber-attacks are "hacktivists," computer criminals motivated by a political cause rather than by a profit motive. Several global networks of hacktivists have been created, including "Anonymous" and "Lutzsec." These loosely organized groups include members in multiple countries who coordinate their efforts online. There are also a number of nationalist hacktivist organizations, some of which may be sponsored by national intelligence services. Hacktivist groups are difficult to disrupt, both because of the challenge in determining the real identity of group members, and because they may be located in countries which refuse to cooperate with international law enforcement. Hacktivists have generally confined their cyber-attacks to vandalism of websites, denial of service attacks, and theft of personal information. There is however, the potential for extremist members of these politically-motivated groups to shift their activities to more destructive cyberterrorism.

National governments are also developing sophisticated cyber-attack capabilities, both to support espionage programs and to damage the computer networks of enemies. Cyber-attacks backed by extensive national military and intelligence resources could be especially destructive and difficult to counter. One new cyber-attack capability which appears to have been deployed by government-sponsored programmers is the ability to cripple or destroy industrial machinery by taking over the software that controls the machines. Cyber-attacks on these "industrial control systems" could be used to damage critical infrastructure such as electrical grids, water treatment systems, and fuel pipelines as well as to attack industrial targets. National cyber-attack capabilities are also expected to include efforts to disrupt secure national networks such as those used for banking. A cyber war between nations with sophisticated cyber-attack capabilities could be very damaging, even to innocent bystanders in the conflict.

Historical Occurrences

Ryuk Ransomware (2018-present)

Unknown cybercriminals have targeted more than 100 U.S. and international businesses with Ryuk ransomware since approximately August 2018. Ryuk encrypts files on network shares and an infected computer's filesystem. Once the victim has been compromised, the actors encrypt all the network's files and demand sums of up to \$5 million worth of Bitcoin (BTC) in exchange for a decryptor program. Many researchers assumed it was tied to the North Korean APT Lazarus Group as Ryuk shares much of its codebase with Hermes ransomware. In June 2019, Ryuk ransomware crew collected more than \$1.1 million dollars from Lake City, FL and Riviera Beach municipalities. In August 2019, 23 towns in Texas were hit by a coordinated ransomware attack.

SamSam Ransomware (2015)

SamSam is a ransomware strain used most commonly in targeted ransomware attacks. SamSam has attacked a wide range of industries in the U.S., mainly critical infrastructure such as, hospitals, healthcare companies, and city municipalities. SamSam actors leave ransom notes on encrypted computers. These instructions direct victims to establish contact through a Tor hidden service site. After paying the ransom in Bitcoin and establishing contact, victims usually receive links to download cryptographic keys and tools to decrypt their network. SamSam attack crippled the city of Atlanta, GA and cost tax payers close to \$17 million. In November 2018, according to the Department of Justice and FBI, two Iranian men have been charged with deploying SamSam ransomware that crippled the operations of hospitals, municipalities, public institutions, and other critical networks in the United States and Canada.

Stuxnet (2010)

First discovered in June of 2010, Stuxnet was a highly sophisticated cyber-attack program. This "computer worm" software had been designed to infect industrial control systems created by the Siemens Corporation. On most computers, the Stuxnet worm stays hidden and does no damage. However, if the Siemens control software is connected to certain types of motors, the worm conducts a cyber-attack on the infected system. The targeted motor is ordered to rapidly change speeds, which will destroy certain types of connected industrial equipment. Meanwhile, the safety mechanisms on the equipment are disabled, and monitors will show motor performance as completely normal, even as the equipment is being destroyed. It is believed that Stuxnet was designed specifically to damage uranium processing equipment operated by the government of Iran. Substantial harm was apparently inflicted on its processing facility at Natanz.

Economic Vulnerability

According to government and industry sources, malicious cyber activity is a growing concern for both the public and private sectors. Between 2013 and 2015, according to the Office of the Director of National Intelligence (DNI), cyber threats were the most important strategic threat facing the United States (DOD 2015a)—they "impose costs on the United States and global economies" and present "risks" for "nearly all information, communication networks, and systems". In the case of Riviera Beach, the Ryuk ransomware attack encrypted city data and took most of the city systems offline. Cops started writing paper tickets, 9-1-1 was impacted, and the city's email, check payment, direct deposit services, and even SCADA (industrial control) systems related to the city's water pump systems were impacted.

Probability of Future Hazards

The Macomb County Information Technology Department reported that there has been no cyber-attack directed upon Macomb County Government although it has experienced Spam-based viruses.

Ultimately, any organization is fair game for cyber threat actors, though at different times a different set of firms may face higher risks. For example, corporate competitors typically target firms in their industry. So-called hacktivists, motivated by ideological considerations, may pile on to attack a different set of organizations at different times, typically because these organizations have somehow offended the hacktivists. That said, every government, business, and private citizen is a potential target.

Most recently, municipalities, healthcare companies, universities, and hospitals have been the targets of ransomware attacks. These attacks have led to the encryption of files and cascaded into a crippling affect for the organizations and their ability to perform their jobs.

2.3.4 Dam Failures

Definition

The collapse or failure of an impoundment, resulting in downstream flooding.

Dam failures occur not only during flood events, which may cause overtopping of a dam, but also as a result of poor operation, lack of maintenance and repair, and vandalism.

Location

The National Inventory of Dams (NID) identifies a total of 11 dams within Macomb County as of June 2018. Please refer to Appendix J for a map of the key dam locations.

Listing of Dams in Macomb County

NID ID	Name	City	River	Year Completed	Type	Height	Storage (acre-feet)	Drainage Area (sq. mi.)	Hazard
M00685	Lower Stoney Lake	Washington Township	Stoney Creek	1961	Gravity Earth	32	13,000	68.2	High
MI00686	Upper Stoney Lake	Washington Township	Stoney Creek	1961	Gravity Earth	24	1,240	38	High
MI02425	Autumn Ridge Detention	Sterling Heights	Shanahan Drain	1982	Earth	11	23	0	Significant
MI00313	Hidden Lake	Romeo	Tributary to East Pond	1968	Earth	8	70	0.5	Low
MI00607	East Mill Lake	Romeo	Tributary to East Pond Creek	1926	Earth	15	440	0	Low
MI00608	Fisher	Romeo	Tributary to East Pond Creek	1920	Earth	15	290	11.5	Low
MI00609	Clifton Mill Pond	Bruce Township	Stoney Creek	1937	Gravity	12	50	27	Low
MI00670	Sterling Mall	Sterling Heights	Utica Drain	1977	Earth	9	234	0	Low
MI02110	Woodland Waters	Romeo	North Branch Clinton River	1962	Earth	6.46	80	-	Low
MI02281	Centennial Lake	Romeo	North Branch Clinton River	-	Earth	7	90	0	Low
MI01510	Chestnut Lake	Shelby Township	Clinton River, Middle Branch	1968	Earth	15.5	100	3	Low

Source: National Inventory of Dams

https://nid.sec.usace.army.mil/ords/f?p=105:113:4146357207197::NO:113.2:P113_STATE,P113_COUNTY:MI,099

Hazard Extent

While dams themselves are fixed sites and easy to locate, the area affected by a failure is more difficult to determine. A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. Dams are important components of the county's infrastructure and provide benefits to all residents. However, as history has demonstrated, dams can fail with disastrous consequences. Many existing dams are getting older and constant repair and maintenance is required. At the same time, development continues in potential inundation zones downstream from dams. There are more people at risk from dam failure than ever before despite better engineering and construction methods. As a result, loss of life and property must continue to be aggressively guarded against.

In Michigan, dam safety is regulated under the Natural Resources and Environmental Protection Act of 1994, Part 315, Dam Safety. In Michigan, dams are not regulated unless at flood elevation, they impound water to a height of six feet or more have a surface area of five acres or more. Regulated dams are broken into three categories, high, significant, and low, based on the impact of a failure. High hazard dams are inspected every three years, significant hazard dams are inspected every four years, and low hazard dams are inspected every five years. Owners of high and significant hazard dams are required to maintain Emergency Action Plans in the event of a dam failure. A meeting with the owners of those dams was conducted at Macomb County Emergency Management on January 16, 2018. Emergency plans were reviewed and updated.

The challenges facing county emergency management officials are:

- Minimize loss of life and property by working closely with dam owners in the development of the Emergency Action Plan (EAP) to ensure consistency with the Emergency Operations Plan (EOP) for the jurisdiction.
- Developing procedures in the EOP for responding to a dam failure (including a site-specific standard operating procedure for each dam site).
- Participating in dam site exercises.
- Increasing public awareness of dam safety procedures.

Only two of the dams in Macomb County have a High hazard rating. They are the Upper and Lower Stony Lake Dams. These dams are located in series so that if the upper dam fails, it is highly likely that the lower dam will also fail. The Metropark Authority drained the lakes in 1998 and performed repairs to the dam. The Upper and Lower Stony Lake Dams were last inspected on 7/31/2017. Mr. Brahm-Henkel, of the Huron-Clinton Metro Parks Engineering Department, updated the Emergency Action Plan for the Stony Lake Dams in 2018 following a meeting with County Emergency Management and sent a copy of that report to Macomb County.

The Autumn Ridge Detention Dam is classified as significant by the National Inventory of Dams but does not meet the definition of a dam in Michigan due to its one-acre impoundment area. Consequently, it is not regulated or inspected by the State of Michigan.

Historical Occurrences

No catastrophic dam failures have been reported in Macomb County. According to the Michigan Department of Environment, Great Lakes, Energy, only two minor dam failures have been documented in Macomb County. It should be noted, however, that the rivers and lakes that dams support often cross jurisdictional boundaries. Many of the rivers and lakes that run through Macomb County run through Oakland County as well. Oakland County ranks #1 in

Michigan in both highest risk hazard dams (27 potential dams) as well as dam failures (18 failures). Failures that occur in neighboring counties could very well impact Macomb County.

One of the more significant dam failure events to occur happened on September 10-11, 1986. The rain that fell during those two days ranged from 8 to 17 inches and covered an area of the central Lower Peninsula 60 miles wide by 180 miles long. The result was 11 dam failures, 19 near failures, and 1500 people being evacuated downstream of the dams. There were no deaths or injuries resulting from these failures. The primary reason for the failures was that they were constructed without an emergency spillway and did not have an adequate inspection and maintenance program.

Economic Vulnerability

Due to the small number and size of the dams in Macomb County, the economic impact of a dam failure is minimal. Should a failure occur, some minor flooding damage would be expected. These damages, depending on the extent of the failure, have the potential to reach into the \$100,000 range.

Probability for Future Hazards

The dams located within the borders of Macomb County consist of earth berms and small weirs. Properly scheduled maintenance and emergency planning are two vital strategies for dam safety. Only two of the county's dams are classified as having a 'High' hazard ratings and both of those are in good condition, well-maintained, and are inspected every three years. Additionally, the Emergency Operations Plan for the dams were updated in 2018 to ensure current emergency notification and response procedures are identified. As long as the State and owner continue to manage these dams in accordance with state laws and regulations, the risk of significant damage or incapacitation as a result of a dam failure is minimized.

2.3.5 Drought

Definition

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

Drought differs from normal conditions found in low rainfall areas in that aridity is a permanent characteristic of that type of climate. Drought is the consequence of a natural reduction in the amount of precipitation received over an extended period of time, usually a season or more in length. The severity of a drought depends not only on its location, duration, and geographical extent, but also on the water supply demands made by human activities and vegetation. This multi-faceted nature of the hazard makes it difficult to define a drought and assess when and where one is likely to occur.

Location

Drought is a normal part of the climate of Michigan, Macomb County, and of virtually all other climates around the world including areas with high and low average rainfall. The range of this hazard can reach from a regional incident (limited to one county) to a statewide scale. Due to the nature of this hazard, all regions of Macomb County either have been or are potentially susceptible to experiencing a drought.

Hazard Extent

Drought impacts are often less obvious than other natural hazards, and they are typically spread over a much larger geographic area. Droughts can cause many severe impacts for Macomb County:

- Water shortages for human consumption, industrial, business and agricultural uses, power generation, recreation and navigation.
- A drop in the quantity and quality of agricultural crops.
- Decline of water quality in lakes, streams and other natural bodies of water.
- Mal-nourishment of wildlife and livestock.
- Increase in wildfires and wildfire-related losses to timber, homes and other property.
- Declines in tourism in areas dependent on water-related activities.
- Declines in land values due to physical damage from the drought conditions and/or decreased economic or functional use of the property.
- Reduced tax revenue due to income losses in agriculture, retail, tourism and other economic sectors.
- Increases in insect infestations, plant disease, and wind erosion; and possible loss of human life due to food shortages, extreme heat, fire, and other health-related problems such as diminished sewage flows and increased pollutant concentrations in surface water.

Historical Occurrences

Based on historical records, major drought events occur approximately once every 10 to 15 years. While the lack of rainfall does not cause direct harm to people, it does, however, take a major toll on the agriculture industry and crop producers. Drought can also lead to major inconveniences among community residents when water restrictions are enforced. A drought had not been recorded for the Macomb County region within the timeline of this plan update.

Since 2000, the longest duration of drought in Michigan lasted 113 weeks beginning on August 26, 2008 and ending on October 19, 2010. The most intense period of drought occurred the week of August 28, 2007 where 17.06% of Michigan land was affected.

The summer of 1988 is well-known, both for the tremendous heat and the dryness experienced across the Midwest. From May 1-June 30, Flint recorded just 0.97 inches of rain. Meanwhile, Saginaw and Detroit both recorded their driest June of the century. In terms of the temperature, Detroit observed 39 days with the temperature reaching 90 degrees. Meanwhile, Saginaw saw 38 and Flint saw 36 days with the mercury topping 90 degrees. Meanwhile, Detroit observed five days with 100 degree heat, while Flint saw four 100 degree days.

The summer of 2012 also brought about a damaging heat wave. This dry spell, coupled with damages cause by extremely warm temperatures in early March followed by a freeze which resulted in major damages to the orchard industry affected most of Michigan. The drought destroyed nearly one-third of the state's fruit, vegetable, and field crops. This resulted in a U.S. Department of Agriculture Disaster Declaration for 45 of the state's 83 counties.

Economic Vulnerability

Macomb County has not experienced repetitive occurrences of drought in its history. According to the National Climatic Data Center, the county has experienced only one major drought event since 1950 that resulted in nearly \$150 million in agricultural losses. The current trend of the county is a reduction in active agricultural land and an increase in residential, commercial, and industrial usage. As this trend continues, less agricultural land in the county will be available to be impacted. However, this land will be much more valuable to the county due to the reduced acreage.

Probability of Future Hazards

Drought is a natural occurrence and Macomb County has dealt with past drought incidents throughout the county's history. According to the EMD PUB-103, a major drought incident occurs once every 10 to 15 years within Michigan. The major impact falls mainly on the agriculture industry and there is a relatively low threat to human life. The continual development in the northern regions of the county and the diminishing farmland is contributing to a lower impact from the hazard. Since drought is a nature-induced phenomenon, there is no reason to believe that the probability or frequency will diminish along with the impact. The potential is always there and it can also lead to other problems, which will indirectly impact people.

2.3.6 Earthquake

Definition

A sudden violent shaking of the ground, typically causing great destruction, as a result of movements within the earth's crust or volcanic action. Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes, or come as a series of tremors over a period of several days. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued.

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

Location

Earthquakes tend to strike repeatedly along fault lines. The most important major fault zone to Michigan is the New Madrid Seismic Zone. This zone extends from approximately Cairo, Illinois through New Madrid, Missouri to Marked Tree, Arkansas.

Hazard Extent

Macomb County lies outside the range of any major event located in these two closest areas and, most likely, only small tremors would be felt in Macomb County. The largest impact to the county could result from damage to natural gas and petroleum pipelines and minor structural building damage.

Historical Occurrences

No severely destructive earthquake has ever been documented as having an epicenter in Macomb County or in the State of Michigan. However, several mildly damaging earthquakes have been recorded since the early 1800s. The earliest tremors felt in Michigan were from a series of devastating earthquakes near New Madrid, Missouri in 1811 and 1812. These quakes destroyed the town of New Madrid, created a 17,000-acre lake in northeastern Tennessee, cause ocean-like swells on the Mississippi River and rang church bells as far away as the eastern seaboard. The Enhanced Richter Scale estimates ranged from 8.0 to 8.8 and included hundreds of aftershocks with some magnitudes between 6.5 and 7.6 on the Enhanced Richter Scale.

Fault lines have been confirmed in the bedrock of Michigan and are now considered relatively stable. However, these fault lines are poorly mapped. On April 19, 2018, a 3.6 magnitude earthquake occurred centered around Amherstburg, Ontario, Canada. According to the United States Geological Survey, Amherstburg is about 20 miles from downtown Detroit. Meanwhile, on May 2, 2015, there was a 4.2 magnitude earthquake detected about five miles south of Galesburg, or nine miles southeast of Kalamazoo, MI. Just weeks later on June 30, 2015, a 3.3 magnitude earthquake was felt just 13 miles southeast of Battle Creek. In 2011, an earthquake with an epicenter in Virginia caused the upper floors of the Renaissance Center in Detroit to sway.

Economic Vulnerability

An economic impact to the County due to an earthquake is not warranted due to the location of Macomb County in relation to the nearest fault line. The county lies outside of the range of significant impact. However, the potential for economic loss would be expected to result mainly from loss of utilities such as gas, water, and sewer service.

Probability for Future Hazards

Records have been kept regarding earthquakes for approximately 200 years in Michigan. In that timeframe there have been no major destructive incidents originating or even reaching Macomb County. Therefore, the probability, based mainly on historical information, is considerably low for a major earthquake event in Macomb County. The probability for a major event does exist, however, in the Mississippi Valley, near the region of the New Madrid fault line. Should a major event occur here, Macomb County would still only experience minor tremors, as it lies well outside of the New Madrid zone.

2.3.7 Energy Emergency

Definition

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

Three specific types of energy emergencies exist. The first and most frequent type involves the physical destruction of an energy production or distribution facility. This can stem from severe storms, tornadoes, floods, earthquakes, sabotage, human error, accidents, or equipment failure. The second type is caused by a sharp, sudden escalation in energy prices or deceleration of production causing a shortage. The third type of energy emergency is a sudden surge in energy usage when U.S. defense forces need to be mobilized.

Location

Energy emergencies can affect all people, from an individual community, to a state, to the entire nation. Therefore, it is safe to say that the entire county is vulnerable to this hazard.

Hazard Extent

Energy emergencies have the potential to develop into severe situations over a long period of time. In most instances, loss of power, gas, or fuel due to a weather-related incident, can be restored relatively quickly with little to no detrimental effects. However, in some instances, like a disruption in fuel import, the effects can reach the entire nation. In the event of a fuel shortage, Macomb County would be most affected by higher gasoline prices. Natural gas shortages, especially in the winter, can have dangerous effects on people such as no heat. The same can be true of electricity failures or shortages.

Historical Occurrences

Energy emergencies typically occur on a much larger scale than a single county. Nevertheless, Macomb County is certainly affected when an energy crisis plagues the state or the Midwest. Energy emergencies are not dependent on the season of the year; however, their effects can easily be multiplied by the seasons. Many more people will suffer from a gas main break in the winter than in the summer due to loss of heating. Conversely, an electrical black out would have somewhat more harmful effects in hot, summer months due to loss of air conditioning and spoiling of food from no refrigeration.

The most recent major energy emergency to strike Macomb County was on January 30, 2019 there was an explosion and fire at the Consumer's Energy Ray Compressor Station. There were no injuries reported. The fire involved equipment and was contained within 1.5 hours. Due to the fire, Consumers Energy asked 1.8 million customers to turn down their heat during bitterly cold weather to help reduce the natural gas usage. Consumers said the Ray Compressor Station, where the fire occurred, accounted for roughly 64 percent of its supply. General Motors agreed to suspend operations at 13 manufacturing facilities and three corporate locations. Fiat Chrysler cancelled 1st shift production at the Warren Truck and Sterling Heights Assembly Plants. Ford Motor Company curtailed certain heat-intensive processes at some plants.

In the winter of 2014 (1/4/2014), the City of Richmond declared a local emergency due to the extreme cold and a notification from DTE that gas service to the city was to be ceased for up to two days due to repairs needed to the supply line to the city. Repairs were made within hours and the emergency declaration was cancelled.

On August 14, 2003, just as rush hour traffic was beginning for many cities in the northeastern and midwestern United States, a power outage struck leaving early 2.3 million customers in southeast Michigan were without power for the next two days. Many businesses lost money due to workers being sent home.

Economic Vulnerability

During the Blackout of 2003, numerous economic losses were incurred due to the power outage. According to the Electricity Consumers Resource Council (ELCON), the total loss across all the affected areas was estimated to be between \$7 and \$10 billion. These figures are based on costs per kilowatt-hours, food spoilage, lost production, and overtime wages. Even though Macomb County suffered a fraction of this amount, it was still a substantial economic loss. This potential for economic loss is ever present and can largely impact the County's economy.

Probability of Future Hazards

Macomb County has a rapidly growing population and with that growth, comes higher demand for energy sources. Today's modern society is heavily dependent on natural fuel sources and electrical power. With such a large dependency on these energy sources, the constant demand for power, and the population increasing, energy emergencies are more of a potential threat to the county now than ever before. The more complex the energy system in the county becomes, the more probable an incident will occur. Probability of future occurrence suggests that a major event will occur.

2.3.8 Extreme Temperature

Definitions

Prolonged periods of very high or very low temperatures, often accompanied by other extreme meteorological conditions.

Although they are radically different in terms of initiating conditions, the two hazards share a commonality in that they both primarily affect the most vulnerable segments of the population, the elderly, children, impoverished individuals, and people in poor health. Due to their unique characteristics, extreme summer heat and extreme winter cold hazards will be discussed individually.

Extreme Summer Heat

Extreme summer weather is characterized by a combination of very high temperatures and exceptionally humid conditions.

Extreme Winter Cold

Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths.

Location

Michigan's climate lends it to both sides of the temperature scale and thus, all portions of Macomb County are subject to the same extremes. The combined effects of high temperatures and high humidity are more intense in urban centers; heatstroke and heat exhaustion are a greater problem in cities than in suburban or rural areas.

Hazard Extent

Extreme Summer Heat

The major threats of extreme summer heat are heatstroke (a major medical emergency), and heat exhaustion. Heatstroke often results in high body temperatures, and the victim may be delirious, stuporous, or comatose. Rapid cooling is essential to preventing permanent neurological damage or death. Heat exhaustion is a less severe condition than heatstroke, although it can still cause severe problems such as dizziness, weakness and fatigue. Heat exhaustion is often the result of fluid imbalance due to increased perspiration in response to the intense heat. Treatment generally consists of restoring fluids and staying indoors in a cooler environment until the body returns to normal. Other, less serious risks associated with extreme summer heat are often exercise-related and include heat syncope (a loss of consciousness by persons not acclimated to hot weather), and heat cramps (an imbalance of fluids that occurs when people unaccustomed to heat exercise outdoors).

Extreme heat events, or heat waves, are a leading cause of weather-related deaths in the United States. According to the Centers for Disease Control and Prevention, between 1999 and 2012, extreme heat caused more than 7,400 heat-related deaths in the United States. Extreme heat increases hospital admissions for heart disease, respiratory disease, and stroke. Extreme summer heat is also hazardous to livestock and agricultural crops, and it can cause water shortages, exacerbate fire hazards, and prompt excessive demands for energy. Roads, bridges, railroad tracks and other infrastructure are susceptible to damage from extreme heat.

Due to Michigan's geographic location within the Great Lakes area and the widespread usage of air conditioning, the threat for deaths attributed to excessive heat has greatly reduced in Michigan.

Extreme Winter Cold

Each year in the United States, approximately 1,330 people die as a result of severe cold temperature-related causes. It should be noted that a significant number of cold-related deaths are not the direct result of "freezing" conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. Hypothermia (the unintentional lowering of core body temperature), and frostbite (damage from tissue being frozen) are probably the two conditions most closely associated with cold temperature-related injury and death. Frostbite rarely results in death, but in extreme cases it can result in amputation of the affected body tissue.

Hypothermia is usually the result of over-exposure to the cold, and is generally thought to be clinically significant when core body temperature reaches 95 degrees or less. Hypothermia usually occurs in one of two sets of circumstances. One situation involves hypothermia associated with prolonged exposure to cold while participating in outdoor sports such as skiing, hiking or camping. Most victims of this form of hypothermia tend to be young, generally healthy individuals who may lack experience in dealing with extreme cold temperatures. The second situation involves a particularly vulnerable person who, is subjected to only a moderate, indoor cold stress. A common example would be that of an elderly person living in an inadequately heated home. In such circumstances, hypothermia may not occur until days or perhaps weeks after the cold stress begin.

Historical Occurrences

Extreme Summer Heat

Although Macomb County has been fortunate not to have a heat wave that resulted in numerous deaths, the potential always exists for such an event to occur. During the prime summer months of 2001, extreme heat and humidity sent heat indexes well above the 100 degree Fahrenheit mark. In mid-June of that year, three elderly residents of a Detroit-area nursing home died and five more were hospitalized due to heat-related stress. (Note: the deaths prompted a bill within the Michigan Legislature to require all nursing homes in Michigan to have air conditioning in resident rooms and common areas.)

Another case of extreme summer heat occurred back in July of 1936. The heat wave that hit Michigan and the metro Detroit area brought with it temperatures which exceeded 100 degrees for seven days in a row, from July 8 to 14. The temperature in Mio, Michigan reached 112 degrees, which is a state record that still stands today. Many healthy adults as well as the elderly fell victim to the temperatures. In addition, many deaths and illnesses resulted from spoiled foods, as many people back in that time period relied on the ice in their iceboxes. Statewide, 570 people died from heat-related causes, including 364 in the Detroit Metropolitan area.

Extreme Winter Cold

Deaths due to extreme winter cold are often not associated with a particular weather event. Rather, they are the result of a one-time overexposure to severe cold weather (a hiker lost in the woods), or more commonly from continuous exposure to moderate cold temperatures by vulnerable persons (such as the elderly or the homeless). In some cases, hypothermia deaths can be linked to severe winter weather such as snowstorms or blizzards, where the victim is caught unprepared for the extreme cold temperatures.

The latest case of severely cold temperatures occurred in early February of 2015. The cold spell lasted approximately two weeks and broke records set in 1875 with temperatures in and around Macomb County recorded at an average of 14.5 degrees, a new record and

dropping many nights to more than 20 degrees below zero. Several warming shelters were in operation in local communities. The 2015 Winter Season for Macomb County registered as the coldest season in history. January of 2018 was also registered as a severe cold event registering as the 6th coldest January in Michigan history.

Economic Vulnerability

Extreme temperatures often times result in loss of power or other critical utilities during particular events. According to the National Climatic Data Center (NCDC), Macomb County has only suffered one large-scale incident resulting in \$475,000 due to extreme cold since 1950. These losses generally stem from pipes breaking, and lost production due to inoperable facilities. Summertime high temperature can result in brownouts in power supply or water shortage due to drought or overload of power grids due to air-condition use.

Probability of Future Hazards

Macomb County exists in a region of the country that experiences both ends of the temperature spectrum. The probability for extreme temperatures, based on the county's history, is moderately high. Although the entire season may not be extreme, there is almost a certainty that extreme temperature spells will occur at some point in the year. This is a hazard that is very likely to occur and certain measures and precautions can be taken to help alleviate the effects.

2.3.9 Hail Storms

Definition

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

Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds.

Location

Hail is a product of the strong thunderstorms that frequently move across the county. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Although it is often times difficult to predict when hail will form or even fall to the earth, we do know that storms and the possibility of hail are most frequent during the warm spring and summer months, typically May through September. The potential thunderstorm threat is measured often measured by the number of “thunderstorm days” – defined as days in which thunderstorms are observed. According to the map in Appendix S, Macomb County is subject to 30-40 thunderstorm days per year.

The National Weather Service began recording hail activity in Michigan in 1967. Statistics since that time indicate that approximately 50% of the severe thunderstorms that produce hail have occurred during the months of June and July, and nearly 80% have occurred during the prime growing season of May through August.

Hazard Extent

Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred with the most severe thunderstorms. Sometimes, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. When hail falls to the earth, it has the potential to batter crops, dent automobiles, and injure wildlife and people. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

Historical Occurrences

On July 27, 2014, severe thunderstorms moved in through the Metro Detroit area. The storms produced heavy rainfall as well as hail in several locations 1” diameter was seen in Warren, MI while Oakland County saw 2.50” diameter size hail. Total damage across Southeast Michigan was estimated to be \$100 million from the severe wind and hail.

Macomb County has experienced seven Hail events since 2014. All were considered minor events with little property damage to report and no injuries were reported as well. Other “main” events have been recorded.

On July 28, 2000, storms organized as they moved slowly but steadily eastward, evolving into a squall line that crossed southeast Michigan in the late afternoon and early evening hours. Several of the thunderstorms became severe. Only a couple of storms produced damaging wind; large hail was the most common type of severe weather. An isolated storm ahead of the squall line produced silver dollar sized hail in Shelby Township (Macomb County); this was the largest hail report of the day. The same storm downed trees in that area. Trees were also downed in Bancroft due to severe thunderstorm winds. The rest of the severe weather was composed of dime to quarter sized hail events.

Economic Vulnerability

According to the NCDC database for Macomb County, even though the County has experienced numerous hailstorms in the last fifty years, none have been reported to result in extensive property or crop damage. Agriculture, automobiles, and homes are vulnerable to suffering damage and a greater economic strain would be felt if a large number of crops were lost.

Probability of Future Hazards

According to the National Weather Service in White Lake, Michigan, Macomb County is subject to approximately 30-40 thunderstorm days per year. Macomb County resides in an area of Michigan where the climate lends itself to generating significant storm conditions, especially during the spring and early summer seasons. Moist air from the south and the cooler air from the north provide ideal conditions for hail to be formed. Therefore, Macomb County possesses a moderate possibility for hail to occur and cause significant property damage.

2.3.10 Hazardous Materials Incidents (Industrial Accidents) - Fixed Sites

Definition

Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential risk to life, health, property, or the environment if they are released.

An industrial accident is a fire, explosion, or other severe accident involving hazardous materials at an industrial facility that results in serious property damage, injury, or loss of life.

Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gasses. Industrial accidents differ from hazardous materials in the scope and magnitude of offsite impacts. Whereas hazardous material incidents typically involve an uncontrolled release of material into the surrounding community and environment that may necessitate evacuations or in-place sheltering of the affected population, the impacts from industrial accidents are often confined to the site or facility itself, with minimal physical outside impacts.

Location

One of the major provisions of SARA Title III is the establishment of a Local Emergency Planning Committee (LEPC) for designated planning districts. Macomb County has a Local Emergency Planning Committee. The LEPC is responsible for developing Community-Right-to-Know plans for those facilities in the county subject to SARA Title III emergency planning requirements. A facility is subject to SARA Title III provisions if extremely hazardous substances (as determined by the U.S. Environmental Protection Agency) are present at the facility in quantities at or above the minimum threshold quantities established in Section 302 of the Act.

At the time this plan was updated, there were 133 facilities identified in Macomb County as Section 302 sites. In addition, the latest report from the Agency for Toxic Substances and Disease Registry had identified 46 locations in the county where a hazardous material release had occurred.

Numerous areas throughout the county were also identified as industrial zones. These areas are located along the major corridors of Van Dyke Avenue, Mound Road, and Groesbeck Highway (M-97). Please refer to the map in Appendix L for zoning areas marked as "Industrial".

Hazard Extent

In both cases of hazardous material releases and industrial accidents, there is typically some type of threat involving a substance or material which, because of its chemical, physical, or biological nature, poses a risk to health, life, property, or the environment. Most hazardous material incidents are the result of human error. Occasionally, releases can be attributed to natural causes, such as a flood that washes away barrels of chemicals stored at a site. Industrial accidents such as fires, explosions, and excessive exposure to hazardous materials, may cause injury or loss of life to the workers at the facility, and often significant property damage. Industrial accidents can cause severe economic disruption to the facility and to the surrounding community, as well as significant, long-term impacts on the families of the workers injured or killed.

Historical Occurrences

Although Macomb County has a large industrial presence throughout many of its communities, there have been no major hazardous material releases or industrial accidents that

resulted in multiple deaths or serious injuries. There have been some minor incidents that have occurred in the county. The following is a brief synopsis of past occurrences involving hazardous material releases and industrial accidents in Macomb County and Michigan.

No large-scale hazardous material releases have occurred to date in Macomb County. However, some minor incidents have occurred in recent years. On October 24, 1988, a chemical spill in St. Clair Shores, at a plant injured 40 people and forced an evacuation of the site. On June 17, 1983, a fire at a hazardous waste site in Shelby Township caused six injuries and forced the evacuation of 1,200 people. Small release incidents have occurred in facilities located within Macomb County, but the county has sustained a relatively good track record of fewer and smaller hazardous material and industrial incidents due to careful regulations set in place by government and private industry officials.

On December 11, 1998, an explosion at the Independence Professional Fireworks Company manufacturing plant near Osseo, in Hillsdale County, killed seven employees and leveled one building at the site. The blast, which occurred in a fireworks shell assembly room, sent debris flying in all directions for about 300 yards and could be heard for at least 20 miles. Fifteen other workers escaped serious injury. Subsequent investigations by the Bureau of Alcohol, Tobacco, and Firearms (ATF), the Michigan State Police Fire Marshal Division, and the Michigan Occupational Safety and Health Administration (MIOSHA) were unable to determine a definitive cause of the explosion. This explosion was the worst industrial accident in Michigan in nearly 20 years.

An additional devastating explosion occurred at this same plant on March 29, 1999, killing five more employees, and destroying another building at the site. This second explosion, which included among its victims, the company co-owner, was later determined by investigators to be accidental. The devastation brought by these two explosions resulted in a total of 12 deaths. Federal and state regulators have since issued numerous citations to the company for safety violations at the plant, with fines totaling several hundred thousand dollars. Ultimately, the company was forced to permanently shut down the business.

Another major industrial accident occurred on February 1, 1999. An explosion in one of several large boilers at the Ford Motor Company Rouge Power Plant in Dearborn, Wayne County, killed six workers, critically injured another 14, and caused extensive structural damage. State officials that investigated the accident concluded that human error played a major part in the explosion when a work crew failed to shut off one of two gas mains leading to the boiler's furnace. That error caused a buildup of natural gas in the boiler that was somehow ignited, causing the explosion. The force of the explosion split open the 60-foot high furnace, blew off the roof of the power plant, ignited fires on five floors, and sprayed surrounding workers with super-heated water that caused severe burns. The blast, which forced the shutdown of the Rouge Complex and other Ford plants for several days, was the second worst industrial accident in Michigan in 20 years and the deadliest at an automobile plant in over 50 years. It also turned out to be the most expensive workplace disaster in U.S. history, with final costs expected to exceed \$1 billion. The seven month probe by state officials was the largest and most complex in the history of state workplace safety investigations.

Note: According to the EMD PUB 103 book, 1998 is the last year for which statewide hazardous material incident response statistics are available. A reportable hazardous material incident is one in which all three of the following conditions apply: 1) a material is present that is suspected to be other than ordinary combustible by-product material; 2) the material is in such a state, quantity or circumstance that, if left unattended, it is presumed to pose a threat to life, health, property, or the environment; and 3) special hazardous material resources were dispatched or used, or should have been dispatched or used, for assessing, mitigating or managing the situation.

Economic Vulnerability

With 133 sites identified as a SARA Title III site, the economic vulnerability to the county due to a fixed site incident is high. Numerous commercial and residential areas surround many of the industrial corridors. Should an incident occur, most spills would be contained primarily within the boundaries of that facility. Spill incidents have the potential to spread to outlying areas but that has not been the case history for Macomb County. In the event of a major spill/release, damages could range anywhere from the tens of thousands to even millions of dollars range.

Probability for Future Hazards

Many regions of southern Macomb County, as well as in South East Michigan, are highly industrialized. With such a large concentration of potential hazardous sites, there is a high probability that a large-scale incident could occur if proper mitigation measures are not taken. Although there have never been any serious fixed site hazardous material incidents in Macomb County, all it takes is one large-scale event to dramatically affect a large area or population. It should be noted that in the highly advanced technological society we live in today, the risk of this type of hazard is high and efforts such as community awareness and training with emergency first responders have been a primary focus of this county. County Hazmat teams perform regular exercises and continued education as to the potential threat of these hazards is continually being administered to employees and responders. Additionally, the Macomb County Local Emergency Planning Committee reviews and revises the Emergency Response Plan for each of the 131 sites annually as well as working with the local fire departments in the development their Firefighter-Right-To-Know Law (FFRTK) site plans.

2.3.11 Hazardous Materials Incidents - Transportation

Definition

Hazardous materials are materials or substances which, because of their chemical, physical, or biological nature, pose a potential risk to life, health, property, or the environment if they are released.

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, and marine – are carrying thousands of hazardous materials shipments on a daily basis through local communities.

Location

Macomb County is subject to all modes of hazardous material transport. Many major thoroughfares run through the County and are frequented by all types of cargo-carrying trucks. Interstates I-94 and I-696 both traverse major portions of the County along with the major State-paved roads of Gratiot Avenue (M-3), Groesbeck Highway (M-97), Hall Road (M-59), and Van Dyke Avenue (M-53). These routes serve most of the county's transportation needs for hazardous material deliveries, especially in the major urbanized areas and always pose as a significant risk for hazardous material transportation incidents.

The two major rail lines servicing the county are Consolidated Railroad Corporation (CR) and CN (Canadian National Rail). The services of these rail companies include chemical, vehicle, industrial supplies and manufactured products (Please refer to Appendix M for a table listing all the known hazardous materials transported through Macomb County via CN) as well as armored vehicles, military components, and munitions.

Lake St. Clair borders the county on the east and is a heavily traveled freighter route between both Canada and the United States.

Macomb County also has Selfridge Air National Guard Base and several small airports including Romeo State Airport and Ray Community Airport in Ray Township. While the smaller, local airports typically would not ship hazardous cargo, Selfridge, being a military installment, definitely has the potential for its aircraft to carry dangerous substances, chemicals, or explosive materials and weapons.

Hazard Extent

Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who come in contact with the spill or airborne plume. In addition, damage to property and the environment can be severe as well. Statistics show almost all hazardous material transportation incidents are the result of an accident or other human error. Rarely are they caused simply by mechanical failure of the carrying vessel.

Located on the Great Lakes, one of the most dangerous hazardous material transportation accident scenarios that could occur in Macomb County would be a spill or release of oil, petroleum or other harmful materials into one of the lakes from a pipeline or transportation methods. Such an incident, if it involved a large quantity of material, could cause environmental contamination of unprecedented proportions.

Historical Occurrences

Macomb County has been fortunate to not experience a major hazardous material transportation incident in its history. Minor incidents have occurred, but none that have resulted in multiple deaths or injuries or that have had any great disruption to the roads system.

On June 28, 2019, there was a multi-car train derailment in an international tunnel connecting Port Huron, MI to Sarnia, Ontario. About 40 freight cars were involved in the derailment that caused significant damage to the track. According to CN spokesman about 13,700 gallons of sulfuric acid were spilled during the derailment.

On October 12, 1983, a tanker truck overturned, spilling 5,000 gallons of methylamylketone. The spill forced the evacuation of 600 people, and M-97 and 14 Mile Road were closed until the spill could be cleaned up and the site restored. More recently, in nearby Birmingham and Bloomfield Township, more than 40 cars of a 98-car freight train carrying automobiles and some hazardous materials (yellow phosphorous) derailed. Two rail cars caught fire and forced police and fire officials to warn nearby residents and motorists to stay indoors and keep their windows closed due to possible toxic fumes. None of the cars containing hazardous materials derailed. Some local roads were closed for several hours. The derailment caused an estimated \$6 million in damage.

Economic Vulnerability

Just as the numerous sites located throughout the county pose an economic risk, so to do the corridors and routes of transporting the hazardous materials to these sites. In some ways, a transportation hazmat incident can be even more detrimental than a fixed site incident. Spills or explosions can occur while onsite or enroute. Costs of clean-up can range anywhere from a few thousand to hundreds of thousands of dollars, depending on the severity of the incident.

Probability for Future Hazards

The large industrial presence throughout the county is supported by the often times even larger transportation presence. For the industrial facilities to operate smoothly, supplies and chemicals are necessary, and these are delivered and removed from the sites in a variety of ways. Transportation methods utilized in Macomb County include train, truck, and even freighters, which pass through Lake St. Clair. Hundreds of hazardous materials are transported through the county and with increased populations comes increased risk for an accident. A major chemical or hazardous material spill is an extremely probable hazard that could occur in the county. Although Macomb County has been fortunate to not experience a major incident, the potential for serious injury or damage is very much present.

2.3.12 Ice and Sleet Storms

Definition

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

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage.

Location

According to the EMD PUB-103, Michigan is susceptible to moderate snowfall and extreme cold, averaging 90 to 180 days per year of below freezing temperatures in the Lower Peninsula. All areas of Macomb County are subject to these conditions.

Hazard Extent

One of the most detrimental effects of an ice storm is the buildup of ice on buildings, radio towers, power lines, trees, and other tall objects. During a major storm event, the buildup can become so great that the excess weight added by the ice, causes the power lines to snap and can pull chunks of buildings off and topple trees. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities.

Both sleet and ice can cause major problems on roadways. Roads, which normally travel at high speeds, are immediately reduced to a snail's pace. Accelerating, breaking and steering a vehicle become exponentially difficult on slick roads. These conditions many times lead to automobile accidents. Excessive amounts of ice can also clog waterways and trap ships out on the water.

Historical Occurrences

Macomb County has a consistent history of severe winter weather, including ice storms. During the period from 1995 to 2018, the National Climatic Data Center documented eight ice storms that caused more than \$180M in property damage, most of it from one event in April 2003.

The most recent record of an ice storm event occurring in Southeast Michigan happened on March 1 and again on April 14 of 2018. Macomb County was spared the worst effects of those two storms. An additional event occurred on March 12, 2014 in Macomb County, again with minor effects to the county and its' population. A December 21st and 22nd of 2013 brought an ice storm to Southeast Michigan and Macomb County with minor effects to the county.

Thunderstorms brought heavy freezing rain to southeastern Michigan between April 3 and April 5 of 2003. Spotter reports indicated that up to 3 inches of freezing rain occurred in some places. By the morning of the 5th, ice accumulations ranged from one half to one inch. Sleet had also accumulated up to two inches in and around Flint and the Saginaw Valley. The ice accumulations led to considerable tree damage and widespread power outages across the entire area. Locations hardest hit, with around an inch of ice reported on the trees, were across northern Oakland County, northern Macomb County, and throughout Lapeer, St Clair, Sanilac and Huron counties. Approximately 450,000 people lost power, one person was killed by a

falling tree branch, two others injured, with a final damage tally of \$161.1M as a result of the ice storm.

On March 13, 1997, low pressure tracked from the central Plains northeast across southeast Lower Michigan. The storm brought widespread precipitation to southeast Michigan from late on the 13th through midday on the 14th. North of Detroit, nearly all of the precipitation fell in the form of freezing rain, with small amounts of snow and sleet noted in a few spots. From Detroit and Ann Arbor south to the state-line, the freezing rain changed to rain, but not before heavy ice accumulations occurred. Total precipitation amounts ranged from 1.5 to nearly 2.5 inches from Detroit and Ann Arbor south to the Ohio state-line. From the northern suburbs of Detroit north to Flint and Port Huron, amounts ranged from 0.8 to 1.5 inches. North of that area, amounts ranged from 0.40 to 0.80 inches. In the Detroit Metropolitan area, the ice storm resulted in power outages to over 425,000 homes and businesses; the 3rd largest outage in history, and the worst ever for an ice storm. Several thousand residents were without power for as long as 4 days. In addition to power lines, falling trees damaged dozens of cars and houses throughout the area. Most schools were closed, and there were numerous auto accidents. Total property damage resulting was \$19M.

Economic Vulnerability

Many older communities within Macomb County, especially in the southern regions, utilize above ground utilities. Ice and sleet storms can have an extremely detrimental effect on infrastructure and can easily down power lines. Toppled trees can also cause significant damage to businesses, power lines, homes, and vehicles. Although infrequent, ice and sleet storms have the potential to result in very large property damage losses.

Probability of Future Hazards

Macomb County is located in a region of the state, which experiences a fairly large number of wintry, cold days. An ice or sleet storm weather event is very probable and typically associated with this type of weather climate. Macomb County has experienced numerous ice and sleet storms in the past and the probability for more to occur is very high. Throughout the winter season, the conditions are very favorable for precipitation and then quickly changing to a colder temperature. This is a hazard that occurs on the average of once a year in Macomb County.

2.3.13 Infrastructure Failure

Definition

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

Location

With miles of water and sewer pipes, phone and cable lines, and the vast network of generators, transformers, and treatment and distribution facilities, an infrastructure failure can happen virtually anywhere in Macomb County. Often times these incidents are not limited to a small localized region, but rather affect multiple communities and up to the hundreds of thousands of people (in some instances entire regions of the country and into the millions).

Hazard Extent

Macomb County's citizens and businesses are dependent on the public and private utility infrastructure to provide essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet interrelated systems fail due to disaster or other cause, even for a short period of time, it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes if immediate mitigation action is not taken (Extreme Temperature Section). 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 (Public Health Emergencies Section). When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur (River/Urban Flooding).

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

Historical Occurrences

Unfortunately, Macomb County has had its share of infrastructure failures, mostly due to the effects of natural disasters such as snow and ice storms, severe cold, windstorms, tornadoes and floods.

The most recent event occurred in the City of Fraser on December 24th, 2016 where a large sewer main that serves more than 300,000 residential and business users in Macomb County that partially collapsed, causing a sinkhole that damaged three homes (*also classified as a subsidence event*). The collapse was of such magnitude that continued sewer service to the 300,000 users was in peril. Fortunately, county officials worked to install a temporary bypass around the collapse area until it could be properly repaired some 11 months later. There were concerns over snow melt, rain and other uncontrollable events, which would cause basements to fill with sewage. There was also the possibility to have to divert millions of gallons of raw sewage into the Clinton River, which would impact Lake St. Clair and eventually the other Great Lakes downstream. However, because of the emergency measures installed, this never occurred. Since that incident, three additional smaller sinkhole events have been recorded in Macomb County, all due to infrastructure failures.

On August 23rd of 2004, a major sinkhole incident occurred in Sterling Heights on 15 Mile Road between Hayes and Moravian. A 160-foot long by 60-foot wide sinkhole opened up on 15 Mile Road right over an 11-foot diameter sanitary sewer interceptor. The 11-foot interceptor was believed to have been infiltrated by the fines and silt in the surrounding soil. The progression of the soil entering the pipe resulted in a reduced sub-grade, which caused the road above to collapse. The repair of this event took ten months and millions of dollars to complete.

In 1978, and again in 1980, a large sewer main that served nearly 300,000 residential and business users in northern Macomb and Oakland Counties partially collapsed. The collapses were of such magnitude that continued sewer service to the 300,000 users was in peril. Fortunately, officials were able to install temporary sleeves within the damaged main until it could be properly repaired. However, in order to relieve the backpressure and keep basements from filling with sewage, officials were forced to divert millions of gallons of raw sewage into the Clinton River, fouling miles of Lake St. Clair beaches. Eventually, the damaged sections of sewer main were repaired, but this unfortunate incident caused tremendous disruption and environmental damage to the area. It showed how serious a large-scale sewer infrastructure failure in a densely populated area could be.

Most recently, the Blackout of 2003 was the largest infrastructure failure to affect, not only Macomb County, but also most of the northeastern United States. The series of events that led up to the blackout occurred over only a sixty-minute interval. An exact cause of the outage was never determined, but a series of power units tripping offline in succession led to the major power failures to occur around 4:00 p.m. After the first major power failure, it only took five minutes for all the other primary units on the power grid to fail. Nearly 2.3 million customers in southeastern Michigan were left without power for the next two days. Since these events occurred after the September 11th tragedy, many people went into a panic mode believing the outage to be another attack. Stores were inundated with people trying to buy up supplies. Gas stations that still had power were faced with mile-long lines of people waiting to gas up. One of the major economic impacts resulted from thousands of businesses being immediately shut down and many people being sent home. Millions of people were stranded in some downtown areas because failed traffic signals left roads in gridlock.

Economic Vulnerability

The economic impact of an infrastructure failure is extremely high. Even small incidents can cause thousands of customers to be without service. Many types of infrastructure such as water, sewer, and cable lines are all buried underground. The costs associated with repairing a damaged or problem area has ranged from the hundreds of thousands to millions of dollars range in some cases.

Probability for Future Hazards

Since Macomb County is one of the most populated in the State, it means the county's infrastructure system is equally large and complex. The more complex the system, the more opportunity there is for failure. This is an extremely probable hazard to affect the county. Historically, Macomb County has experienced many infrastructure failures. Proper mitigation actions would help to reduce the effects of this hazard. Probability of future occurrence suggests that a major event will occur.

2.3.14 Lightning

Definition

The discharge of electricity from within a thunderstorm.

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

Location

In the United States, approximately 100,000 thunderstorms occur each year, and every one of those storms generates lightning. It is not uncommon for a single thunderstorm to produce hundreds or even thousands of lightning strikes. As seen in the previous hazard "Hail", Macomb County is subject to 30-40 thunderstorm days per year. This translates to thousands of lightning events in the county alone each year, not necessarily registering as a strike. Statistics compiled by the National Oceanic and Atmospheric Administration (NOAA) and the National Lightning Safety Institute (NLSI) for the period 1959-1994 revealed the following about lightning strike locations.

Location of Lightning Strikes

- 40% are at unspecified locations
- 27% occur in open fields and recreation areas (not golf courses)
- 14% occur to someone under a tree (not on golf course)
- 8% are water-related (boating, fishing, swimming, etc.)
- 5% are golf-related (on golf course or under tree on golf course)
- 3% are related to heavy equipment and machinery
- 2.4% are telephone-related
- 0.7% are radio, transmitter and antenna-related

Months of Most Strikes

July (30%); August (22%); June (21%)

Time of Most Strikes

2:00 PM – 6:00 PM

Hazard Extent

Lightning is a random and unpredictable product of a thunderstorm's tremendous energy. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit (hotter than the surface of the sun) and speeds approaching one-third the speed of light. Lightning damages many structures and kills and injures more people in the United States per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat lightning presents to their safety.

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

Lightning-Related Deaths in Michigan: 2017-2018

Number of Deaths	Location	Percent of Total
0	Open fields, ball fields	
0	Under trees (not golf)	
0	Boats / water-related	
0	Golf course	
0	Near tractors / heavy equipment	
0	At telephone	
0	Other location / unknown	
0	Total Lightning Deaths	100%

Source: Storm Data, National Climatic Data Center

Lightning-Related Injuries in Michigan: 2017-2018

Number of Injuries	Location	Percent of Total
0	Open fields, ball fields	
0	Under trees (not golf)	
0	Golf course	
0	Boats / water-related	
0	At telephone	
0	Near tractors / heavy equipment	
0	Other location / unknown	
0	Total Lightning Related Injuries	100%

Source: Storm Data, National Climatic Data Center

Historical Occurrences

According to the National Climatic Data Center, there were no lightning incidents reported in Macomb County during the March of 2017 to March of 2018 time frame. A further report stated that in the previous 10 years starting in 2008, there were 4 lightning strikes in Macomb County that caused \$46,000 in property damage with no injuries.

On May 30, 2006, the City of Warren in Macomb’s southwest corner experienced a small lightning storm resulting in a reported \$250K in damages.

On July 28, 2005 near Romeo, a lightning strike started a fire that destroyed an auto mall (\$1 million damage).

On July 16, 2005 in Macomb Township, one house was completely destroyed by fire as the result of a lightning strike. Five additional house fires started in the areas of 22 and 23 Mile Roads, due to other lightning strikes from the same storm event. Total damages amounted to about \$1 million.

On July 21, 1998, the south half of neighboring Macomb County was hit hard by severe thunderstorms. Spotters in the south part of Sterling Heights reported dime sized hail and 76 mph winds. In Warren, spotters reported gusts up to 75 mph. The stretch of county between 10 and 12 Mile Roads, from Warren east to St Clair Shores, took the brunt of the storms. Damage was extensive in Warren, Roseville, and St Clair Shores, with hundreds of downed trees and power lines. Further north, an office building in Mt Clemens was declared a total loss after it was de-roofed by severe winds. In nearby Harrison Township, power lines were downed. The storms also produced over 4300 cloud-to-ground lightning strikes. Overall, all counties suffering from this storm incurred \$275K in damages. Wayne County and parts of Macomb County received both state and federal disaster declarations.

Economic Vulnerability

Lightning strikes have the potential to cause damage in many ways. Many fires are started in fields, forests, and homes after storms due to lightning strikes. The NCDC database reports that in the last 10 years, Macomb County has suffered a total of \$46,000 in property damages. Lightning strikes have also been known to cause power outages which also result in large economic impacts.

Probability of Future Hazards

Lightning occurs in virtually every thunderstorm on earth. Most occurrences remain in the clouds. Many times though, lightning will discharge and either strike the ground or even occur in the reverse direction (ground to cloud) if the charge difference is great enough. Since Macomb County is subject to a relatively high number of thunderstorms each year, the probability of lightning strikes to occur during these storms is very high. According to the location breakdown above, lightning strikes can also be very unpredictable in that they can occur virtually anywhere. This is a very probable hazard affecting the county.

2.3.15 Nuclear Attack

Definition

Any large-scale hostile action taken against the United States which involves nuclear weapons and results in destruction of military and/or civilian targets.

Note: The United States is vulnerable to a number of national security threats from external, hostile forces. National security threats include nuclear attack, chemical and biological warfare, and terrorism. The potential for damage resulting from a national security emergency ranges from the relatively localized damage caused by a terrorist attack using weapons of mass destruction, to the catastrophic devastation that could be expected following a full-scale nuclear attack. This section focuses on the nuclear attack threat. Information on terrorism and other hostile acts of sabotage or destruction using nuclear and non-nuclear weapons are addressed in the Sabotage/Terrorism section.

Location

The Federal Emergency Management Agency (FEMA) attack planning guidance provided in the document Nuclear Attack Planning Base 1990 (NAPB-90) remains the basis for the population protection strategy adopted for Michigan. The NAPB report identifies potential aiming points or target areas throughout the United States. These targets were categorized into seven classifications:

1. Commercial Power Plants
2. Chemical Facilities
3. Counterforce Military Installations
4. Other Military Bases
5. Military Support Industries
6. Refineries
7. Political Targets

The potential size, or yield, and the height of burst were postulated for each target. In the height of the "Cold War" Michigan had 25 target areas with three of them being located in Macomb County. According to the Nuclear Attack Planning Base 1990, several other target sites exist in the Metro-Detroit area. Due to the destructive nature of a nuclear warhead, an attack from one, let alone several, would have unfathomable effects on the county and many others surrounding it. Please refer to Appendix N for a map of potential target sites in Michigan.

Hazard Extent

Nuclear weapons are intended to create mass destruction. The main difference between a nuclear missile or bomb and a conventional missile or bomb is that the range of the nuclear weapon is typically far greater than the conventional. Ranges may vary depending on the size of the weapon. In any case, hundreds of thousands of lives could be lost from a single weapon, along with buildings, vehicles, and even the landscape. Since most nuclear weapons are created with a radioactive substance, an area struck by a weapon would be inaccessible due to radiation for months or even years.

Historical Occurrences

Macomb County, along with the rest of the country, has never experienced a nuclear attack. However, misunderstandings and small incidents during and after the Cold War era could have led to near disasters.

On January 13, 2018, an emergency alert was sent out to smartphones in Hawaii saying that a “BALLISTIC MISSILE THREAT INBOUND TO HAWAII. SEEK IMMEDIATE SHELTER. THIS IS NOT A DRILL.” Hawaii residents tuned in to television or radio heard an even more threatening message, “The U.S. Pacific Command has detected a missile threat to Hawaii. A missile may impact on land or sea within minutes. THIS IS NOT A DRILL.” However, the alert had been sent in error during what the Hawaii Emergency Management Agency called a “regular system drill,” and revoked 38 minutes after it was issued. At no time, officials said, was there any indication that a nuclear attack had been launched on the United States.

Perhaps the best example of why the threat of nuclear attack cannot be ignored was an incident that occurred on January 25, 1995. The Russians mistakenly believed that the launching of a U.S. scientific rocket from Norway might be the start of a nuclear attack. Not certain whether they were under attack or not, Russian President Yeltsin and other Russian leaders immediately activated their “nuclear suitcases” for the first time in history. (A nuclear suitcase is a portable communications and weapons activation device that allows political leaders to launch a nuclear counter attack from any safe location.) Fortunately, the misunderstanding was cleared up a short time later and a response attack was averted. However, the incident demonstrated how easily an accidental attack could occur and just how vulnerable the United States and the rest of the world still is to nuclear attack – even in the post-Cold War era.

In 1980, a computer malfunction sent a false missile alarm to the North American Aerospace Defense Command (NORAD) – the U.S./Canadian bi-national missile tracking and command center. The error was detected only minutes before the President was to be advised that Soviet missiles had been launched against the United States, which could have triggered a massive counter-attack. Fortunately, the error was discovered in time to avert a response that could have escalated into all-out war. It was later determined that someone had mistakenly put military exercise tapes into the computer system, which then generated the false alarm. This had been the second such incident at the NORAD in less than a year. Fortunately, since that time, special safeguards have been instituted that separate military exercise data from real world data.

Economic Vulnerability

Since there has never been a nuclear attack within the country let alone the county, historic economic data for this hazard is not available. It is conceivable, however, to assume the impacts would be severe and damage alone would be near billions of dollars.

Probability of Future Hazards

Recent events throughout the world have escalated the threat of nuclear attack to high levels. Many countries now possess nuclear, chemical, and biological warfare technology. Macomb County has three sites identified (Nuclear Attack Planning Base 1990, FEMA) within its borders as being potential nuclear targets. With the county lying outside of the downtown Detroit area and also largely contributing to the automotive world, a nuclear attack would greatly devastate the county and even the U.S. economy. This huge burden on the economy would make the metro-Detroit area a very probable target. Therefore, the threat from this hazard poses a great risk to not only the county, but to the United States.

2.3.16 Nuclear Power Plant Accidents

Definition

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

Location

Michigan has three active nuclear power reactor units. These include D.C. Cook 1 & 2 near Benton Harbor in Berrien County, the Palisades unit near South Haven in Van Buren County, and Fermi 2 near Monroe. The Fermi 2 unit is the closest to Macomb County and is the only facility that poses as a threat. Michigan also has four nuclear testing and research facilities. These include the MI Tech Graphite Moderator Reactor in Houghton County, the Dow Reactor in Midland County, the MSU Cyclotron & Reactor in Ingham County, and the U of M Cyclotron & Reactor in Washtenaw County. In 2021, Michigan State University will open a \$765 million nuclear research facility to study rare isotope beams. Michigan also has two decommissioned plants: Big Rock Point in Charlevoix County and Enrico Fermi 1 in Monroe County. Please refer to Appendix O for a map of plant locations.

Hazard Extent

Though the construction and operation of nuclear power plants are closely monitored and regulated by the Nuclear Regulatory Commission (NRC), accidents at these plants are considered a possibility and appropriate on-site and off-site emergency planning is conducted. An accident could result in the release of potentially dangerous levels of radioactive materials into the environment that could affect the health and safety of the public living near the nuclear power plant. A nuclear power plant accident might involve both a release of air borne radioactive materials and radioactive contaminate of the environment around the plant. The degree and area of environmental contamination could vary greatly depending on the type and amount of radioactivity and weather conditions.

Historical Occurrences

Fortunately, Macomb County does not have a nuclear power plant within its borders. A commercial nuclear power plant operating nearby (the Enrico Fermi plant near Monroe), has had one "minor" incident in its existence in 1966 when a small accident required the shutdown of the Fermi 1 facility for four years. No radioactive release of any kind was registered in this incident. However, the potential for disaster still exists and the following historical incidents reinforce why preparedness is essential.

On March 11, 2011, the Fukushima Daiichi nuclear disaster occurred after a magnitude 9.0 earthquake followed by a devastating tsunami. On detecting the earthquake, the active reactors automatically shut down their fission reactions. Because of the reactor trips and other grid problems, the electricity supply failed, and the reactors' emergency diesel generators automatically started. Critically, they were powering the pumps that circulated coolant through the reactors' cores to remove decay heat. The earthquake generated a 14-meter-high tsunami (46 feet) that swept over the plant's seawall and flooded the plant's lower grounds around the Units 1–4 reactor buildings with sea water, filling the basements and knocking out the emergency generators.] The resultant loss-of-coolant accidents led to three nuclear meltdowns, three hydrogen explosions, and the release of radioactive contamination in Units 1, 2 and 3 between March 12 and 15. The spent fuel pool of previously shutdown Reactor 4 increased in temperature on March 15 due to decay heat from newly-added spent fuel rods; but did not boil

down sufficiently to expose the fuel. In the days after the accident, radiation released to the atmosphere forced the government to declare an ever larger evacuation zone around the plant, culminating in an evacuation zone with a 20-kilometer (12.4 miles) radius. Some 154,000 residents evacuated from the communities surrounding the plant due to the rising off-site levels of ambient ionizing radiation caused by airborne radioactive contamination from the damaged reactors. The disaster was the most severe nuclear accident since the April 26, 1986 Chernobyl disaster and the only other disaster to be given the Level 7 event classification of the International Nuclear Event Scale.

On April 26, 1986 a Soviet nuclear reactor at Chernobyl, Ukraine exploded while conducting experimental testing. This explosion, and the ensuing fire in the graphite core of the reactor, released radioactive debris into the upper atmosphere where wind currents dispersed it around the world. Other radioactive material was deposited in areas around the plant site, contaminating the land and food. Exposure to high levels of radiation on-site immediately killed 32 plant workers and firefighters. The World Health Organization and other public health agencies are still studying the effects of the accident on public health in the Ukraine and adjacent areas.

The long-term impacts of this accident are continuing today. The 30-square-kilometer (11.6 square miles) area around the plant is heavily contaminated with radioactive material to the extent that many of the 4.9 million people that previously resided there have not been permitted to return to their homes. Soil contamination does not allow the consumption of crops grown in these areas. Because residents consumed contaminated crops and milk, studies have indicated significant increases in childhood thyroid cancer in the region around the plant. One of the major lessons learned from this accident is the need for early impoundment of suspected food and milk that may have been contaminated. The EPA has revised its guidelines for environmental monitoring in affected areas as a result of the Chernobyl experience.

While an event of this nature is not physically possible at a U.S. reactor due to differences in reactor design and safety systems (for example, the Chernobyl reactor did not have a containment building), the event did impact U.S. emergency planning regulations. Lessons learned from this accident have been incorporated into federal guidance (e.g. EPA 400 Ingestion Pathway Protective Action Guidance). Additional emphasis has been placed on the ingestion pathway during nuclear power plant emergency exercises.

On March 28, 1979 the most serious nuclear reactor accident ever to occur at a commercial power plant in the United States occurred at the Three Mile Island nuclear power plant near Harrisburg, Pennsylvania. This incident resulted from a plant malfunction combined with operator override of automatic safety systems. These errors resulted in a partial meltdown of the reactor core. Utility, state and local personnel implemented response plans to protect the public in the area around the plant, while on site efforts were undertaken to cool the reactor and eliminate any possible release of radioactive material. While this accident resulted in no off-site health consequences, it had a major impact on emergency planning regulations in the United States.

Following the accident, new federal regulations were written to mandate specific activities by both on-site and off-site emergency response organizations. These more stringent federal regulations aimed at improving emergency planning efforts at nuclear power plants and providing for additional plant safety systems. Among the new regulations was NUREG 0654, which forms the basis for state and local government planning, training and emergency exercises. The EPA also issued new guidance on environmental monitoring and protective actions.

Economic Vulnerability

There have been no reactor or power plant accidents in or around Macomb County. Therefore, there is no historic data available regarding this hazard. It can be assumed that the immediate areas around a nuclear plant would suffer damages in the millions of dollars. There would be considerable damage also resulting from public health issues stemming from radiation and after effects.

Probability of Future Hazards

The closest nuclear power plant to Macomb County is the Enrico Fermi 2 plant in Monroe County, which is located approximately 35 miles from the County's southwest border. This plant has never had an incident in its existence. Strict regulations at nuclear facilities have drastically reduced the potential for incidents. However, should a catastrophic event occur, Macomb County would be effected by it. The historical records and strict regulations lend this hazard to be of a very low probability. It should also be noted that the other plants located on the west side of the state could also pose some risk. Should an incident occur at one of these plants, the winds coming from the west could carry toxic and radioactive fumes, smoke, and debris for miles. This contamination could reach the county or somehow affect surrounding areas or natural resource supplies such as rivers and streams and contaminate and pollute the region.

2.3.17 Oil and Gas Well Accidents

Definition

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

Location

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Many oil and natural gas wells exist throughout Macomb County. In addition, there are also many storage and disposal sites for the resources as well. Underground gas storage fields in Macomb County are located in Lenox, Richmond, Ray, and Washington Townships. The detailed map in Appendix P shows locations of wells, pipelines, and other important natural resource information.

Hazard Extent

The petroleum and natural gas industry is highly regulated and has a fine safety record, but the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Macomb County's oil and gas wells contain extremely poisonous hydrogen sulfide (H₂S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions.

Within humans, small concentrations can cause coughing, nausea, severe headaches, irritation of mucous membranes, vertigo, and loss of consciousness. Hydrogen sulfide forms explosive mixtures with air at temperatures of 500 degrees Fahrenheit or above, and is dangerously reactive with powerful oxidizing materials. Hydrogen sulfide can also cause the failure of high-strength steels and other metals. In addition, accidents at these wells can cause serious environmental damages, especially to an ecosystem.

Physiological Response to H₂S	
10 ppm	Beginning eye irritation
50-100 ppm	Slight conjunctivitis and respiratory tract irritation after 1 hour exposure
100 ppm	Coughing, eye irritation, loss of sense of smell after 2-15 minutes. Altered respiration, pain in the eyes and drowsiness after 15-30 minutes followed by throat irritation after 1 hour. Several hours of exposure results in gradual increase in severity of these symptoms and death may occur within the next 48 hours.
200-300 ppm	Marked conjunctivitis and respiratory tract irritation after 1 hour of exposure.
500-700 ppm	Loss of consciousness and possibly death in 30 minutes to 1 hour.
700-1000 ppm	Rapid unconsciousness, cessation of respiration and death.
1000-2000 ppm	Unconsciousness at once, with early cessation of respiration and death in a few minutes. Death may occur even if the individual is removed to fresh air at once.

Source: American National Standards Institute, Standard: 237.2-1972

Historical Occurrences

To date, Macomb County has been fortunate not to have an oil or natural gas well accident that resulted in loss of life or significant property damage. However, several recent, significant oil and natural gas well accidents have occurred that required an emergency response by the drilling company and state and local officials have occurred in Michigan and the United States.

The largest oil spill in United States waters occurred on April 20, 2010 when Deepwater Horizon, an ultra-deepwater, dynamically positioned, semi-submersible offshore drilling rig owned by Transocean, was drilling at the Macondo Prospect. A blowout caused an explosion on the rig that killed 11 crewmen and ignited a fireball visible from 40 miles away. The fire was inextinguishable and, two days later on April 22, the Horizon sank, leaving the well gushing at the seabed. The resultant oil spill continued until July 15 when it was closed by a cap. Relief wells were used to permanently seal the well, which was declared "effectively dead" on September 19, 2010.

On February 3, 1994 an explosion and fire occurred when a pipe released under pressure at an American Oil Company (AMOCO) production facility in Ogemaw County. One service company employee was killed and another employee was injured. The situation was immediately brought under control with no additional injuries, damage, or threat to public safety.

On June 15, 1993 a natural gas explosion occurred at a Michigan Consolidated Gas Company (MICHCON) underground storage facility in Columbus Township, St. Clair County. One worker was injured in the explosion, two vehicles were burned, and several homes in the immediate vicinity of the facility were evacuated.

On January 9, 1989 a natural gas well blew out in Au Gres Township, Arenac County. Although there was no fire, methane, butane, and hydrogen sulfide leaked from the wellhead. The surrounding area was evacuated while attempts were made to seal the leak with mud and concrete and replace the wellhead. On January 11, a new valve was successfully installed and the community resumed its normal activities.

Economic Vulnerability

There has never been a significant incident regarding this hazard in Macomb County. Therefore, no further economic investigation is recommended at this point.

Probability of Future Hazards

Macomb County has several oil and gas wells located within its borders. Production in the county of these natural resources has decreased in recent years. This fact coupled with the fact that no major incidents have occurred in the county's history, supports the claim that the probability for a major incident would be low.

2.3.18 Petroleum and Natural Gas Pipelines

Definition

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

This hazard is very closely related to Oil and Natural Gas Well Accidents. The pipeline hazard deals mainly with the transport of these natural resources and the potential problems that have and can arise.

Location

Macomb County is both a major consumer and producer of natural gas and petroleum products. Vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the county, making many areas vulnerable to petroleum and natural gas emergencies. Macomb County's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries, from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems. The maps in Appendix Q show the major pipelines traversing through the state and Macomb County.

Hazard Extent

Several major petroleum and natural gas pipelines traverse Macomb County. Petroleum and natural gas pipelines can leak or fracture and cause property damage, environmental contamination, injuries, and even loss of life. The vast majority of pipeline accidents that occur are caused by third party damage to the pipeline, often due to construction or some other activity that involves trenching or digging operations. In addition to these hazards, there is the danger of hydrogen sulfide (H₂S) release. This is the same potential problem that exists in the Oil and Gas Well hazards mentioned earlier. Please refer back to the Oil and Gas Accidents section for a more detailed report on the dangers of hydrogen sulfide.

Historical Occurrences

Petroleum and natural gas pipeline accidents occur with some regularity, but they usually have a limited impact and are quickly and adequately handled by pipeline company emergency crews and local and state responders. While it is true that Macomb County has been free of catastrophic pipeline accidents, the possibility is always there for a significant accident to occur. The following are some accounts of petroleum and natural gas pipelines in and around Macomb County.

The most current event occurred on January 30, 2019. A still-unknown "abnormality" set off an alarm within Plant 3 of the Consumer's Energy Ray Compressor Station, a Macomb County facility that has the capacity to distribute 64 percent of the company's natural gas and was expected to distribute between 45 and 50 percent that day. The alarm triggered a "firegate" that released natural gas outside. But instead of dissipating as it should have, the gas "hung" until the wind blew it over other equipment where the plume ignited all the way back to the stack. The plant operators followed protocol and initiated a firegate release at Plant 2, which also ignited. Plant 1 was firegated last, but the gas released from that site did not ignite. However, by the time the fire was extinguished around 3 p.m. that day, many of the valves and pipes in Plant 1 had frozen because of the water contained in dehydration equipment used to pull liquid from the stored natural gas. The frozen equipment delayed operations at the plant further. Consumer's Energy was able to restore operations late into the night which allowed for gas delivery operations to be maintained.

An apparent natural gas explosion destroyed a portion of a plastics factory in Warren on March 18, 2001. Fortunately, the building was empty at the time of the explosion, which collapsed the roof and blew out parts of the wall at the loading dock, causing significant damage.

On the morning of June 7, 2000 a Wolverine Pipeline Company gasoline pipeline ruptured in Jackson County's Blackman Township, releasing 75,000 gallons of gasoline into the environment and forcing the evacuation of more than 500 homes in a one square mile area around the spill. The leak was detected when a drop in pressure was recorded at a metering station along the 80-mile pipeline that runs through Blackman Township from Joliet, Illinois to Detroit. The spill caused significant environmental and public safety problems and shut down 30% of the state's gasoline supplies for nine days. (The pipeline carries approximately seven million gallons of gasoline per day.) Most of the evacuees were allowed to return to their homes within five days of the accident. Wolverine Pipeline Company has expended in excess of \$10 million, to date, in response to this pipeline accident.

On May 20, 1992 a natural gas explosion occurred in a two-story commercial building in Rochester, in Oakland County, killing one person and injuring 17 others. Estimated property damage was nearly \$1 million. The explosion occurred when the gas service line to the building was damaged during excavation in the sidewalk. The service line separated under the sidewalk and gas migrated into the building, where it was ignited by an unknown source, causing the explosion.

Economic Vulnerability

Although the county has not experience a major event regarding this hazard, the historical occurrences in other areas of Michigan have demonstrated that the potential costs can reach into the millions of dollars.

Probability of Future Hazards

Several pipelines travel throughout Macomb County. There has never been a history of large, catastrophic accidents in the county, but incidents have occurred. These types of accidents, if not controlled properly, can create a very unstable environment and pose as a very dangerous threat. With continued industrial and residential development placing more and more demand on these pipelines and ground being re-disturbed near them due to the additional development, this hazard will continue to pose as a significant and very probable event.

2.3.19 Public Health Emergencies

Definition

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

Public health emergencies can take many forms: disease epidemics, large scale incidents of food or water contamination, extended periods without adequate water and sewer services, harmful exposure to chemical, radiological or biological agents, and large scale infestations of disease carrying insects or rodents, to name just a few.

Location

There is no specific location where a public health emergency could be limited. A public health emergency can occur in any region of the county at any time. Certainly some emergencies may be more localized due to their nature. For instance, mosquito borne illnesses could occur anywhere, but there may be a much higher likelihood in an area near water where the mosquito population would be much larger.

Hazard Extent

Public health emergencies can occur as primary events by themselves, or they may be secondary events to another disaster or emergency 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. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

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

Historical Occurrences

Macomb County is fortunate in that it has an excellent public health system and a professional management team that constantly monitors the threats that could lead to a widespread or significant public health emergency. However, even the best monitoring and surveillance programs cannot always prevent such incidents from occurring.

A constant occurrence in the county has been the threat of a Pandemic Flu Event. From October 2009 to the current 2018 season, Michigan has averaged 5,200 reported confirmed cases of a flu strain annually.

Starting in 2017 to the present, Macomb County and the State of Michigan as well as the Nation, is experiencing an Opiate Crisis. In 2017, the U. S. Department of Health and Human Services declared a National Public Health Emergency due to the Opiate Crisis. In Michigan, 2,356 deaths were attributed to Opiate overdoses in 2016, more than auto accident deaths for that year. Macomb County recorded 318 deaths for that same time period.

Starting in 2016 to August of 2018, the County has been monitoring a Hepatitis A Virus event that has spread across the State of Michigan with a reported 820 cases statewide to date. Macomb County has the State's largest number of cases with 235 reported as of August, 2018.

In 2014-15, Macomb County experienced an Ebola scare, which was also experienced by several other U.S. States related to Ebola victims being brought to the United States for treatment. Although the risk of an Ebola outbreak in Michigan was very low, state and county partners worked to prepare and prevent this from happening. A single “possible” case was reported for Macomb County, but that never proved to be a positive event.

In 1977, the worst outbreak of botulism in U.S. history was linked to home canned jalapeno peppers served by an Oakland County restaurant. (Botulism is caused by a bacterium that grows from spores in an atmosphere without oxygen. Improperly canned foods are a primary source of the botulism bacterium. Botulism attacks the neuromuscular system and is one of the most dreaded of food poisoning agents, with a high mortality rate.) The restaurant used 200 jars of home canned peppers because a crop failure the preceding winter had created a shortage of commercially prepared peppers. Fifty-nine (59) restaurant patrons reportedly fell ill from the botulism poisoning, though no one died. Many of those affected required intensive care level treatment and horse serum botulism antitoxin. (Note: The supply of horse serum botulism antitoxin is limited, and it must be transported to a hospital in need of it from regional depots. Because the amount of toxin required to paralyze a person is so low, the potential for a very large botulism outbreak always exists.)

One of Michigan’s most serious statewide public health emergencies occurred in 1973 when a chemical company inadvertently sent bags of a fire retardant containing polybrominate biphenyl (PBB), a highly toxic chemical, along with a shipment of livestock feed supplement to Michigan Farm Bureau Services. After being mixed with the livestock feed, the contaminated mixture was distributed statewide for use by farmers in feeding livestock herds. The result was an environmental and public health disaster of unprecedented magnitude in Michigan. Thousands of cattle and other animals died from the poisoning and serious questions were raised regarding the long-term effects of this contamination on all Michigan residents. The exposed populations continue to be followed, although studies to date have not shown any serious health consequences from that exposure.

Economic Vulnerability

A large-scale public health event could have a large economic impact resulting mainly from health care issues. Lost work or production from numerous employees being ill, medical expenses, loss of customers and business would be the primary reasons for economic loss. Since there has never been a case of large scale public health in the county in recent years, the actual dollar amounts resulting from this hazard are not available.

Probability of Future Hazards

Although the county has never experienced a total countywide outbreak of any kind, the potential for serious illness is still very much an issue. Illnesses can stem from chemical ingestion from hazardous materials, disease, and bacteria. Highly populated areas such as Macomb County are especially susceptible due to the many ways in which illness can be spread. Introduction of exotic animals, improper food storage, shipping incidents are only some of the means that would result in a public health emergency.

2.3.20 Riverine Flooding

Definition

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

Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events.

Location

Flood prone areas are found throughout the county, as every lake, river, stream and county drain has a floodplain. The type of development that exists within the floodplain will determine whether or not flooding will cause damage. All of the sixty three watersheds in the state experience flooding and the Clinton River watershed is among the top twelve that have experienced the most extensive problems. The 100-year flood prone areas in Macomb County are shown on the map in Appendix K.

Hazard Extent

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

The flooding is not restricted to the main branches of these rivers. Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. The water, with no place to go, will find the lowest elevations, areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Macomb County, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. In Macomb County, the communities of Harrison Township, St. Clair Shores, Fraser, Clinton Twp., Chesterfield Township, Macomb Township, Roseville, Eastpointe, and Mt. Clemens have often experienced this type of problem.

Macomb County is ranked number four of all Michigan counties in flood insurance policies. Harrison Township (3) and Chesterfield Township (7) are in the top ten of Michigan communities in flood insurance policies.

Historical Occurrences

The most recent flooding event occurred in July and August of 2016 following record rainfalls in Mount Clemens and Sterling Heights causing the Clinton River to crest and caused minor flooding events in both those communities.

In August of 2014 following a historic rainfall on 8/11/2014, Macomb, Oakland and Wayne Counties were affected by a severe flood event. Macomb County communities, primarily south of M-59 experienced the brunt of this storm and ensuing flooding. Local emergency declarations were made and a request to the Governor of the State of Michigan for a State declaration was also made and granted. A Presidential Disaster was also requested and granted for this flood event. An estimated \$300 million in public and private losses for Macomb County was recorded.

Another major event for the County began in late May of 2004. Rainfall began on May 20th and continued through May 24th. Macomb County was one of the most severely affected by the rain and numerous areas were flooded. At one point the Clinton River North Branch swelled to a record 20.3 feet before subsiding again. The County incurred \$9 million in road and bridge damage alone and another \$6 million in property damages. The Governor declared a "State of Disaster" for twenty four counties including Macomb. Nearly 500 homes and over 20 businesses were damaged by floodwaters.

Flooding is a frequently occurring hazard. Some recent past instances of flooding in Macomb County are listed below:

- Flood events were registered in Romeo on September 14, 2008 and in Warren on September 13, 2008. Both events were from sudden downbursts and caused very minor damage or inconveniences to those communities.
- A Flash Flood occurred in Chesterfield on March 27, 2007, again causing minor damages to a small area of the Township.
- A Flash Flood occurred countywide on July 16, 2005 due to a quick moving storm. The damages did not exceed \$100K countywide.
- In February 1998, an early winter thaw coupled with an unusually high rainfall caused numerous communities to experience flooded homes and waterways.
- In 1997, unusually high water levels in Lake St. Clair resulted in the initiative "*Flood Fight 1997.*"
- August 1995, major flooding due to heavy rains totally submerged cars on local freeways.
- January 1993, early thaw due to unusually warm weather coupled with heavy rains created major flooding problems.
- February 1986, a Governor's Declaration was issued due to flooding of the Great Lakes and Lake St. Clair.

Economic Vulnerability

The economic loss from flood events in Macomb County is quite extensive. Property damage is the primary source of loss for this particular hazard, but corollary effects, such as lost business are also felt. Some sections of this plan discuss more specific areas of potential and historical property damage at risk from flooding. According to the NCDRC web site, Macomb County has suffered over \$100 million in property damage from floods in the last ten years.

Probability of Future Hazards

Flooding in Macomb County has occurred on a regular basis. Current NFIP mapping indicates many areas in Macomb County have at least a 1% annual chance of flooding. As development continues, watersheds are being altered and run-off water is reaching streams and rivers much faster than in the past. This surge of run-off is leading to overflowing of banks during major rain events and causing considerable damage to homes, property, and businesses. Since the development trend is constantly increasing, and river and floodplain areas will always exist, efforts must be made to reach a stable balance between population and controlling drainage.

2.3.21 Severe Wind

Definition

Non-tornadic winds of 58 miles per hour or greater.

Location

Typically severe winds are spawned by thunderstorms or the right blend of humid and cool air masses moving across the state. Since the mixture of these air masses occurs on such a large scale, windstorms cannot be solely associated with one county or community. Usually, several counties are affected by a windstorm. Some of the more violent wind events have occurred in the summer months where humid air is more common. However, the state has experienced late fall and sometimes winter high wind events. Therefore, all of Macomb County is susceptible to a severe windstorm at any time of the year.

Hazard Extent

During the period 2005 through 2013, the National Oceanic and Atmospheric Administration's National Climatic Data Service reports a total of 13 severe wind incidents in Macomb County. Of these events, 7 were part of thunderstorm activity that took place, typically but not always, during the summer months. Winds reported ranged from 43 to 65 knots in speed. While only eight of the twenty seven communities in Macomb County were singled out in the 13 incidents, these incidents usually involved the entire Macomb County area. In addition, Mt Clemens, Romeo, St Clair Shores, Sterling Heights, and Utica are all communities that have each experienced nine or more severe wind incidents over the past ten years.

Strong winds have the potential to cause severe damage to building structures, automobiles, topple or uproot trees, send objects into projectile flight, destroy crops, and injure people. Windstorms often cause downed power lines and widespread power outages, disable traffic signals creating major traffic problems, and result in falling tree limbs, awnings, and other large objects that can result in injuries and deaths.

Historical Occurrences

Macomb County has certainly experienced numerous storms involving dangerous winds. The most recent events occurred on October 15, 2017 and just prior to that event on July 7, 2017. Both events caused power outages and minor property damage.

On January 19, 2013 a storm with high winds caused 1.5 million dollars in property damages in Macomb County and more than 120,000 DTE customers in SE Michigan lost power for a period exceeding one week. According to NOAA, Macomb County has experienced 20 High-Wind events associated with thunderstorm activity since 2014.

On July 4th, 2012, a severe wind event resulted in more than 1/3 of the county's residents being without power for more than seven days. In June 2009, a strong low pressure system moved across Lower Michigan producing gusts ranging from 59 to 65 knots. An estimated 75,000 customers in Southeast Michigan lost power and the region experienced an estimated total of less than \$10 million property damage.

On June 8, 2008, severe thunderstorms once again produced heavy winds gusting between 55 and 61 knots which resulted in an estimated \$300,000 in local damages.

A December 23, 2007 winter storm with high winds up to 50 knots caused \$35,000 in local damages. A lesser storm occurred earlier that year on April 16th that caused more than \$30,000 in damages.

Three high wind events in 2005 occurred causing more than \$11.4 million in damages impacted the Macomb County area as well as adjoining counties in S.E. Michigan.

On July 21, 1998, severe thunderstorms passed through the metro-Detroit area, producing strong winds that killed three persons, damaged or destroyed nearly 200 homes, and downed trees and power lines. Wind speeds were estimated at 70-80 miles per hour, roughly equivalent to a weak hurricane. The storms affected thirty four jurisdictions in Wayne County, and five jurisdictions in Macomb County. Over 430,000 electrical customers were left without power. Total storm-related public damage was in excess of \$6.8M. A Presidential Major Disaster Declaration was granted for the two counties, providing both public and hazard mitigation assistance to affected local jurisdictions.

During the afternoon and evening hours of May 9, 2000, an outbreak of severe thunderstorms (with winds gusting to 70 miles per hour) struck southeast Michigan, causing considerable damage across the region. In Monroe County, dozens of trees were downed and a 150-year old historic railroad depot was destroyed. Some communities were without power for up to a week. All totaled the storms left more than 200,000 electrical customers without power, injured at least six persons, and caused several million dollars in property damage.

Amazingly, with all the widespread damage throughout the region, Macomb County only had minor incidents or damages to report. The extent of the damages suffered by Macomb County was limited to downed power lines and fallen tree branches. Although the county escaped this particular storm without suffering major damage, the evidence of the other counties is clear that this hazard can be extremely dangerous and costly.

Economic Vulnerability

The 12 incidents reported in National Climatic and Data Center's database between 2005 and 2010 resulted in a total of \$12.1 million in property damages across Macomb County. Minor property damage was documented for all of these 12 events. Consequently, economic vulnerability is difficult to predict from event to event. Nevertheless, the potential always exists for property damage, injuries, and loss of life as a result of severe winds. All of Macomb County is subject to this hazard and its economic vulnerability to major incidents is high.

Probability of Future Hazards

Severe winds are a naturally occurring hazard with a long documented history in Macomb County and its communities. Macomb County is situated in an area that is subject to drastically changing weather patterns, and severe winds occur as a result of these patterns. While there are methods for mitigating against severe winds to limit the damage they can cause, severe winds cannot be prevented or eliminated. The probability of future hazards is extremely high, estimated average of occurrence is three to five times a year.

2.3.22 Shoreline Flooding and Erosion

Definition

The flooding and erosion of shoreline areas caused by high Great Lakes water levels, storm surges, or winds.

Shoreline flooding and erosion, as natural processes, occur at normal and even low lake water levels. However, during periods of high water, flooding and erosion are more frequent. In addition to natural causes of water level fluctuation, there are three man-made factors that can also affect water levels to some degree:

- 1) Diversion of water for power generation, municipal water supply, and navigation.
- 2) Regulation of water levels via dams and other control structures.
- 3) Dredging of connecting waterways for navigation purposes.

Although these man-made factors do impact water levels, natural factors such as precipitation, evaporation and winds have a far greater overall impact. The vast majority of shoreline flooding and erosion that occurs along the Great Lakes and Lake St. Clair is caused by natural factors.

Note: Macomb County is not bordered by any of the 5 Great Lakes. Lake St. Clair, however, is fed by Lake Huron and in turn, drains to Lake Erie. Therefore, impacts to Great Lakes water levels have a direct impact and correlation to Lake St. Clair.

Location

Michigan has over 3,200 miles of coastline (the longest freshwater coastline in the world) that is home to more than 4.4 million people. Generally, low-lying lands along the coastline, such as the city of St. Clair Shores, New Baltimore, Harrison and Chesterfield Townships, are prone to shoreline flooding during both high and low lake water periods. The Michigan Department of Natural Resources and Environment estimates that approximately 10% of Michigan's Great Lakes shoreline (30 counties encompassing greater than 45,000 acres) is flood-prone.

Hazard Extent

Shoreline flooding can cause serious damage to homes and businesses, roads, water, and wastewater treatment facilities, and other structures in coastal communities. Part 323 of the Natural Resources and Environmental Protection Act is designed to provide protection to Michigan's Great Lakes shoreline. While these fragile and dynamic shorelines are desirable vacation and recreational areas, they also present inherent hazards to development and are vulnerable to the development that it often brings. Part 323 gives the MDNR&E responsibility to identify hazardous and fragile coastal areas and establish regulations designed to minimize the impact of development on these areas, and to minimize the hazard facing development. Part 323 identifies three shoreline areas:

- 1) High-risk erosion areas, those shorelines identified as receding at an average long-term rate of one foot per year
- 2) Flood risk areas, those coastal areas that are vulnerable to Great Lakes flooding
- 3) Environmental areas, those coastal areas necessary for the preservation and maintenance of fish and wildlife

Historical Occurrences

In nearly every decade, high water levels on the Great Lakes have caused significant damage and impact to Macomb County's coastal communities. The most recent high water period began in 2017 and is currently affecting Macomb County, resulted by the Great Lakes being at record levels. Since the 2005 recording, Macomb County has not experienced any recorded moderate or major shore line flooding event until the events of 2019 which are currently being experienced at the time of this Plan review.

Prior to the 2005 event, the record-high lake levels in 1985-86 culminated in a Governor's disaster declaration for 17 shoreline counties. The U.S. Army Corps of Engineers (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.

The Advance Measures Program allowed for the USACE to provide "self-help" materials (i.e. – sandbags, sand, and plastic sheeting), at 100% federal cost, to participating units of government for use in direct pre-flood mitigation activities. USACE could also provide assistance with permanent construction projects designed to mitigate potential flood damages. The agreement stipulated a 75% federal and 25% local cost basis, the jurisdiction must furnish all land, easements and rights-of-way, agree to operate and maintain the project for 25 years, and provide interior drainage.

The State administered programs (established only for the '85-'86 high water period and have since been closed out), included the Shoreline Community Protection Program, the Emergency Home Moving Program, and the Emergency Flood Protection Program. The Shoreline Community Protection Program provided grants for 85% of damage prevention project costs. Four hundred and seventy-one (471) grants were awarded, totaling approximately \$4.2 million. The remaining two were interest rate buy-down programs. The programs provided a lump sum payment equaling 3% of the interest rate of the secured loan amount for the projects to move houses away from the eroding bluff line or elevate homes in flood prone areas. From 1986 to 1988, a total of \$2 million was made available to interested homeowners. A total of 72 structures were relocated under the program, and 43 were elevated.

Economic Vulnerability

The rivers running through the county all drain to Lake St. Clair. Often times flooding experienced from the rivers also leads to the shoreline areas being flooded. These damages are often grouped with that of river flooding.

Probability of Future Hazards

Due to the Great Lake level cycle, it is expected that for every 10 to 20 years, flood issues become a concern to the local jurisdictions. Shoreline flooding also poses a relatively high risk along with river flooding. Numerous communities in Macomb County exist on the western coast of Lake St. Clair. When lake levels are high or when a major rain event occurs, the regions along the lake are very susceptible to flooding. This hazard is likely to occur relatively often and has the potential to impact a large number of people due to the attractiveness of lakefront property. The current 2019 lake levels are at the record high level average at this reporting time (July 2019) but is expected to abate as the year progresses into the winter months, as was reported by the USACE (June 2019).

2.3.23 Snowstorms

Definition

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

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

Location

As a result of being near the Great Lakes, Macomb County experiences large differences in snowfall in relatively short distances. The annual mean accumulation for Macomb County is 40.2 inches of snow. The highest accumulations are in the northern and western parts of the Macomb County due to the higher elevation in Washington and Bruce Townships. All regions of the county, however, are subject to heavy snowfall.

Hazard Extent

Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous. When roads become treacherous or impassable due to accumulating snow, the impacts tend to fall greatest on the economy. People cannot make it to the workplace, businesses suffer fewer customers because many people remain home, and airline flights may become grounded. When schools close and children have to remain home, many parents must also remain home, regardless of if they can make it to work or not, to watch their children. When power lines or other utilities fail, workers often have to work around the clock to repair them.

Historical Occurrences

Macomb County has suffered regularly from severe winter storms and blizzards. The following are just some of the accounts of severe snowstorms in and around Macomb County. The 2013-2014 Snow Season for Macomb County was ranked as the snowiest season on record with a recorded 94 inches. The 2017-2018 season registered as the 6th snowiest season for Macomb County with a snowfall amount of 61 inches.

A storm system passed across the northern Ohio Valley on April 7, 2003. This produced an area of snowfall across the Metro Detroit region. The heaviest snow fell across Oakland and Macomb counties, where snowfall of 5 to 7 inches was measured. The rest of the Detroit area received four inches or less. Some of the highest snowfall totals include 6.5 inches in Royal Oak (Oakland County), 6.5 inches in Troy (Oakland County), and 6.2 inches in Richmond (Macomb County). Although the NCDRC did not document property damage for this storm, the snowfall led to dozens of traffic accident across the metro area and exacerbated the cleanup efforts from an earlier ice storm in Oakland and Macomb counties.

A low-pressure system developed in the Ohio River Valley during the early morning hours on February 26, 2002. This low-pressure system moved across central Ohio and into eastern Ontario on the 26th. Snow fell on the backside of this storm system, affecting most of southeastern Michigan. Snowfall began late in the evening on the 25th and continued through the morning of the 26th. Portions of southeast Michigan received around 6 inches of snowfall from this storm system. Six to seven inches of snow were reported across central Livingston, northern Oakland, northern Macomb, southern Lapeer, and northwestern Washtenaw counties.

In the early morning hours of December 11, 2000 a severe winter storm moved through the state, inflicting its heaviest wrath on the southern two-thirds of the Lower Peninsula before moving out of the state on the morning of December 12. That storm produced record or near-record 24-hour snowfall levels in 31 counties, paralyzing the entire region. High winds and frigid temperatures created blizzard conditions that lasted in some areas until late in the day on December 13th. The storm produced great hardships for many Michigan communities. Schools across much of southern Lower Michigan were closed for several days, idling hundreds of thousands of school children. The storm also forced the cancellation of hundreds of airline flights in and out of Detroit Metro Airport and at other airports across the region, and forced many businesses to close at the height of the Christmas shopping season (the most profitable shopping period of the year).

Economic Vulnerability

A review of the NCDC data for snow storms shows that the true costs of heavy snow storms are not well documented. While sometimes, the NCDC is able to document related property damages, impacts to the local economy due to closed businesses, lost sales, interruption of utilities, etc. are not effectively captured. While historically, the property damages for snow storms tend to be lower than for ice and sleet storms, impacts to the local economy can be very similar.

Probability of Future Hazards

Snowstorms are a naturally occurring climatic event that will continue to occur in Macomb County. While normally, property damage due to snow storms is minimal, extended snow accumulation over a period of weeks can lead to failure of roofs and other property damage. Other elements of a snowstorm such as high winds and very cold temperatures often time make for very treacherous travelling and even lead to health issues. Macomb County is extremely susceptible to this hazard during the winter season with an average of one main storm per season and efforts to mitigate against it should be considered.

2.3.24 Structural Fires

Definition

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

In terms of average annual loss of life and property, structural fires, often referred to as the "universal hazard" because they occur in virtually every community, are by far the biggest hazard facing most communities in Macomb County. According to the National Fire Protection Association, structural fires cause more loss of life and property damage than all other types of natural disasters combined. Direct property losses due to fire exceed \$9 billion per year and much of that figure is the result of structural fire.

Location

There is no definitive region where structural fires are limited. One aspect of this "universal hazard" is that they can occur anywhere at any time. Therefore, all communities in the entire county are susceptible to structural fires.

Hazard Extent

Although structural fires occur every day in Macomb County, what is significant about these particular fires is the disastrous impact they have on the communities. In many cases, the very lifeblood of the community's business and retail districts was destroyed or severely damaged, affecting not only the structures themselves, but also the community economy as well. Adding insult to injury is the fact that some of these businesses never re-opened, leaving a permanent scar on the community.

Historical Occurrences

Macomb County's fire experience generally mirrors the national and Michigan's fire situation. According to statistics compiled by the Office of the Michigan Fire Marshal Division, 13,523 structural fires occurred in Michigan – 1,583 occurring in Macomb County in 2017, resulting in 104 deaths and more than 400 injuries in the State. Dollar losses for structural fires alone were estimated at more than \$415 million in the State of Michigan with more than 30 million in Macomb County. The State Fire Marshal's Office estimated that a structural fire occurred in Michigan every 38 minutes, 5 seconds in 2017.

Economic Vulnerability

Since Macomb County is one of the larger jurisdictions in the southeastern Michigan region, it has the potential to suffer large economic losses. It can be estimated that of the \$415 million lost in 2017 in Michigan, Macomb County's losses were more than \$30 million dollars. This potential still exists today, and with continued development of industrial, residential, and commercial areas, larger property values may be vulnerable to loss.

Probability for Future Hazards

Structural fires occur for a number of reasons. Since there are so many factors that contribute to this hazard, it can never be fully mitigated against. However, major efforts are already in place to reduce structural fires. Building codes, building inspections, fire prevention, and fire marshals are among some of the preventative measures already implemented. The probability for this hazard to occur in Macomb County is very high and it can occur at any time. This hazard can have a severe impact of property loss as well as loss of life. Therefore, any additional mitigation efforts that can be made towards this hazard should be implemented.

These efforts would include but not be limited to the strict enforcement of current building codes as well as fire education.

2.3.25 Subsidence

Definition

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

Natural subsidence occurs when the ground collapses into underground cavities produced by the solution of limestone or other soluble materials by groundwater. Human-induced subsidence is caused principally by groundwater withdrawal, drainage of organic soils, and underground mining.

Location

In Michigan, the primary cause of subsidence is underground mining. Although mine subsidence is not as significant a hazard in Michigan as in other parts of the country, many areas in Michigan are potentially vulnerable to mine subsidence hazards. The principal types of underground mining that occurs, or has occurred in Michigan include coal mining, metallic mineral mining, salt mining, gypsum mining, and solution mining. Macomb County has some very small regions where subsidence could occur due to mining (See Appendix R).

Michigan has one of the world's largest underground salt accumulations. The thickest salt beds lie under most of the Lower Peninsula. A large deposit lies under the City of New Baltimore and Chesterfield Township. These formations are, in some places, over 3,000 feet thick and composed of layers of salt and other minerals.

Hazard Extent

Generally, subsidence poses a greater risk to property than to life. Mine subsidence occurs when the ground surface collapses into underground mined areas. In addition, the collapse of improperly stabilized mine openings is also a form of subsidence. Mine subsidence can cause damage to buildings, disrupt underground utilities, and be a potential threat to human life. In extreme cases, mine subsidence can literally swallow whole buildings or sections of ground into sinkholes, endangering anyone that may be present at that site. Subsidence can also occur as a result of the existence of underground utilities. Unknown water main leaks or sewer leaks can lead to water and other liquids eroding soil away from under a roadway and cause a collapse.

Historical Occurrences

There are areas in the county where mineral deposits exist and therefore, the potential for subsidence to occur does exist although these events have yet to occur. Subsidence incidents near Macomb County and throughout the state have occurred in the past. The following major events have been documented within Macomb County and the State of Michigan:

The most recent event occurred in the City of Fraser on December 24th, 2016 where a large sewer main that served more than 300,000 residential and business users in Macomb County partially collapsed causing a sink hole that damaged three homes. The collapse was of such magnitude that continued sewer service to the 300,000 users was in peril. Fortunately, county officials were able to install a temporary bypass around the collapse area until it could be properly repaired some 11 months later. There were concerns over snow melt, rain and other uncontrollable events which would cause basements to fill with sewage, and the need to possibly divert millions of gallons of raw sewage into the Clinton River which would impact Lake St. Clair and eventually the other Great Lakes downstream. However, because of those

emergency measures installed, this never occurred. Since that incident, three additional smaller sinkhole events have been recorded in Macomb County, all due to infrastructure failures.

On August 23rd of 2004, a major sinkhole incident occurred in Sterling Heights on 15 Mile Road between Hayes and Moravian. A 160-foot long by 60-foot wide sinkhole opened up on 15 Mile Road right over an 11-foot diameter sanitary sewer interceptor. The 11-foot interceptor was believed to have been infiltrated by the fines and silt in the surrounding soil. The progression of the soil entering the pipe resulted in a reduced sub-grade, which caused the road above to collapse. The repair of this event took ten months and millions of dollars to complete. **[These two events are also cited as an Infrastructure Failure on Pages 53-54 of this document.]**

On February 9, 2000, a 15-foot sinkhole opened up on Senaca near Mack on Detroit's eastside. The sinkhole swallowed a half-ton pickup truck. Fortunately, the truck's two occupants escaped serious injury. Officials believe a leaking underground pipe may have caused the subsidence.

On June 29, 1999, northbound traffic on U.S.-23 at Milan was diverted for approximately 10 hours after the pavement sank eight (8) inches over a 30-foot stretch of highway. The subsidence and traffic diversion caused traffic to backup for several miles throughout the day. Although a definitive cause of the subsidence was not established, officials believe a leaking storm sewer may have contributed to the problem.

On July 27, 1999, an abandoned mineshaft in Iron Mountain, Dickinson County, caved in, exposing a 50-foot diameter by 1,600-foot deep shaft. The cave-in occurred directly adjacent to the Cornish Pumping Engine and Mining Museum, a popular tourist attraction in the downtown area. The structure was in danger of collapsing into the opening until temporary stabilization measures were taken. Officials were also concerned that further subsidence could have damaged nearby infrastructure, including a roadway. Because the cave-in posed a significant threat to public safety, a Governor's Emergency Declaration was granted to provide state assistance in securing the site and permanently capping the opening.

Economic Vulnerability

Subsidence is a hazard that puts many underground utilities and even building foundations at risk. Very high costs could be incurred to stabilize a building over where a sinkhole occurred. Man hours, materials, lawsuits, repair, and loss of local and nearby business all contributed to the overall cost of this particular hazard.

Probability of Future Hazards

Although Macomb County has regions within its borders where mining used to occur, the chances of a large population or structure being affected are small. Based on the county's historical record as well as the relatively small portion, which was subject to mining, a subsidence hazard is of low concern and probability.

2.3.26 Terrorism using WMD

Definition

An intentional, unlawful use of force, violence or subversion against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives.

Location

The Metropolitan Detroit area, with its automotive facilities, is known as the Motor Capital of the World. Along with that distinction, comes industrial and manufacturing power as seen during the historical period of World War II, when it was known as the "Arsenal for Democracy". That makes this area a prime target for a terrorist attack. There are many other factors that make Macomb County ideal for a terrorist attack:

- Two key military installations, Selfridge Air National Guard Base and the U.S. Army Tank Command (TACOM).
- Easy international access from Canada via bridges, tunnels, ferries, and ships and boats. Foot traffic access is also possible in the winter when Lake St. Clair freezes over. Large foreign freighters use the Great Lakes waterways. This area has experienced difficulties from ships releasing foreign substances into the environment (i.e. zebra mussels, lamprey eels).
- Industrial and commercial complexes which conduct business on a global level.
- Engineering and Design Centers such as the General Motors Technology Center, General Dynamics Land Division, and the U.S. Army Tank Command.
- Significant ethnic population base and work force.
- Large infrastructure base for gas, oil, electric, water supply, highways, waterways, railways, hospitals and medical treatment centers proximity to Detroit.
- Utilities such as water, electricity, and gas could be affected by terrorist attacks from outside of Macomb County.
- Key government and public facilities - office buildings of governmental units along with corporations with government contracts, police, fire, and EMS units, water treatment facilities, hospitals and schools.

Hazard Extent

In the past, most incidents of terrorism or sabotage were associated with bombings. Today, the scope and magnitude of sabotage/terrorism methods and threats, which now, in addition to bombings include:

1. Nuclear, chemical, and biological weapons.
2. Information warfare.
3. Ethnic/religious/gender intimidation (hate crimes).
4. State and local militia groups that advocate the overthrow of the U.S. Government.
5. Eco-extremism, designed to destroy or disrupt specific research or resource-related activities.

6. Lone Wolf pre-meditated attacks upon schools, workplaces, transportation systems, or other places of public assembly.
7. Organized criminal enterprises and activities.

All these methods can, in some way, hinder a government or population and lead to extremely threatening conditions for all people involved and even the innocent people who unfortunately get caught up in the path.

Historical Occurrences

The most recent terrorist attack in the U.S. was August 3, 2019, when 22 people were killed in El Paso, Texas, after a mass shooting at a Walmart store in a case that's being treated as domestic terrorism. Police said they found an anti-immigrant document espousing white nationalist and racist views, which they believe was written by the suspect, 21-year-old Patrick Crusius. He may face hate crime charges in addition to capital murder charges.

Another terrorist attack on U.S. soil was on April 15, 2013, when twin bomb blasts exploded near the finish line of the Boston Marathon, killing three and wounding at least 264. One suspect, Tamerlan Tsarnaev, was killed in an encounter with police. His brother, suspect Dzhokhar Tsarnaev, was captured and charged with one count of using and conspiring to use a weapon of mass destruction resulting in death and one count of malicious destruction of property by means of an explosive device resulting in death. He was given the death penalty on June 25, 2015.

On December 25, 2009, Northwest Airlines Flight 253, an international passenger flight from Amsterdam Airport Schiphol in the Netherlands, to Detroit Metropolitan Wayne County Airport, was the target of a failed al-Qaeda bombing attempt on Christmas Day. A passenger, Umar Farouk Abdulmutallab, tried to set off chemical explosives sewn to his underwear, but failed to detonate them properly. There were 290 people on board the aircraft. Passengers tackled and restrained Abdulmutallab while others put out the fire. Had the attempt succeeded, it would have surpassed American Airlines Flight 191 as the deadliest aviation occurrence on U.S. soil and tied Iran Air Flight 655 as the eighth-deadliest of all time.

The most significant incident of terrorism in U.S. history occurred on Tuesday, September 11, 2001. On that morning, terrorists hijacked four commercial airliners originating from Boston Logan Airport, Newark International Airport, and Washington Dulles International Airport. After seizing control of the planes, they crashed the aircraft into the World Trade Center in New York City, the Pentagon in Washington, D.C., and a field near Shanksville, PA, killing an estimated 3,200 persons, injuring 9,000 others, and causing billions of dollars in property damage. This coordinated attack was the worst act of terrorism in the history of the United States. The attack would have been even worse had the fourth aircraft hit its intended target – presumed to be the White House in Washington, D.C. Instead, passengers held hostage on the flight apparently regained control of the aircraft and were able to steer it off course before it crashed in a remote field near the town of Shanksville, PA.

On August 28, 2000, police detonated a bomb found by a child outside a senior citizen complex in Roseville, MI. The child picked up the homemade bomb and carried it home, then brought it back to the apartment complex. Police indicated the bomb had the potential to do serious bodily harm, had it detonated. No one was injured in the incident and no property was destroyed.

On July 25, 2000, a saboteur with knowledge of the Detroit lighting system ripped wiring out of 100 street lights in downtown Detroit, leaving the live wires exposed and forcing city officials to shut off power to more than 600 downtown street lights to ensure public safety. The

exposed wires carried 400 volts each. In one case, a wire was attached to a fence along the Fisher Freeway, electrifying the fence. Damages were estimated at \$26,000. One person was arrested and charged in the case.

These instances, especially the September 11th attacks, are evidence enough that Macomb County is just as susceptible as any other region of this nation to a terrorist incident. There have been countless measures implemented since the 9/11/2001 event and countless more to continue. The one common effective measure in all of them is a diligence to keep the country safe.

Economic Vulnerability

Even though a large-scale act of terrorism has not occurred in the County, the events of September 11, 2001, have demonstrated that billions of dollars in property damage can be caused from a single event. Along with the initial property damages, corollary effects such as lost businesses or clientele can be felt years after an event.

Probability of Future Hazards

The probability of sabotage or terrorism is even higher than the probability of a nuclear attack for many of the same reasons. There are also many additional factors that make a terrorist or saboteur incident that much more likely. One of the biggest differences between this hazard and a nuclear attack is that a terrorist incident often times is completely unpredictable and can occur on a multitude of levels. Macomb County and the metro-Detroit area is a probable target for terrorism or a sabotage incident because of the strong influence the area has on the automotive industry. The world is highly dependent on the automotive industry for transportation as well as a strong factor in the global economy. The probability of a catastrophic incident has dramatically risen especially in the wake of the September 11th attacks on the World Trade Centers. Several critical sites exist in Macomb County with ties to the automotive industry as well as other significant military and political facilities.

2.3.27 Tornadoes

Definition

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

A tornado may have winds up to 300+ miles per hour and an interior air pressure that is 10-20 percent below that of the surrounding atmosphere.

Location

Tornadoes in Macomb County are most frequent in the late spring through summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind that are called tornadoes. Macomb County lies at the northeastern edge of the nation’s primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio.

Hazard Extent

Most of the tornado’s destructive force is exerted by the powerful winds that knock down walls and lift roofs from buildings in the storm's path. The violently rotating winds then carry debris aloft that can be blown through the air as dangerous missiles. The Enhanced Fujita Scale rates the intensity of a tornado based on damaged caused, not by its size.

The Fujita Scale of Tornado Intensity

EF-Scale Number	Intensity Descriptor	Wind Speed (mph)	Type/Intensity of Damage
EF0	Gale tornado	65-85	Light damage. Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
EF1	Moderate tornado	86-110	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	Significant tornado	111-135	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	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	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	Incredible tornado	>201	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 reinforced concrete structures badly damaged; incredible phenomena will occur.

The Enhanced Fujita Scale or EF Scale, which became operational on February 1, 2007, is used to assign a tornado a 'rating' based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DIs) and Degrees of Damage (DoD) which help estimate better the range of wind speeds the tornado likely produced. From that, a rating (from EF0 to EF5) is assigned.

The EF Scale was revised from the [original Fujita Scale](#) to reflect better examinations of tornado damage surveys so as to align wind speeds more closely with associated storm damage. The new scale has to do with how most structures are designed.

Typically, tornadoes last only a few minutes on the ground, but those few minutes can result in tremendous damage and devastation. Historically, tornadoes have resulted in tremendous loss of life, with the mean national annual death toll for the last 10 years being 100 persons. That number is artificially high due to the unbelievable number of deaths in 2011 which was 553. Discounting at year, the nation experiences roughly 40 deaths per year based on the last 10 years records. Property damage from tornadoes is in the hundreds of millions of dollars every year.

Historical Occurrences

According to the National Climatic Data Center, 18 tornadoes have been reported in Macomb County between 1950 and 2014. However, the County has experienced substantial damage as well as deaths and injuries resulting from tornadoes. The most recent occurrence was an EF-0 event that occurred in Ray Township on August 20, 2014. Minor damages were reported to several structures. The State of Michigan averages 15 tornados every year.

Previously, an EF-1 strike impacted Shelby Twp., Utica, Sterling Heights, Macomb Twp. and Clinton Twp. on Aug. 19, 2010. Minimal damage was reported from these communities.

On July 2, 1997, a series of intense thunderstorms went through south-central and southeast Michigan. These storms spawned a total of 16 tornadoes, 13 of which occurred in the southeastern Michigan counties of Genesee, Lapeer, Livingston, Macomb, Oakland, Saginaw and Wayne. The total for Southeast Michigan is the highest number for a single day since records have been kept from 1950. The tornadoes damaged or destroyed over 2,900 homes and nearly 200 businesses, and caused over \$25 million in public damage and nearly \$30 million in private damage. A total of 16 deaths were attributed to this storm front, but only two of those deaths were caused by the tornadoes. Another 120 persons were injured in the storm event.

Another notable tornado occurred in Macomb and St. Clair counties on May 8, 1964. This F4 tornado inflicted \$2.5 million in damages, killed 11 people, and injured another 224 people.

The June 8, 1953, Flint tornado, Michigan's worst storm to date, is ranked 9th on the top 10 list of single killer tornadoes that have occurred in the United States. It was also the last single tornado, as of this writing, to cause over 100 deaths in the U.S. The storm began its destructive path approximately two miles north of Flushing, moved east-northeast and devastated the north part of Flint before ending two miles north of Lapeer. The tornado obliterated homes on both sides of Coldwater Road for about one mile. It was there that the damage swath was over one-half mile wide and most of the deaths occurred. There were multiple deaths in at least twenty families. The final death toll stood at 115 in Flint alone, along with 785 injuries and total damage estimated at \$19 million. Several tornadoes touched down in other locations in Michigan on that day as well, resulting in an additional six deaths and 129 injuries statewide.

Typically, the most common type of tornadoes to pass through the County have been either EF1 or EF0 magnitude. Although these are relatively small tornadoes, larger ones have and still can pass through leaving destruction in their wake. Tornadoes are a very deadly and historically, relatively frequent hazard to affect Macomb County, and they should be planned for as such.

Economic Vulnerability

Even though tornadoes do not occur in Macomb County as frequently as severe wind events, they can be equally or exceedingly dangerous and deadly. In the past 50 years, Macomb County has suffered over \$58 million in property damages. As development continues to increase within the County, the vulnerability to the economic base of the county also increases. This trend shows that in the future, there will not only be more property and buildings at risk, but many more lives as well.

Probability of Future Hazards

Tornadoes are often associated with severe thunderstorms and many times are spawned from them. Macomb County often times experiences violent thunderstorm patterns in the spring and summer months. The charts in Appendix T reflect the trend of tornado activity in the county. Tornadoes are a very likely by-product of these weather patterns. Tornadoes are never entirely predictable. Certainly if they can occur in numerous areas in the Southeast Michigan area, there is a high probability they can occur in Macomb County as well, occurring on the average one every twenty years. Tornadoes may also cross more than one county line, as well. Even if a tornado begins in an outside county, Macomb County may still be adversely affected by it.

2.3.28 Transportation Accidents

Definition

A crash or accident involving an air, land or water-based commercial passenger carrier.

Location

Air - Macomb County has three small airfields and an Air National Guard military installation. The City of Detroit, Marine City, and Oakland County airports are located near Macomb County. There is frequent use of helicopters by law enforcement, military, emergency medical services, and media. Macomb County has experienced several transportation accidents involving military aircraft from Selfridge Air National Guard Base (SANG). SANG hosts the 127th Wing, U.S. Coast Guard Air Station, U. S. Border Patrol-Detroit Sector, and the U.S. Customs & Border Protection Operational Integration Center along with units representing the United States Army, Navy, Marine Corps and Coast Guard.

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

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

Land - Please refer to Appendix U for a map of southeastern Michigan’s traffic flow densities. The following sites are Macomb County’s high-crash street intersections, based on a 5-year study from 2014 to 2018, done by the Southeast Michigan Council of Governments. A map citing the areas of these accident zones can be found in Appendix V:

Macomb County's high-crash street intersections

2014 Data	2018 Data
1. 12 Mile at Dequindre	1. 11 Mile/696 at Van Dyke
2. 19 Mile at Garfield	2. 18 1/2 Mile at Van Dyke
3. 15 Mile at Ryan	3. 16 Mile at Mound
4. E 11 Mile at Van Dyke	4. M-59 at Schoenherr
5. Garfield at Canal	5. 23 Mile at I-94
6. W. 11 Mile at Van Dyke	6. 16 Mile at Van Dyke
7. 15 Mile at Groesbeck	7. M-59 at Romeo Plank
8. 23 Mile at Schoenherr	8. 11 Mile/696 at Hoover
9. Cass at Groesbeck	9. 11 Mile at Gratiot
10. 14 Mile at Ryan	10. 14 Mile at Schoenherr

Macomb County’s number 1 and 2 worst intersections for 2018 were also rated as the State of Michigan’s number 1 and 2 worst intersections.

Rail - Land accidents have often involved commercial railroad lines as well as commercial bus travel:

Railroad Crossing Crashes, Injuries and Fatalities in Macomb: 2009-2019

Year	Total Crashes	Fatalities	Injuries
2009	3	0	1
2010	3	0	1
2011	0	0	0
2012	2	0	0
2013	3	0	2
2014	7	0	3
2015	2	0	0
2016	1	1	0
2017	2	1	0
2018	2	0	2
2019	0	0	0

Water - The only location that water transportation accidents could occur would be on Lake St. Clair. This is the only body of water in and around Macomb County where commercial and recreational water travel is legal. No commercial shipping accidents have ever occurred on Lake St. Clair in its recorded history up to the period ending in November 2018.

Hazard Extent

The one commonality all transportation accidents share, whether air, land or water-based, are that more often than not they result in mass casualties. Air transportation accidents, in particular, can result in tremendous numbers of deaths and injuries and major victim identification and crash scene management problems. Water transportation accidents, on the other hand, may require a significant underwater rescue and recovery effort. The New Baltimore and Harrison Township Fire Departments and the Macomb County Sheriff Marine Division are well-trained for handling water (ice) rescues and shipboard firefighting capabilities. Selfridge ANG Base Fire Department is part of the county's mutual aid pact and provides excellent firefighting equipment and a well-trained crash/rescue team.

A land transportation accident in Macomb County could involve a commercial passenger bus, a local public transit bus, a school bus, or a train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, bus accidents are caused by the bus slipping off the roadway in inclement weather, or colliding with another vehicle. Train accidents usually involve a collision with a vehicle attempting to cross the railroad tracks before the train arrives at the crossing. Unless the train accident results in a major derailment or carries hazardous materials, serious injuries are usually kept to a minimum. Bus

accidents, on the other hand, can be quite serious, especially if the bus has tipped over. Numerous injuries are a very real possibility in those types of situations.

Historical Occurrences

Numerous transportation accidents occur daily throughout Macomb County and other surrounding counties.

Michigan's worst commercial passenger airplane crash, and the fifth worst in U.S. aviation history, occurred on August 16, 1987, at Detroit Metropolitan Airport (Wayne County). In that incident, Northwest Airlines Flight 255 was unable to gain sufficient altitude at takeoff and crashed onto a nearby highway, killing 156 passengers and crew. A small child was the lone survivor. A Governor's Disaster Declaration was granted to the City of Romulus and numerous state resources were mobilized to assist in the recovery.

Economic Vulnerability

Transportation accidents typically involve personal vehicles and property. Some cases involve public transportation such as busses. In most cases, there is not a large economic impact felt as a result of a traffic accident. However, the vulnerability still exists. An incident involving a large commercial airplane would have a very large impact. Also, increased numbers of traffic accidents result in personal insurance rate increases.

Probability of Future Hazards

Since Macomb County is the third most heavily populated region in the state, there are also high traffic volumes associated with it. The higher volumes would very easily lead to more frequent accidents. Seven of the State of Michigan's top 20 high crash intersections lies within Macomb County; three of which are ranked in the top 10 (#1, 2 & 7). The population's future trend is continuing to increase. Continued increases in volumes of people will definitely increase the potential for more transportation accidents. Many other modes of transportation are also used in and around Macomb County and could also lead very easily to transportation accidents. This is a hazard that can range from mild to extremely severe in terms of the number of people affected and it can also occur very frequently. The county is currently working in conjunction with American Automobile Association (AAA) and the Michigan Department of Transportation (MDOT) to develop a traffic study. This study will help identify any changes in problem areas and provide information to help in the development of solutions for this issue.

2.3.29 Wildfires

Definition

An uncontrolled fire in grasslands, brush lands or forested areas.

The immediate danger from wildfires is the destruction of timber, property, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area.

Location

Outdoor burning is the leading cause of wildfires in Macomb County. Most Macomb County wildfires occur close to where people live and recreate, which puts both people and property at risk. There are numerous parks and a large number of wooded areas in the county. Much of the undeveloped northern regions pose a wildfire threat due to the large forested areas.

Hazard Extent

Although Michigan's landscape has been shaped by wildfire, the nature and scope of the wildfire threat has changed. Because Michigan's landscape has changed substantially over the last several decades due to wild land development, the potential danger from wildfires has become more severe. Increased development in and around rural areas in the State of Michigan (a 60% increase in the number of rural homes since the 1980s) has increased the potential for loss of life and property from wildfires. There are simply not enough fire suppression forces available in rural areas to protect every structure from wildfire.

Historically, Macomb County has reduced wildfire vulnerability by restricting open burning of trash and yard debris (which causes nearly one-third of the wildfires in the state), and developing evacuation procedures for wildfires in the county's and local jurisdiction's Emergency Operations Plan (EOP) to minimize potential injury and loss of life.

Enforcement of present banning of open burning or burning by fire department approval has resulted in Macomb County having one of the lowest wildfire loss rates in the state. One area of concern is the marsh located near Metropolitan Park in Harrison Township. Fires in the marsh are difficult to control due to inaccessibility for fire apparatus. No further mitigation action should be taken. Monitoring reports would be recommended and encouraging strict control of open burning with fire department approval.

According to the Michigan Department of Natural Resources and Environment (DNR&E) during 2006 - 2017, Michigan experienced 5,323 total wildfires with 80,574 acres burned. Macomb County had no major events other than occasional fires set along a highway or a farmer's field in that time frame. There are still areas of high and moderate concern in the county when it comes to wild land/urban interface.

Historical Occurrences

Macomb County has experienced only minor damage as the result of wildfires. The county's Emergency Management Director will monitor, through the State Fire Marshal Annual Fire Report, any significant increase in the number of wildfires. No other action is recommended at this time.

One of the more significant wildfire events to note was in Champion in Marquette County. In early May 1999, a wildfire near the village of Champion (known as the Tower Lake fire) burned a total of 5,625 acres of forestland, destroyed at least eight structures. It forced the evacuation of over 400 persons in Champion as well as those in the vicinity of Fish Lake, Perch

Lake, Mud Lake, and Van Riper State Park. In addition, the fire forced the closure of US-41 and M-95 in the Champion area for several days. Timber losses were estimated at \$12.8 million, with property losses totaling another \$700,000. Aerial firefighting assets were brought in from surrounding areas to help prevent the spread of the fire into Champion, thus saving the town from destruction. At the request of the Governor, the Federal/State Forest Fire Suppression Agreement was activated by the Federal Emergency Management Agency (FEMA) to provide financial assistance to the State and eligible local agencies to cover some of the firefighting costs incurred.

Economic Vulnerability

Much of the undeveloped land remaining in Macomb County consists of agricultural and grassland. There are some regions with heavier woodland cover. The NCDRC has reported that one grass fire in Chesterfield Township in 2006 burned half a square mile of land and destroyed a barn resulting in \$20,000 in damage. Potential for timber loss exists as well.

Probability for Future Hazards

In the last 20 years, Macomb County has only experienced a handful of minor wildfires. Most of the southern portion of the county is developed industrial, commercial, and residential areas. The northern regions are mostly farmland areas with very little forested area remaining. Therefore, according to the county's past and the land types existing, the likelihood of a major wildfire occurring in the county is quite small. The probability of a fire still exists, especially during dry, hot weather periods. However, the extent of the damage would be minimal.

3 Flood Mitigation Assistance (FMA) Focus Section: A Detailed Analysis of Macomb County Flood Hazards

This section is a 2019 update of the original FMA Focus Section originally developed in November 2002 and approved by the Michigan State Police Emergency Management Division and FEMA Region V. The projects identified to address the flood mitigation priorities in this section have been identified and incorporated into the project listing in Chapter 4. Unfortunately, due to a lack of funding, both locally and from the State and/or Federal levels, there have been no mitigation efforts conducted since the last review of this Plan. There have been no changes to the topography of the county nor have any remediation efforts to address the flooding hazard threats, both shoreline and riverine, been conducted. The threat has increased over the last 12 months due to the historic rise within the Great Lakes, most notably Lake St. Clair of which Macomb County shares a 32 mile shoreline. This FMA Section has primarily stayed the same as the original 2002 version, with the same reportable threats and areas of concern, and will continue until mitigation funding assistance or local homeowner actions, can affect any real change. A review of Chapter 4, Section 4, "Individual Community Mitigation Projects", starting on Page 194, identifies several new projects to be completed by Macomb County to mitigate several of these flooding issues.

3.1 COUNTY OVERVIEW

Flooding was the primary hazard affecting Macomb County that warranted an advanced analysis. Most of the hazards affecting the county are of a "natural disaster" nature. Flooding may occur as a result of Mother Nature; however, the damage caused by it is due to modified drainage systems and improper building and planning. This analysis investigated a number of flood-prone, recurring problem areas throughout the county. The following sections will explore this hazard in more detail. The sections will identify the problem areas, proposed projects for mitigation, alternative strategies, and potential partners involved in the projects.

There are several types of flooding that occur in Macomb County. Since Macomb County is adjacent to Lake St. Clair, it has experienced damaging flood events from shoreline flooding and storm surges. This type of flooding shall be referred to as **shoreline flooding**. Macomb County has numerous rivers and creeks, and an extensive drainage system, and many flood events have taken place near these water channels when their average capacity is exceeded. This type of flooding will be referred to as **riverine flooding**. Such flooding is usually due to occasional natural patterns of unusually heavy precipitation or snowmelt. In other cases, rivers and drains have had their drainage capacities lowered over time with the build-up of sediment and debris, which can be very expensive to clear away. In addition, increased urban land use has resulted in increases in the amount and speed of surface water that runs off into these drains and channels. While the drainage used to be adequate, they now tend to overflow their banks more frequently. Another source of flooding shall be called **urban flooding**, which concerns events caused by flaws or inadequacies of storm and sanitary sewer systems. In some cases, water merely pools in low-lying areas where no sewers have been installed. In other cases, sewers are present, but due to limited capacity of the system, the surface water depths in that area continue to rise and eventually become hazardous. When the capacity of the sanitary sewers in some areas is exceeded, sewage may flow back up the pipes into people's homes, causing damages and health concerns. Failures at pumping stations may also be a cause of this sort of flooding. Some sewer systems in the county are burdened by illicit or inappropriate connections of downspouts, footer drains, or other sources of runoff water. Some areas still have combined rather than separated storm and sanitary sewer systems, whose capacities are more easily overwhelmed during rain and storm events. In other cases,

drains that are meant to empty into Lake St. Clair will not do so during some periods of high lake levels, storm surges, or wind and wave activity.

3.1.1 Historical Background and Current Conditions

Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes. The amount of water flowing through these channels will therefore tend to increase and overflow into surrounding areas as its quantity increases, flooding lands that are normally dry. Flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. The water, with no place to go, will find the lowest elevations, areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Macomb County, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Many flood fatalities occur due to people attempting to travel through flooded areas, either by car or on foot. A foot of flowing water may sweep a car off a road, and drivers will also be unable to see if the road beneath the floodwaters is still intact. Portions of it may have eroded or broken away, manhole covers may have been displaced, and live power lines may be in the vicinity of the flooding. Debris flowing along with floodwaters can easily damage vehicles and trap or injure persons in their path, increasing risks of drowning. Collateral dangers from flooding include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, the collapse of weakened structures, and the release of hazardous materials.

Flood-prone areas are found throughout the county, as every lake, river, stream and county drain may have a floodplain. The type of development that exists within the floodplain will determine whether flooding will cause damage. This "focus section" of Macomb County's hazard mitigation plan will provide a detailed assessment of its flood-prone areas, based on government data and mapping sources, and input from representatives of all jurisdictions in the county (except in the cases of Grosse Pointe Shores and Memphis, which are covered by the emergency management programs of adjacent counties, even though portions of them are located in Macomb County). The Michigan Department of Natural Resources and Environment has estimated that about 6% of Michigan's land is flood-prone, including more than 200,000 buildings, and that the southern half of the Lower Peninsula, where Macomb County is located, contains the areas with the most flood damage potential. Steps have been and are currently being taken to mitigate flood impacts on people, property, business, travel, and quality of life. This section of the hazard mitigation plan will suggest areas of need, where actions should be performed to further mitigate flood damages.

The primary flooding sources include Lake St. Clair, the different branches of the Clinton River, hundreds of miles of streams, creeks, drains, and inland lakes. Flooding is not restricted to the main branches of the river. The Lake St. Clair shoreline and the Clinton River watershed have some of the most significant damage potential in the state, which this plan will address.

Most riverine flooding occurs in early spring and is the result of excessive rainfall and/or the combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the spring through fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious health and safety concerns. In Macomb County, numerous communities have experienced this type of problem, and more detail on it will appear later in the text.

Macomb County is ranked number four of all Michigan counties in flood insurance coverage. Harrison Township (3), and Chesterfield Township (7) are in the top 10 of Michigan communities for flood insurance policy coverage. Most communities in the county are participants in the **National Flood Insurance Program (NFIP)**. Twenty-four of the 26 communities located wholly or partially in Macomb County participate in the NFIP. Even in the inland and rural northern areas, the Village of Armada, Ray Township, and Lenox Township participate in the National Flood Insurance Program. Communities not listed as NFIP members are the cities of Richmond and Eastpointe, and the Village of Romeo. As a result, flood insurance is not available in those areas although in some cases they are vulnerable to certain types of minor, insignificant flooding events.

Macomb County has a historical record of severe windstorms, thunderstorms, tornadoes, winter snowstorms and heavy rainfalls that have led to flooding.

- On May 2, 2019, Harrison Township made an Emergency Declaration due in part to the rains that fell the week prior causing flooding primarily in Wayne County-resulting in a State of Michigan Disaster Declaration, and also due to the rising lake levels. St. Clair Shores had also enacted a City Ordinance requiring residents to begin sandbagging their properties on the Lake St. Clair shoreline. (See shoreline flooding for additional information, Page 74)
- On August 11, 2014, Macomb County-along with Wayne and Oakland Counties experienced record rainfalls and severe flooding conditions that resulted in a Presidential Disaster declaration FEMA-4195-DR. More than 125,000 homeowners and businesses were impacted. More than \$139 million in Federal Assistance and \$101 million in SBA funds were allocated to this disaster.
- On June 25, 2009, flash flooding was reported throughout southern Macomb County. Reports of street flooding were tallied for area roads with up to 5 feet of standing water on some low lying areas, resulting from several severe thunderstorms during the afternoon and early evening. The majority of the 80,000 DTE Energy customers who lost power resided in Macomb County.
- In September 2008, rain estimated at two inches caused minor flooding as the Clinton River backed up in some spots. The worst effects of this were felt at the Willow Point Mobile Home Park in Harrison Township, but some other areas in the county were affected as well.
- In March 2007, a flash flood was reported in the northeast section of Chesterfield Township, resulting in roughly \$300,000 in total monetary damages. It was estimated that up to 100 homes experienced some amount of water damage.
- In February 2006, flooding was reported after heavy rains coupled with frozen ground and the melting of a one foot snowpack in the 21 Mile area of Macomb Township along the Clinton River. Estimated \$5,000 of damage to private property was reported.

- In July 2005, flash flooding became a countywide problem due to heavy rainfall associated with severe thunderstorms. The most severe of the problems were centered in the area between 21 and 24 Mile Roads in Macomb Township where several roads were impassible for much of the day. An estimated \$100,000 in private property damage was reported.
- On May 23, 2004, flooding caused an estimated \$100 million in property damage across Southeast Michigan following a weekend of severe thunderstorms and heavy rains of a reported two to six inches within a 36 hour period. A State of Disaster was declared for many counties in Southeast Michigan. A reported 100 homes were damaged in Macomb County with 2 being completely destroyed in the City of Utica. The North Branch of the Clinton River in Mount Clemens crested at 20.34 feet, well above the 15 foot flood stage. The Clinton River in Clinton Township crested at 17.93 feet, also above the 16 foot flood stage.
- In 1997, unusually high water levels in Lake St. Clair resulted in the initiative “*Flood Fight 1997.*” In July of the same year, Macomb was included in a Presidential Disaster Declaration for five Michigan counties that had been affected by flooding and wind damage from a series of intense thunderstorms.
- In February 1986, a Governor’s Declaration was issued due to flooding of the Great Lakes and Lake St. Clair.
- In September 1986, a Presidential Emergency Disaster was declared due to major flooding.
- In April 1985, a Governor’s Declaration was declared due to flooding on Lake St. Clair.
- In October 1981, there was major flooding in the county due to heavy rains—SBA loans were made available.
- April 1975, a Presidential Emergency Disaster was declared due to rain, flooding, and tornadoes.

The County now seeks to use the Flood Mitigation Assistance Program to fund mitigation projects to alleviate future damages from this hazard. Current risk conditions are described and prioritized in the following parts of this document.

3.1.2 Warning Systems

Presently, Macomb County relies on the National Weather Service for flood warnings. Historically, Macomb County has suffered shoreline flood damages during periods of high lake levels, which allows communities time to anticipate mounting risks and undertake actions to alert residents. Urban flooding, due to storm sewer backup, has a shorter preparedness time factor. The National Weather Service will issue flood watches and warnings when conditions are right for such events, and this information is then relayed to residents throughout the area, using radio, television, cable, and computer media. There are three flood gauges placed in various locations on the Clinton River system that offers timely information regarding water flow and flood stage surge in that system.

3.1.3 Mitigation Priorities

Most of the communities are proactive in mitigating flood problems, within the limits of their resources. In general, new developments throughout the county require retention and detention facilities to reduce the effects of heavy rainfalls in flood-prone areas, and so the current problems tend to be with older structures that were less carefully engineered against flood threats when they were built. Encouragement must be given to developing areas, such as the county’s northern communities, to carefully avoid building structures in flood plains and use

flood plain areas for recreational use. Public purchases of property, while it is still undeveloped and relatively low-priced, are also critical at this time to mitigate the flood hazard in many areas. Special efforts are needed to help residents of Harrison Township and other areas with funds to elevate homes out of the flood plain. Efforts of local communities toward mitigating flood damage should be recognized, with the realization that much can still be done to reduce the damages and dangers caused by floods to an even lower level. Detailed maps and discussion of identified risk areas will be given in this plan for all areas of significant risk throughout the county.

Although it may be extremely difficult in some cases to state definitively that some areas are of greater or lesser concern than others, a general classification scheme has been followed in which highest priority mitigation actions are assumed to be those involving structures that have repeatedly suffered flood damages according to the NFIP. Second priority would be structures that are known to have suffered from flooding, and are clearly in a floodplain area. The third priority has been assigned to structures that have been determined to be in the 100-year flood plain, but for which no damages have been reported to local authorities. Last in priority but still worthy of consideration are structures that are in areas of less than a 1% chance of flooding each year, such as in a 300 or 500-year flood plain area. Included in this category are those in areas that may be prone to basement flooding from sewer back-ups, but only when there is no basis for predicting which homes in the urban area will experience this problem. Structures deemed to have lesser risks than those outlined in these categories have not been considered in this plan.

In terms of affected infrastructure, major highways that become temporarily impassable from floodwaters, and threatened facilities that are critical to an area's infrastructure will be given highest priority. Second priority would be locally important roads that become temporarily impassable, or suffer substantial damage from flooding, or major highways that have traffic significantly impeded by floodwaters. Third priority in this category would be minor roads that are temporarily impassable or suffer damages from flooding, or locally important roads that have traffic significantly impeded by floodwaters. Last in priority but still worthy of consideration would be local roads that experience flooding but are not impassable, and flood areas that are a local nuisance but do not have clear damages that would make them a higher priority, by FMA standards. Many incidents of localized street and yard flooding would fall into this lowest-priority category, in terms of countywide flood mitigation priorities.

3.1.4 Methods for Assessing and Prioritizing Flood Hazard Areas

Although broad levels of priority were described in the preceding section, it is necessary to subdivide these categories still further to identify which specific areas and projects are most meritorious to implement in the near future, using the Flood Mitigation Assistance Program (FMAP). Since FMAP money comes from the National Flood Insurance Program (NFIP), it was essential to identify as **highest priority** those NFIP-*insured* structures that have suffered repeated property damages to reduce continued financial drains on these public funds. Properties that have suffered known damages were assessed as **second priority**, but these will be further analyzed in a later section to estimate whether they are located in NFIP-identified floodplain areas and what depths of flooding they are experiencing. Hazard-prone areas will be ranked according to these factors, favoring official floodplain locations over unofficially identified flooding areas, and favoring greater flood-depth areas over lesser flood-depth ones. **Third priority** hazard areas, and **last in priority** areas are not given precise priorities in this document. Such projects will be examined either after the mitigation of **first priority** and **second priority** ones in a future plan revision, or after a Letter of Map Amendment (LOMA) is submitted to officially adjust the floodplain designation of the area on the NFIP's Flood Insurance Rate Map (FIRM).

This FMA focus section of the Macomb County Hazard Mitigation Plan started in a detailed comparison between the floodplain areas shown on official Flood Insurance Rate Maps and the USGS topographic quadrangles for the same areas. The initial plan was written by a professional planner after extensive meetings with local and Macomb County officials between March and September 2001. These meetings involved Macomb County Emergency Management, Macomb County Public Works, and various officials from the cities of Fraser, Roseville, St. Clair Shores, Sterling Heights, Utica, Mt. Clemens, Warren, Center Line, New Baltimore, Eastpointe, and Richmond. Local officials also met with to discuss the concerns and conditions in the townships of Clinton, Macomb, Harrison, Chesterfield, Bruce, Shelby, Armada, Ray, Lenox, Richmond, and Washington, thus covering all political units that are located in Macomb County. The discussions of township conditions also tended to cover any associated villages that were situated within township borders. Feedback was also obtained from the Village of New Haven, and all of this information was shaped into a draft version of this current document, focusing on the county's flood hazards. The current draft version of this FMA Focus Section was again reviewed by officials at the local and county level, and revised in November of 2009 in accordance with their suggestions. Finally, it was updated in 2010 by the same planner who had done the initial research. FEMA conducted updates on the County's FIRM mapping in 2017 & 2018. The completed maps were approved and sent to Macomb County in December, 2018. Additional meetings between FEMA and local authorities regarding FIRM and other related flood issues were also conducted in the county in 2017 and 2018.

Meetings were conducted on May 10, 2019 with shoreline communities and the US Army Corps of Engineers to discuss mitigation strategies based on the rising Great Lakes water table.

3.1.5 Overview of Flood Priorities in Macomb County

NFIP Repetitive Loss Properties (highest priority)

Properties identified as "repetitive loss structures" are to be targeted for elevation, relocation, or acquisition with very high priority by the county. Damages and risks to these properties have been sufficient that the cost-effectiveness of these mitigation projects is clear, and federal funding has been made available with which to implement them.

The addresses, loss information, and structural values of identified NFIP repetitive loss properties in Macomb County, with information on observed water depths at that location, are included only as a special appendix following *some* copies of this plan, to be used only for official planning information. It was agreed that this specific information would be kept confidential to preserve the privacy of involved residents and landowners.

Some NFIP-identified Repetitive Loss Properties in Macomb County had already been moved or removed prior to the initial HM Plan of 2000-2005. Since then, due to a complete lack of available funding to address these projects, no progress has been made to address the flood mitigation projects since that 2000-2005 Plan was in force. Communities in Macomb County have identified homes and property to remove flood-prone structures and return the property back to a natural state to be used as parks and green space. Purchase of property located in the floodplain will reduce damages and injuries from flooding, and help slow water flows in area watersheds, thus helping to mitigate broader flood hazards for Macomb County.

Properties with Locally Confirmed Flooding Damages (second priority)

Although not appearing on the NFIP list of repetitive loss structures, many houses and buildings have been identified as having suffered significant damages from flooding. Most of these are located in 100-year flood plain areas, as identified on local Flood Insurance Rate

Maps (FIRM), but others were identified solely through the first-hand knowledge of local emergency management personnel, fire chiefs, public works officials, and others with direct knowledge of community flood impacts. These properties that have been known to suffer damages from flooding will be identified on maps and/or in detailed text descriptions for each community in the county. Where known, the depth of floodwaters will also be reported. Also listed as second priority will be properties identified as being at greater risk from flooding than merely the base flood rate.

Floodplain Properties without Known or Reported Damages (third priority)

Many structures have been identified from Flood Insurance Rate Maps and Michigan Department of Natural Resources and Environment data as being located within a 100-year floodplain, but which apparently have not had damages that local officials are aware of. Some of these structures may be safe from flooding due to their elevations, or the presence of flood walls or berms, but are still noted as at-risk, and are bound to experience at least some inconvenience during major flood events. Other structures may have suffered damages in the past that have been forgotten about as different persons assume ownership, or as local officials are replaced by others who may not have been aware of these events.

Properties Designated as Less Than 1% Annual Flood Risk (last in priority)

The risk of flood damaged structures in these areas should not be entirely discounted, since *low* risk should not suggest *no* risk. Also, aspects of risk may change over time, such as when upstream development speeds runoff rainwater into area drains and rivers such that their past capacities are exceeded. There have been numerous reports of structures in "lesser-risk" areas that have suffered significant damages and inconveniences as a result of shoreline flooding. Many shoreline areas that technically were considered lower-risk have been classed in this report as being at least in 100-year floodplain areas, when the assessments of local officials indicated that this was warranted. This was also the case because some of the definitions of the risk classifications on floodplain maps seemed to warrant a higher classification in this document.

Infrastructure

It is suggested that, for those roads that may be critical to health and safety, alternative routes be determined in advance of flooding conditions.

Priorities for road flooding were based on the physical characteristics of the road (number of lanes, type of surface), designations of highway status (state highway, arterial road, collector, or local road), and estimated average traffic counts, as made available from Southeast Michigan Council of Governments (SEMCOG) data. Highways of top priority typically carry more than 20,000 vehicles per day, arterial roads somewhat less. Roads of mainly local importance (collectors) typically average only a few thousand vehicles per day, and local roads tend to have well under 2,000 vehicles using them per day. When classifying road-flooding hazards for priority, it was also necessary to consider whether water depths were sufficient to cause road closure and stuck vehicles, or merely slowed traffic. The amount of time that flooding affected the road was also considered—whether observed flooding was only a temporary and unusual situation, or was more enduring and repetitious in that area and therefore representative of ongoing risks.

3.1.6 Highest Priority Areas of Vulnerability Summary Maps

The highest priority areas of vulnerability (mainly those classified as first and second-priority in this report) are listed below. On the following page, a summary map showing the locations of these areas by number and then an enlarged map of each area is presented on the following pages. The numbers below are in alphabetical order by community and do not represent the priority for each area. Following the enlarged area maps, in Section 3.2, detailed reports are presented for each community that supports each of these high priority areas.

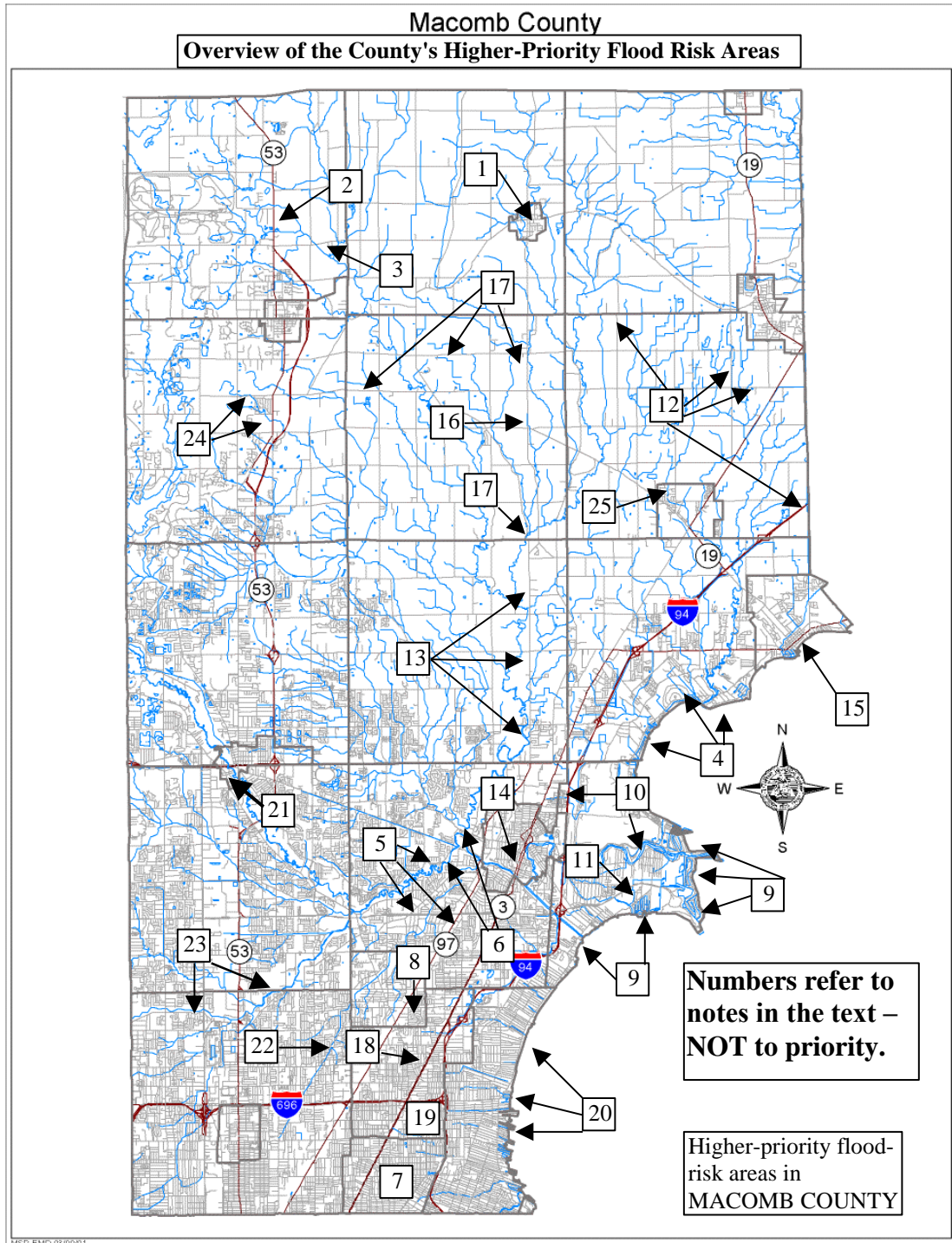
**Table 3.1 - Highest Priority Areas of Vulnerability
(In alphabetical order by community)**

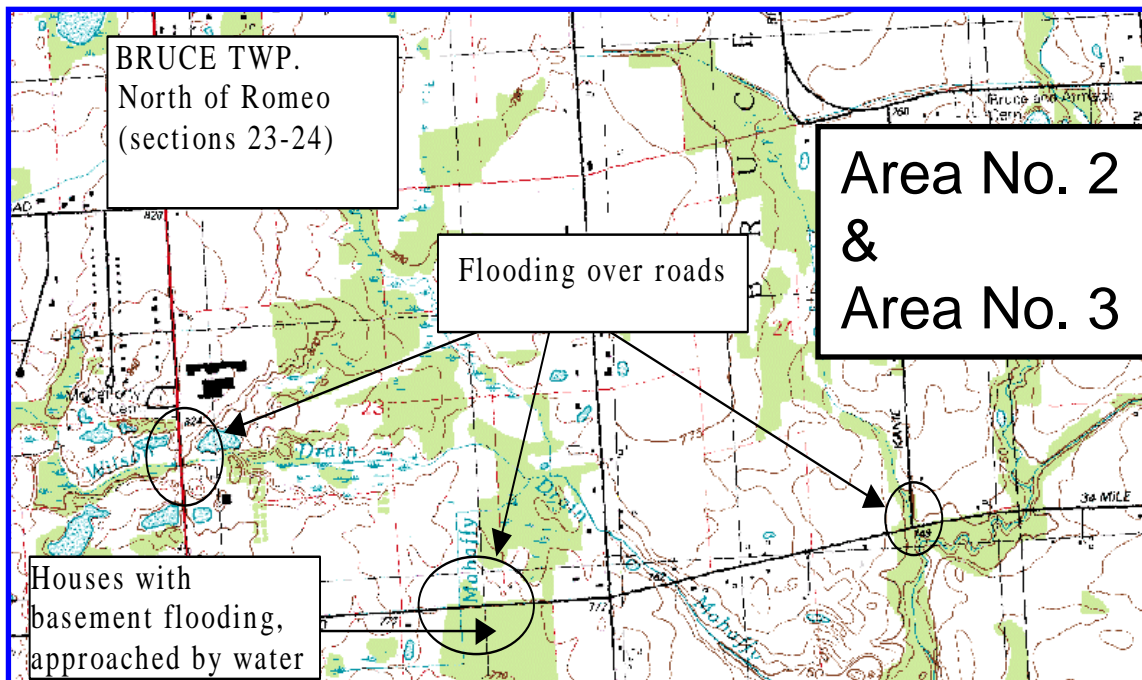
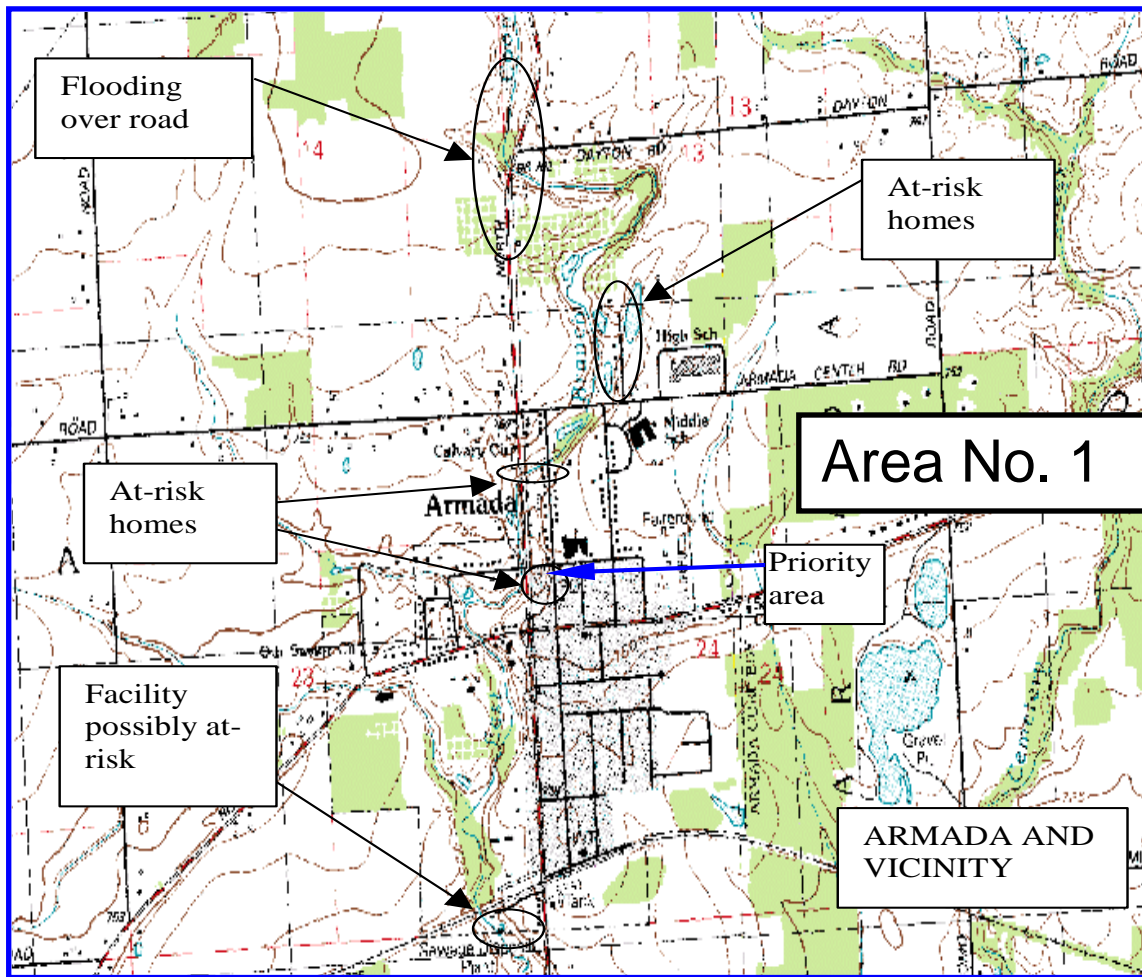
No	Areas of Vulnerability
1.	An at-risk house in the Village of Armada, which has ponding water regularly coming right up to it.
2.	Bruce Township road flooding over M-53.
3.	Bruce Township homes with basement flooding and nearby floodwaters regularly approaching them.
4.	Chesterfield Township areas with high flood risks from riverine and shoreline flooding, including structures with repetitive damages. See the Chesterfield Township section of this document for more details.
5.	Clinton Township areas of road flooding. See the Clinton Township section of this document for more details.
6.	Clinton Township higher-risk floodplain areas. See the Clinton Township section of this document for more details.
7.	Eastpointe area of combined sewer system with higher potential of basement flooding.
8.	Area of regular basement and street flooding in Fraser.
9.	Harrison Township's extensive high-risk shoreline flooding areas. See the Harrison Township section of the document for more details.
10.	Harrison Township areas of flood problems from runoff waters.
11.	Harrison Township area that will benefit from pumping station improvements. See the Harrison Township section of the document for more details.
12.	Areas of severe road flooding in Lenox Township.
13.	Severe and recurrent road flooding along North Avenue in Macomb Township.
14.	Flooding on a major road in Mount Clemens.
15.	New Baltimore high-risk shoreline flooding area.
16.	Ray Township road flooding on North Avenue north of 29 Mile Road, threatening nearby structures.
17.	Other areas of serious road flooding in Ray Township.
18.	Roseville project removed from plan in 2018-project completed.
19.	Roseville combined sewer system area with greater likelihood of basement flooding.
20.	Various higher-risk areas of shoreline flooding in St. Clair Shores. See the St. Clair Shores section of the document for more details.
21.	Area of serious flood problems in the city of Utica.
22.	Area of more frequent and more serious basement floods in Warren.
23.	Mitigation project locations in Warren: berm construction, removal of pumping station, and raising grade of road.
24.	Area of road flooding, major sheet flows of runoff water, and basement flooding in Washington Township.
25.	Houses in the floodplain areas of New Haven.

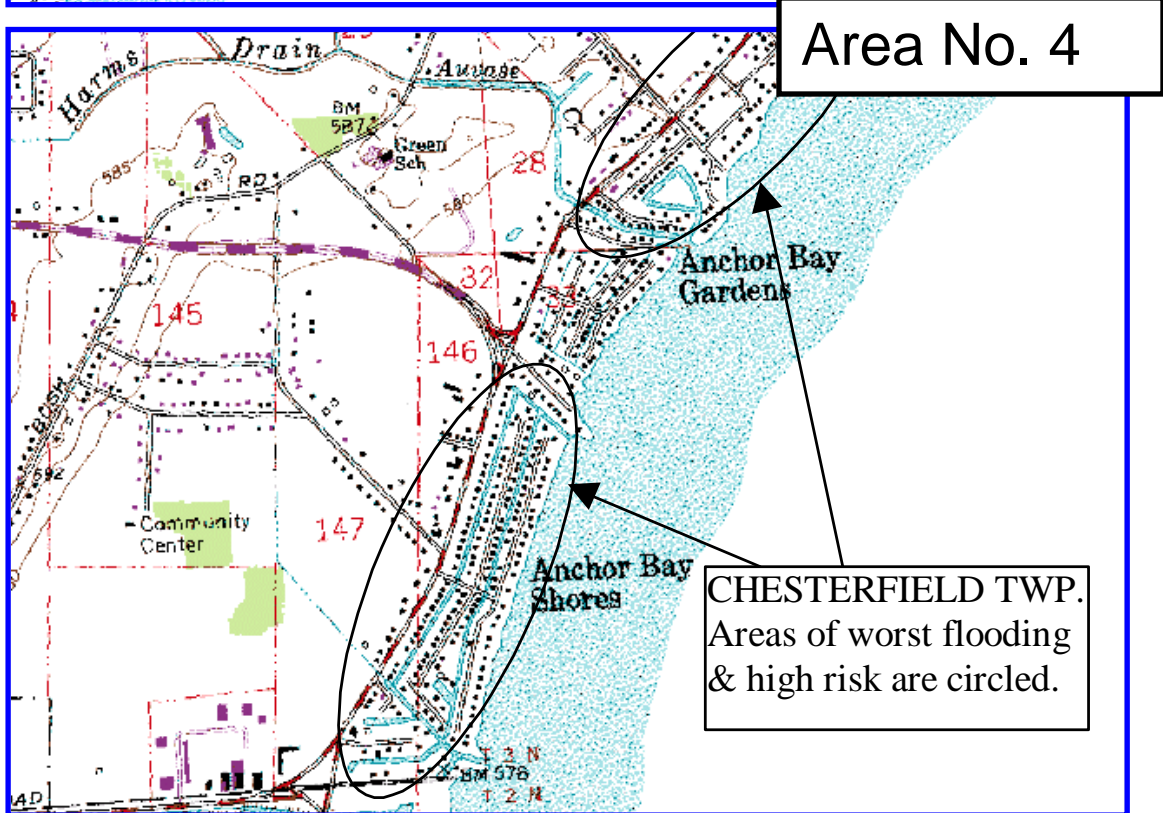
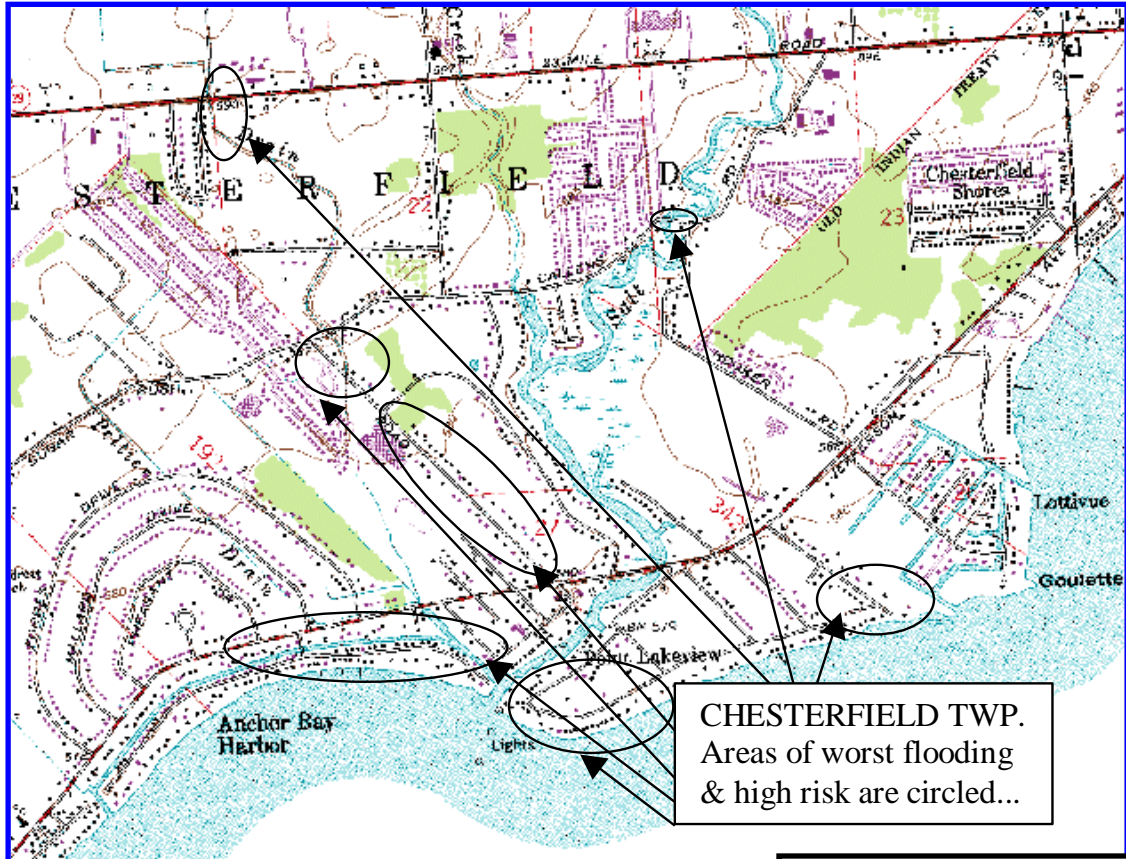
*These locations have not changed for the past two plans as no action to mitigate these areas have been conducted. Lack of funding is the major obstacle in managing these mitigation projects.

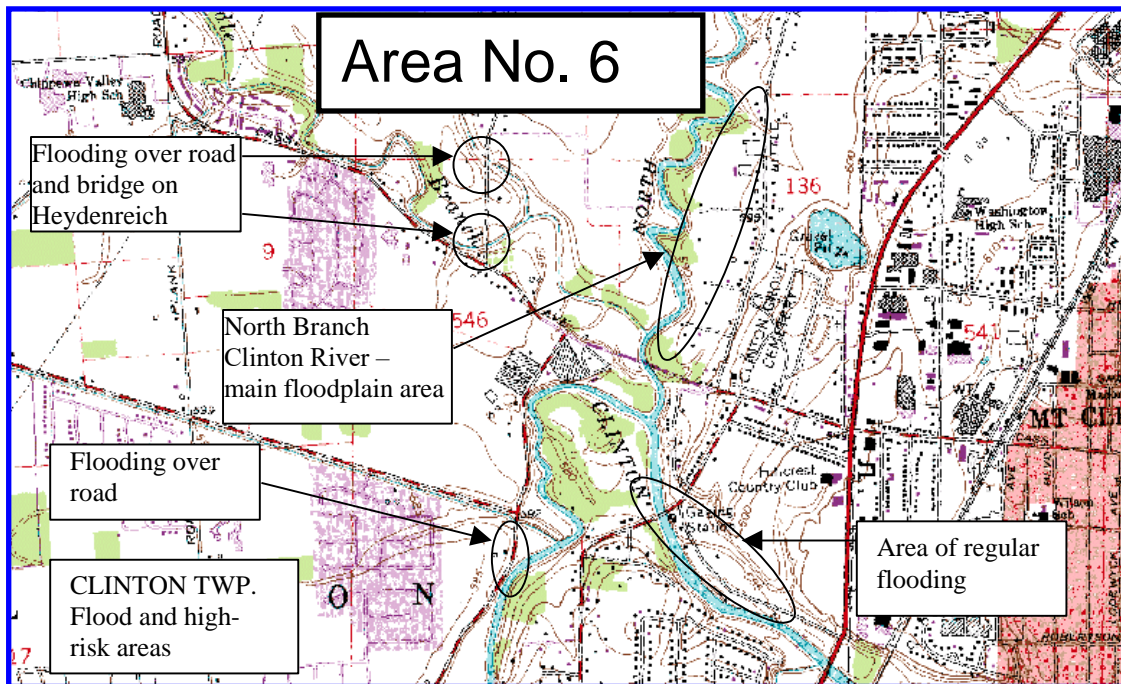
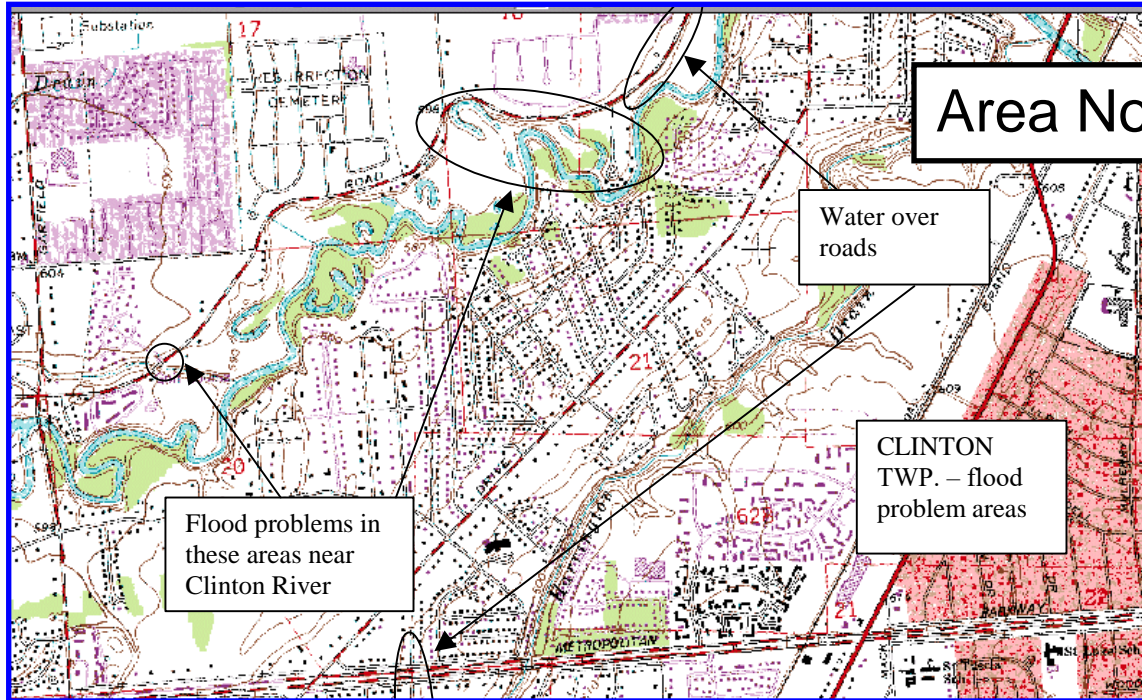
Table 3.2 NFIP Repetitive Loss Structures in Macomb County

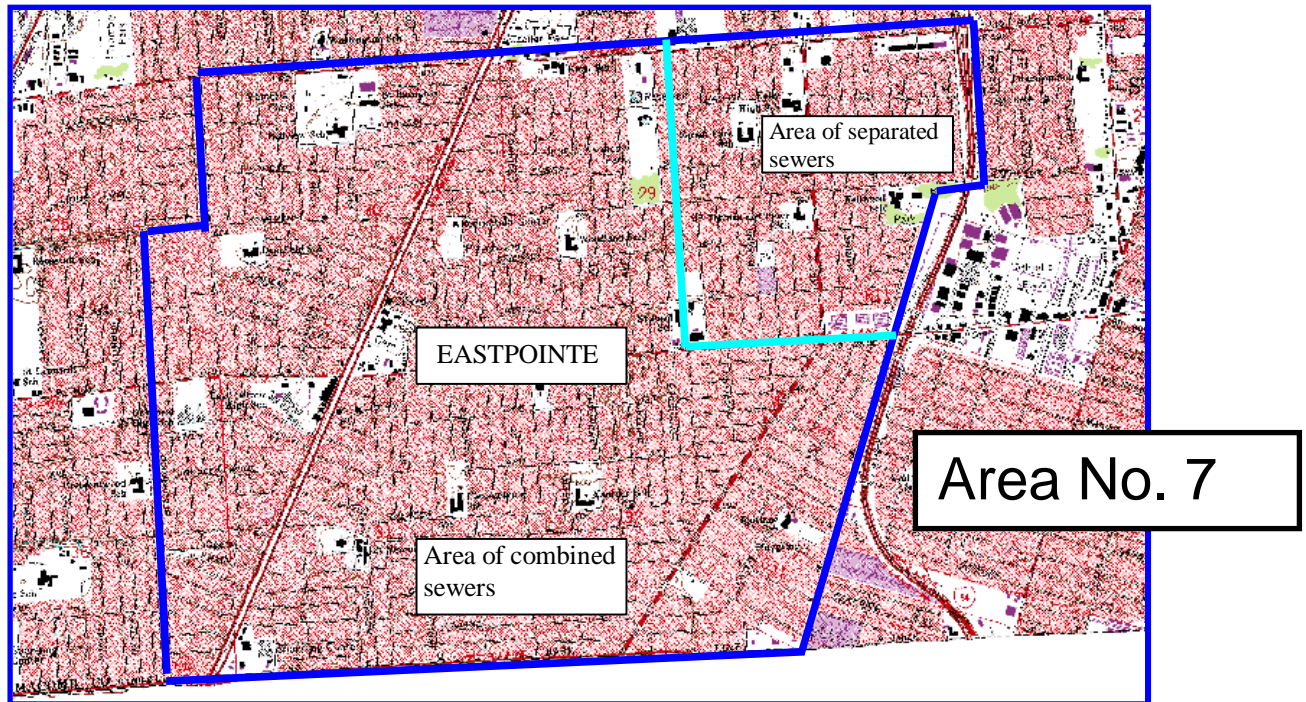
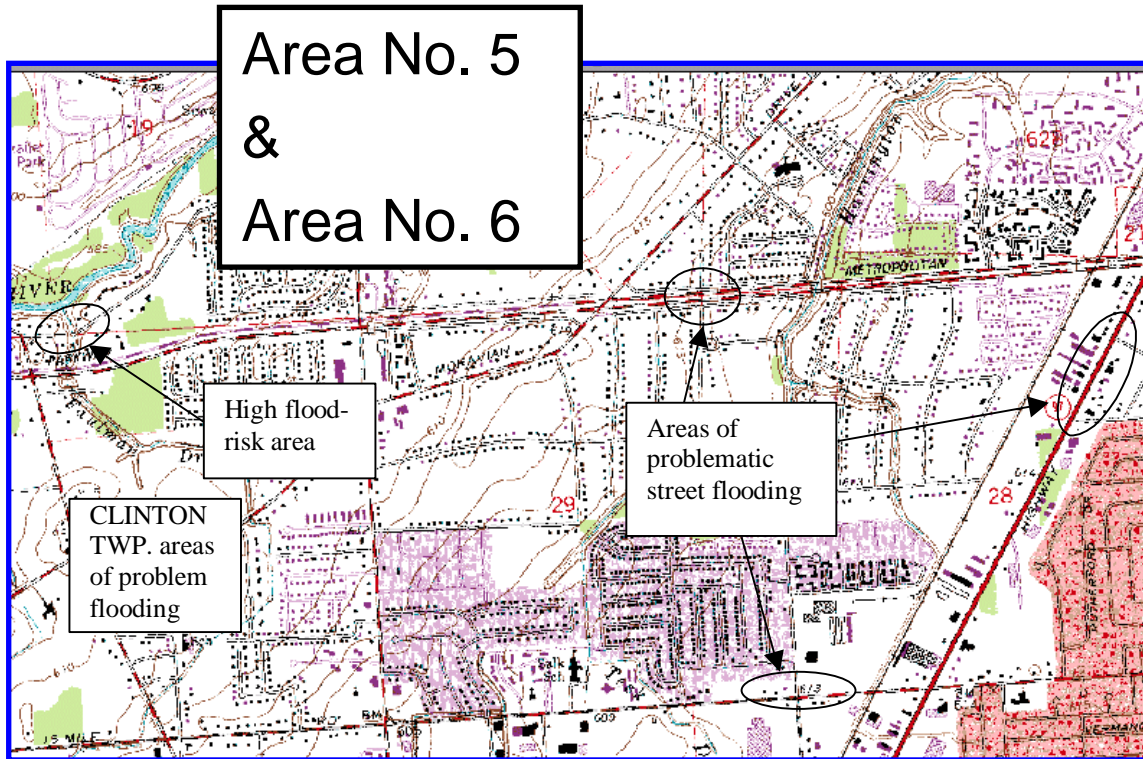
Locations	Residential	Commercial	Repetitive Loss
Armada Twp	0	0	None
Armada Village	0	0	None
Bruce Twp	0	0	None
Center Line	0	0	None
Chesterfield Twp	3	0	Yes
Clinton Twp	1	0	Yes
Eastpointe	0	0	None
Fraser	0	0	None
Harrison Twp	10	0	Yes
Lenox Twp	0	0	None
Macomb Twp	4	0	Yes
Mount Clemens	0	0	None
New Baltimore	2	0	Yes
New Haven	0	0	None
Ray Twp	0	0	None
Richmond	0	0	None
Richmond Twp	0	0	None
Roseville	0	0	None
Shelby Twp	0	0	None
St. Clair Shores	4	0	Yes
Sterling Heights	1	0	Yes
Utica	2	0	Yes
Warren	0	0	None
Washington Twp	0	0	None
Village of Romeo	0	0	None

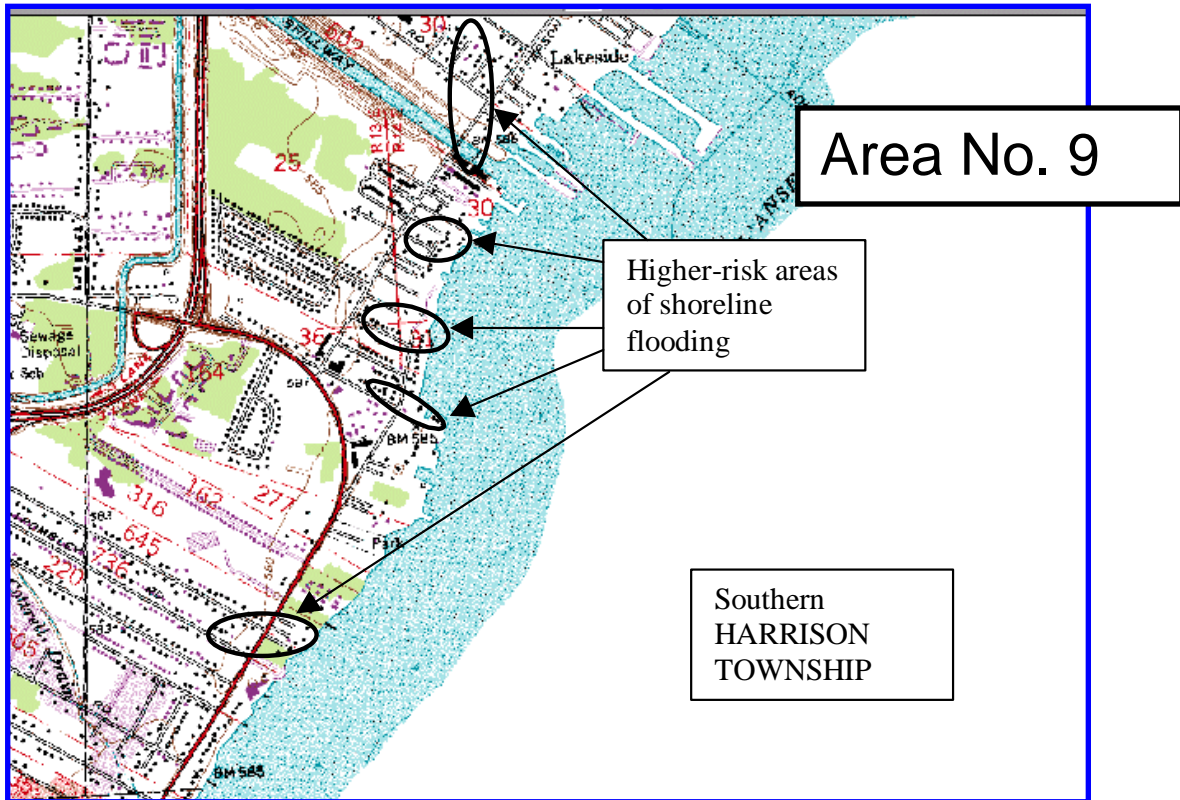
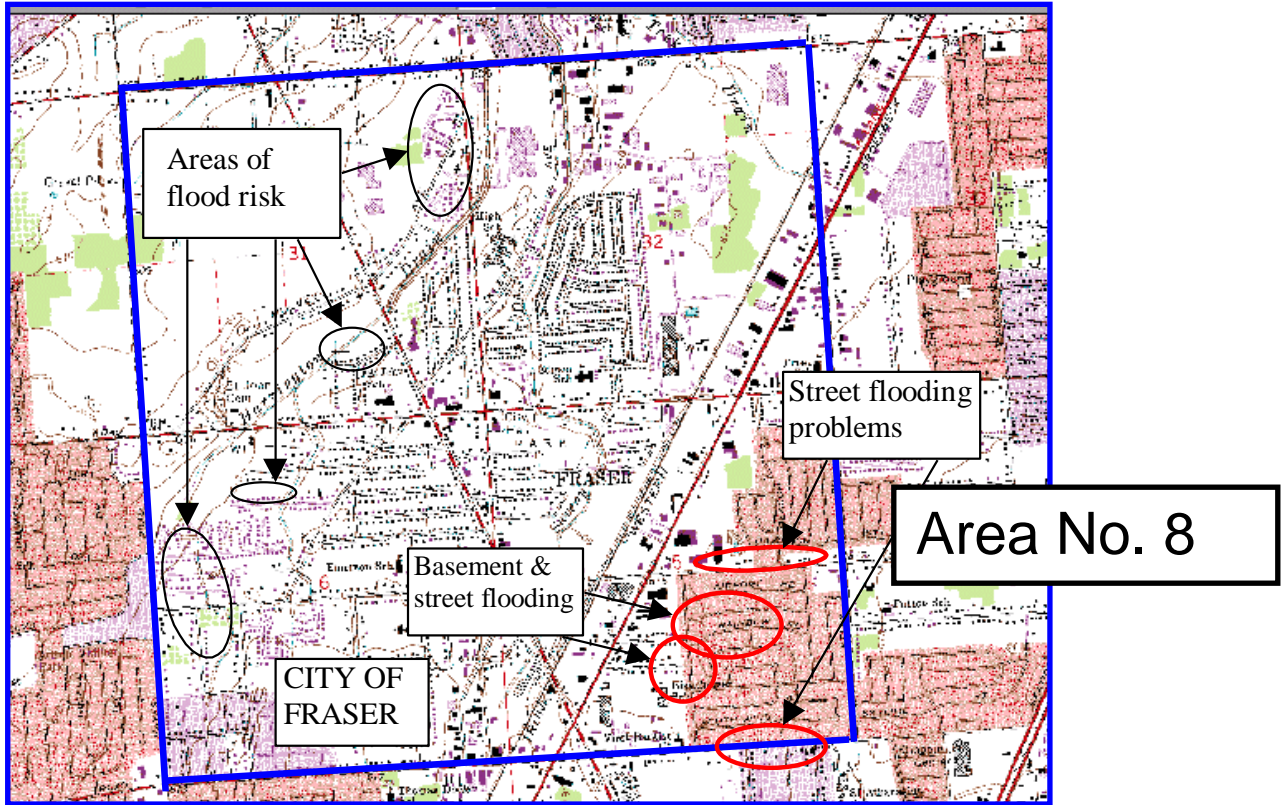


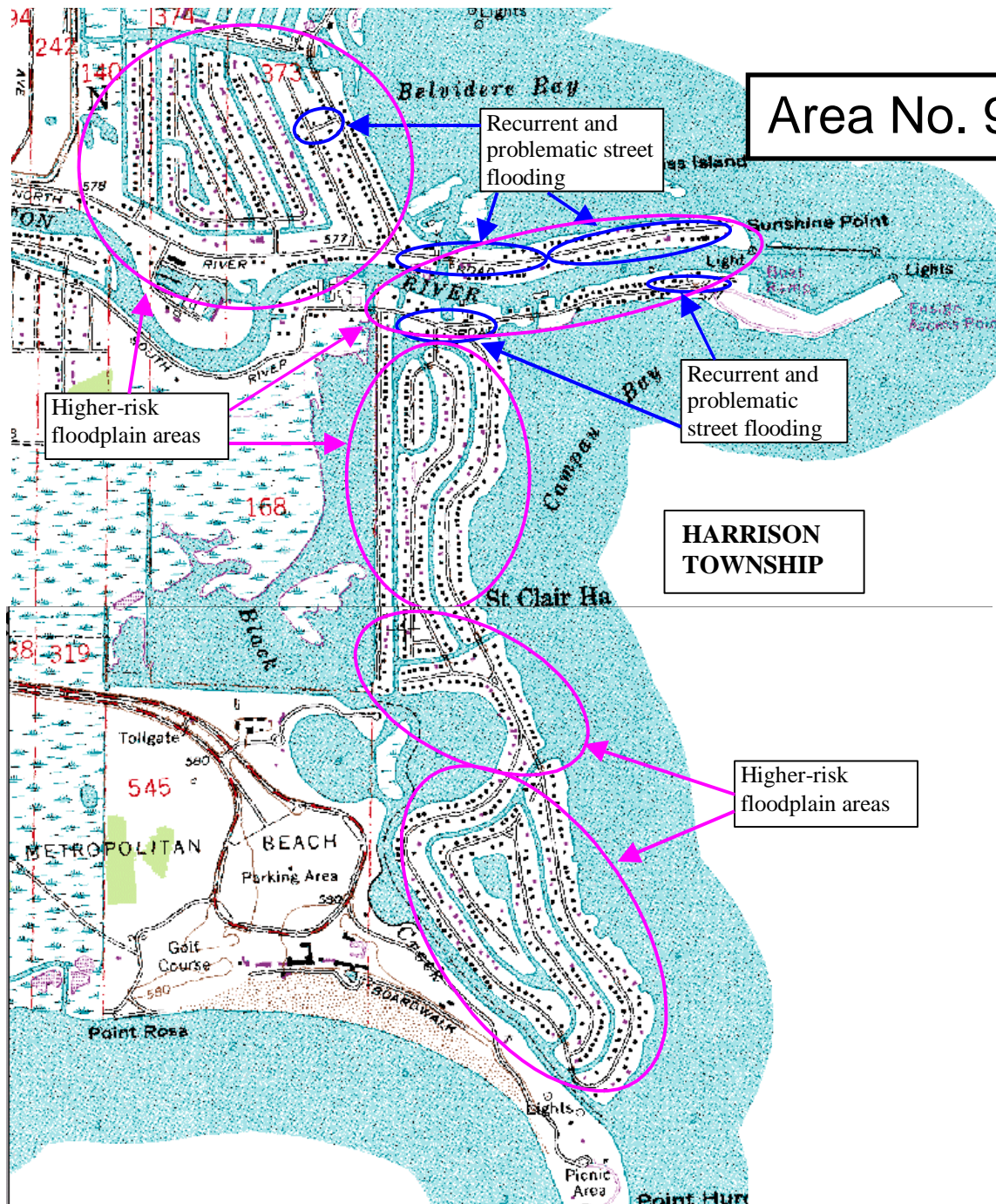


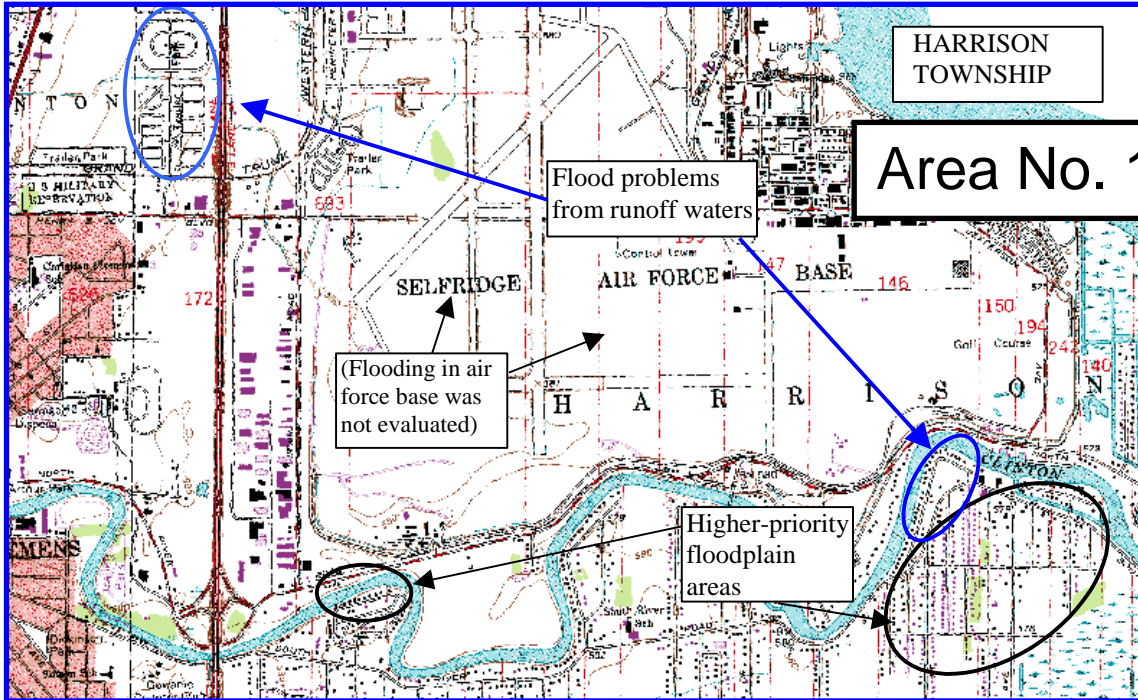




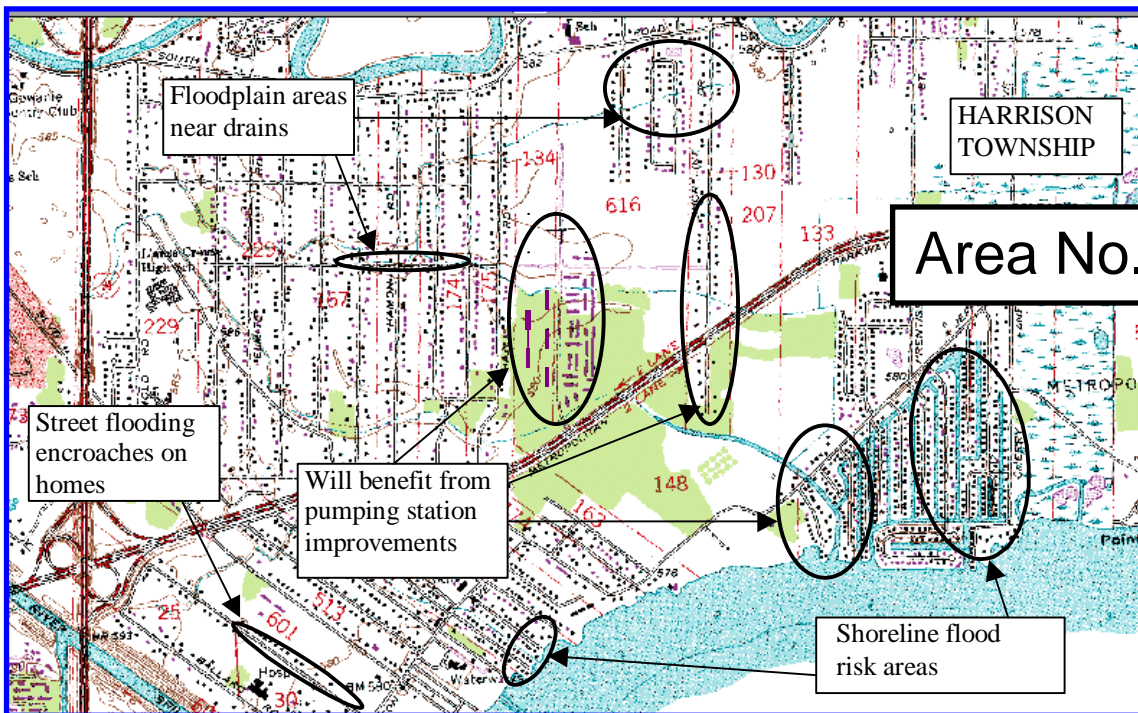




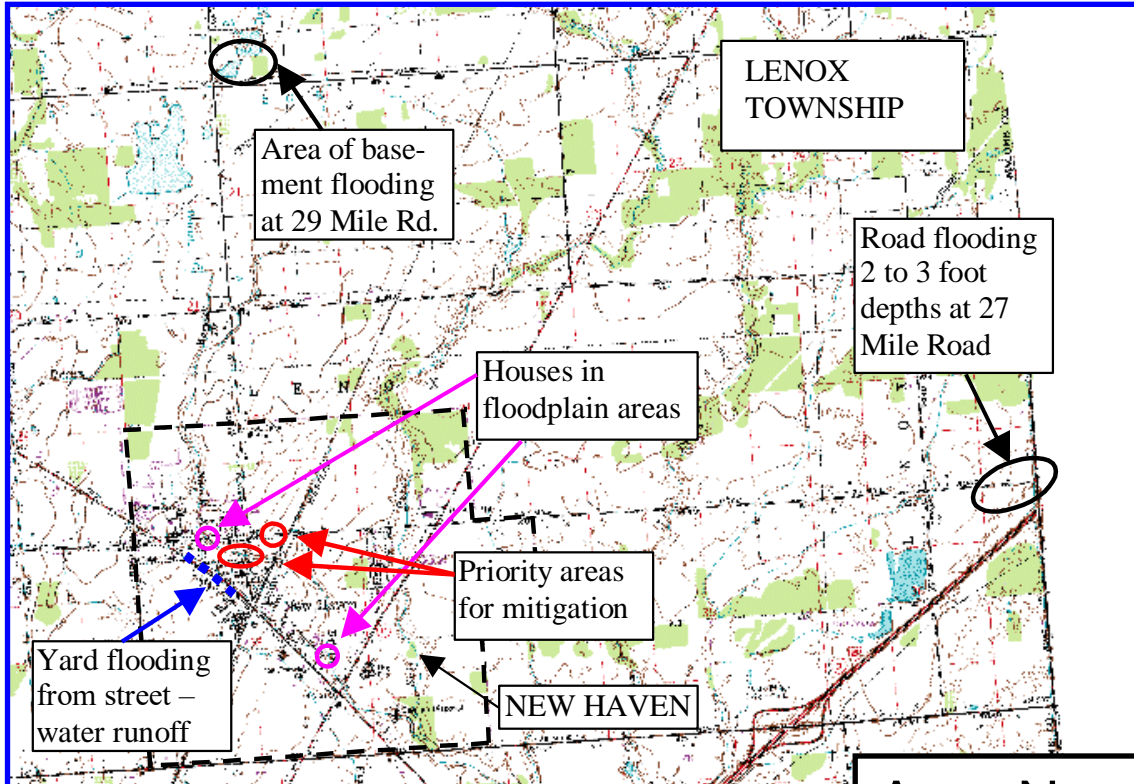




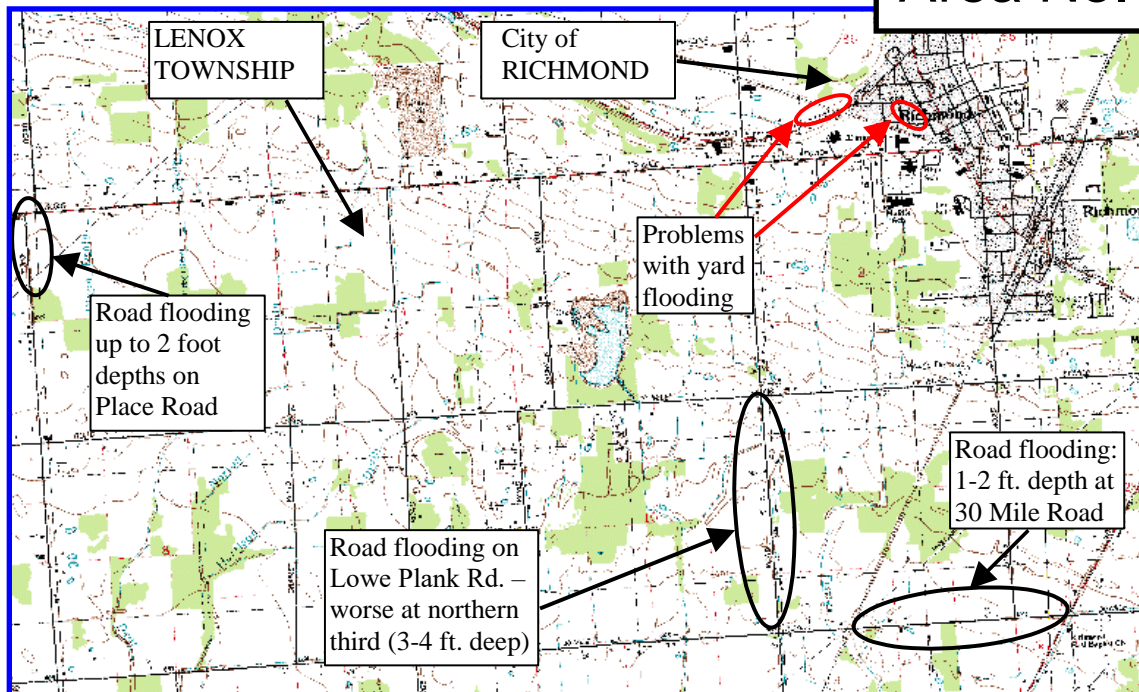
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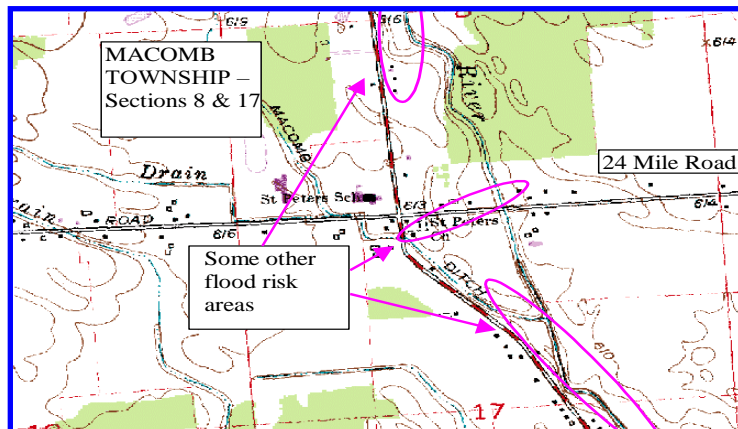
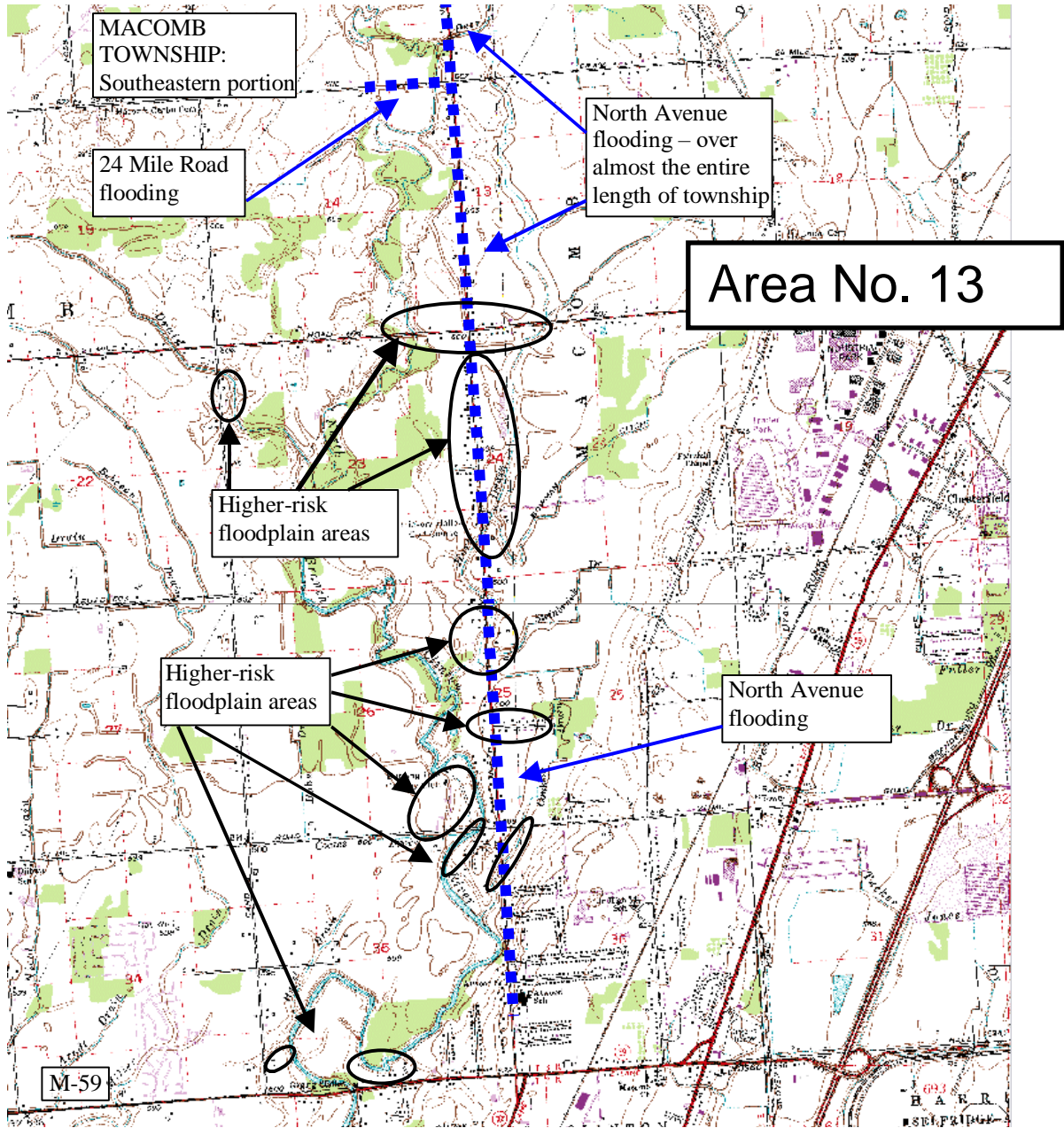


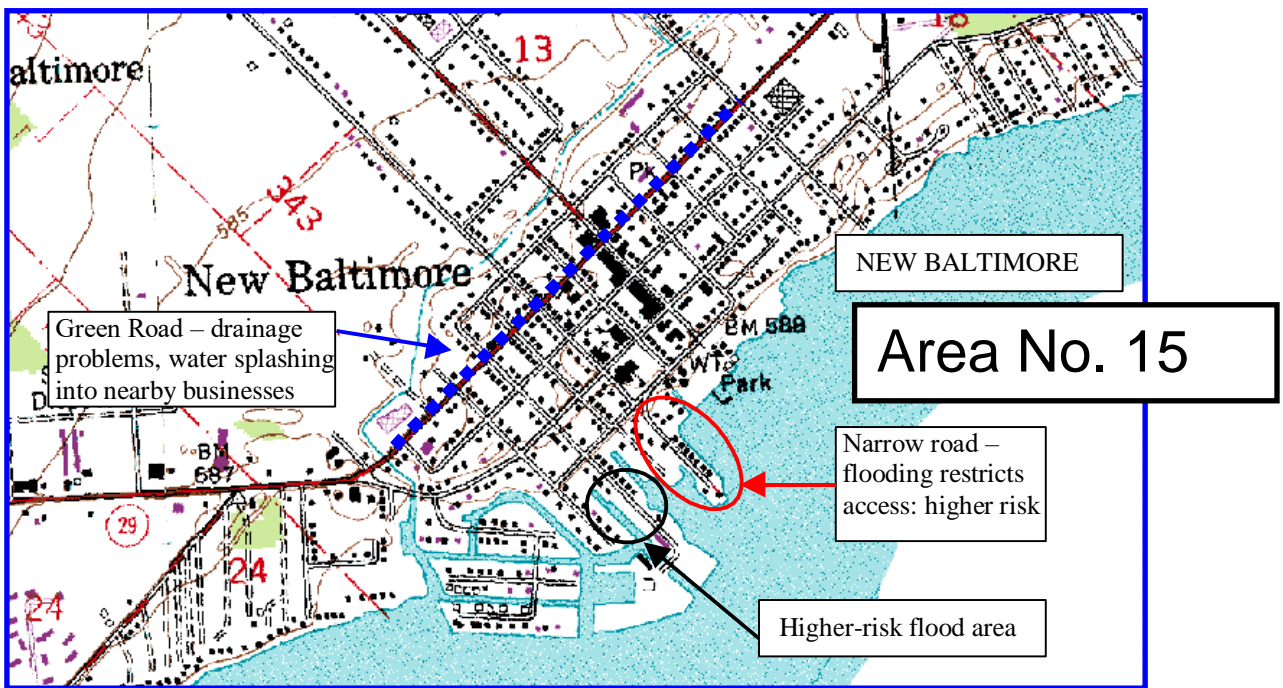
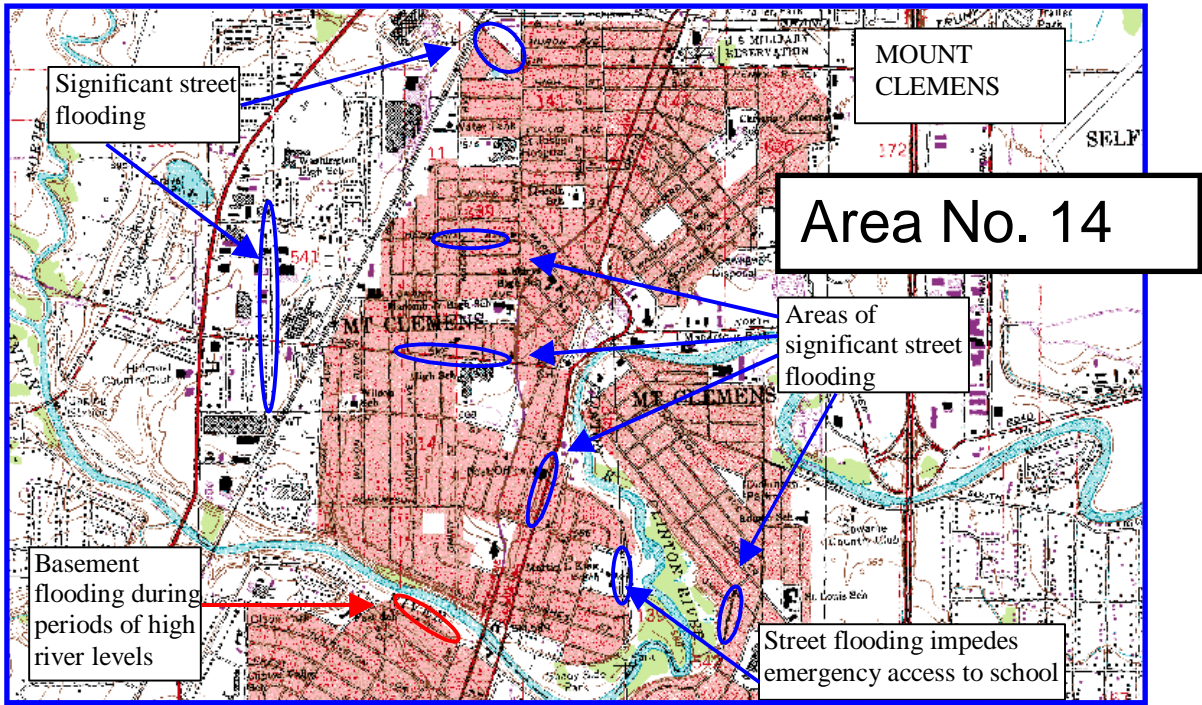
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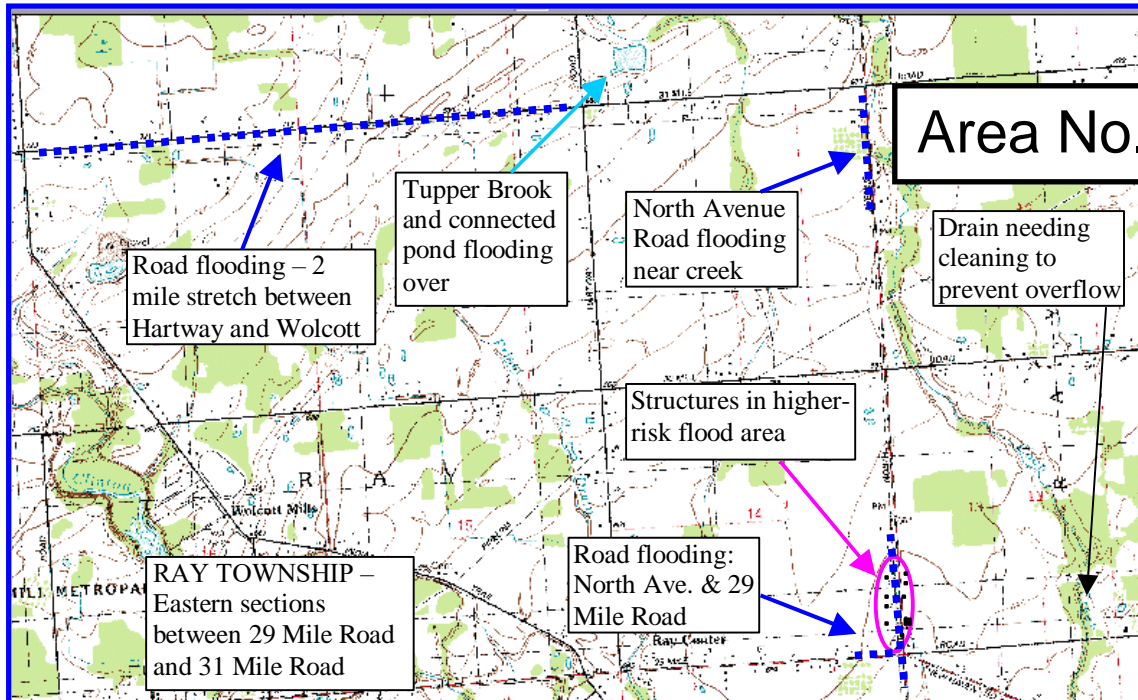


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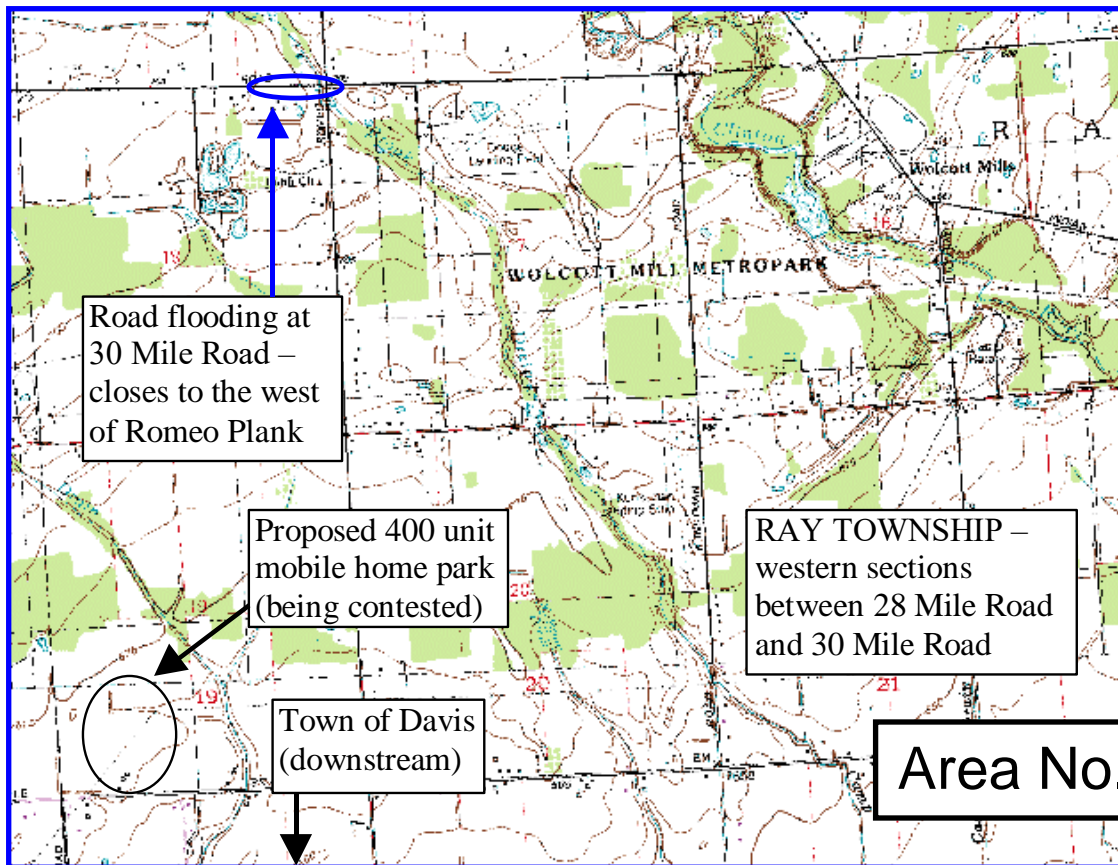




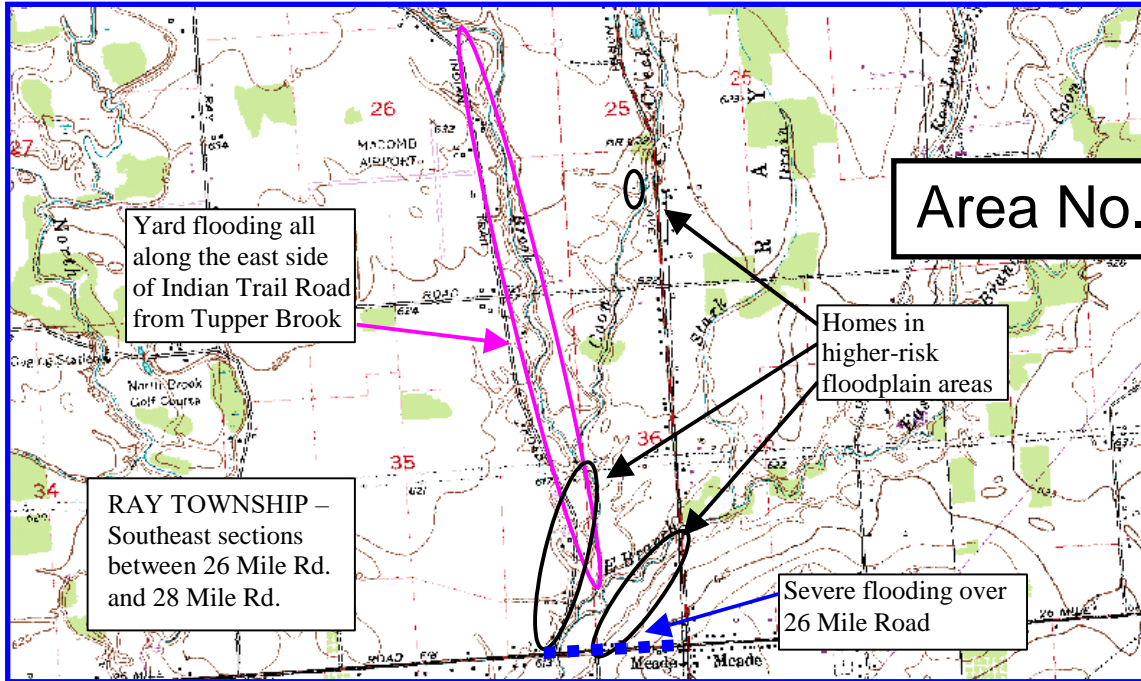




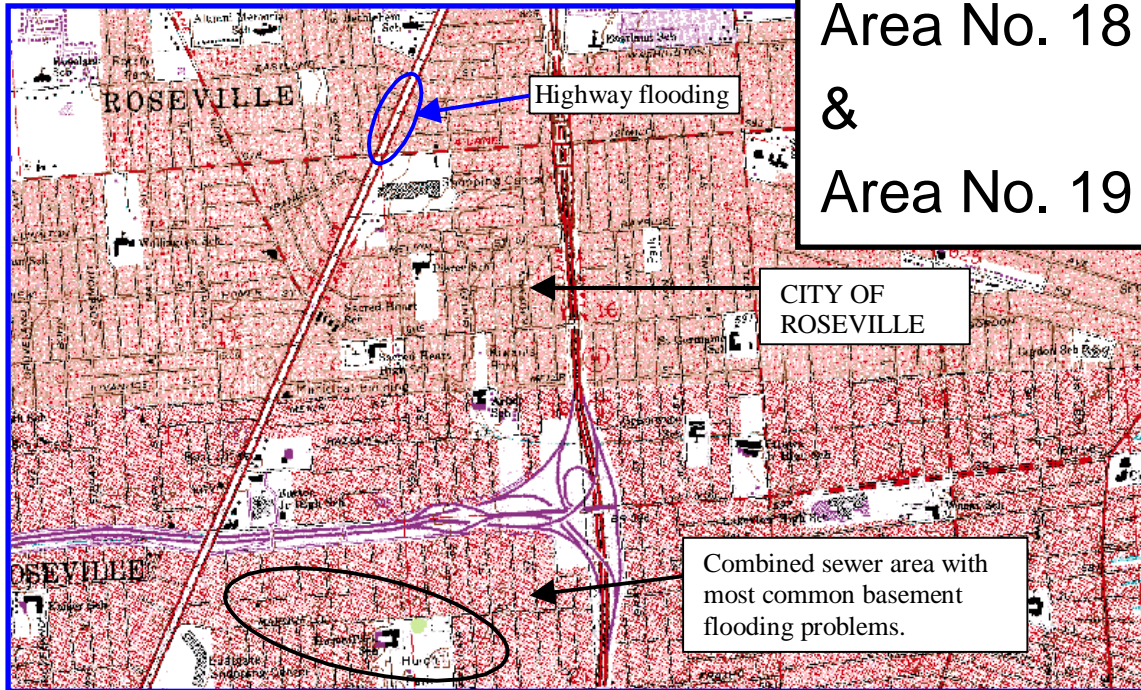
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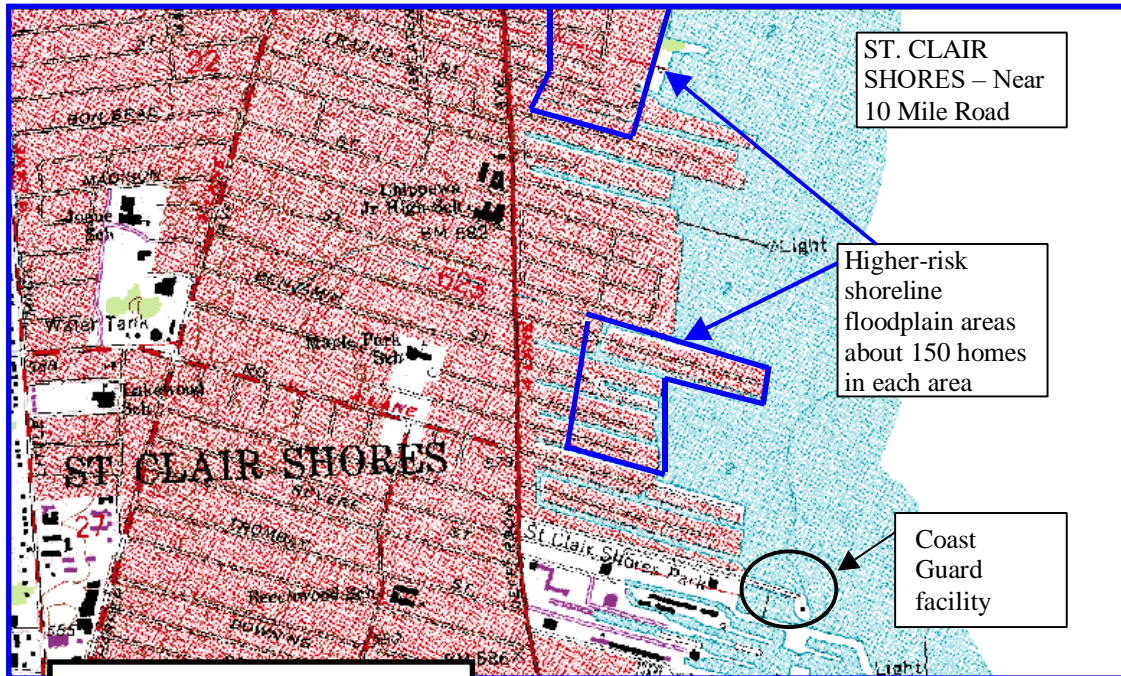
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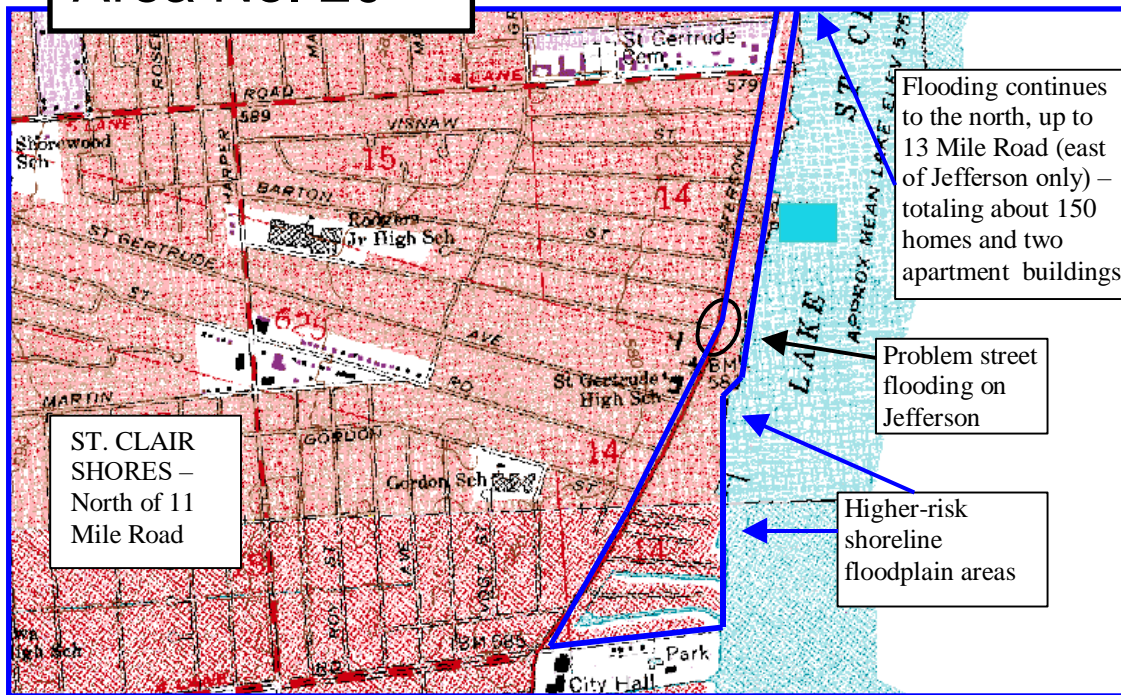
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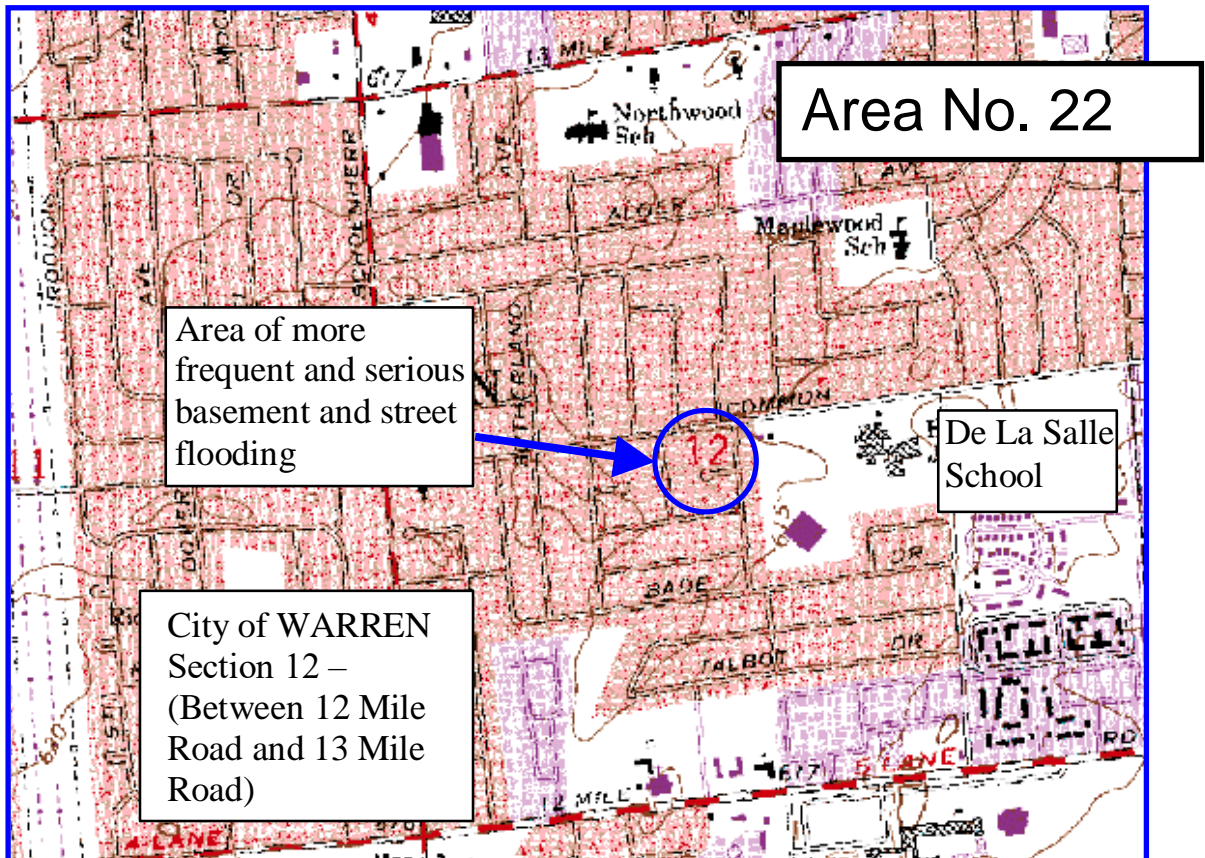
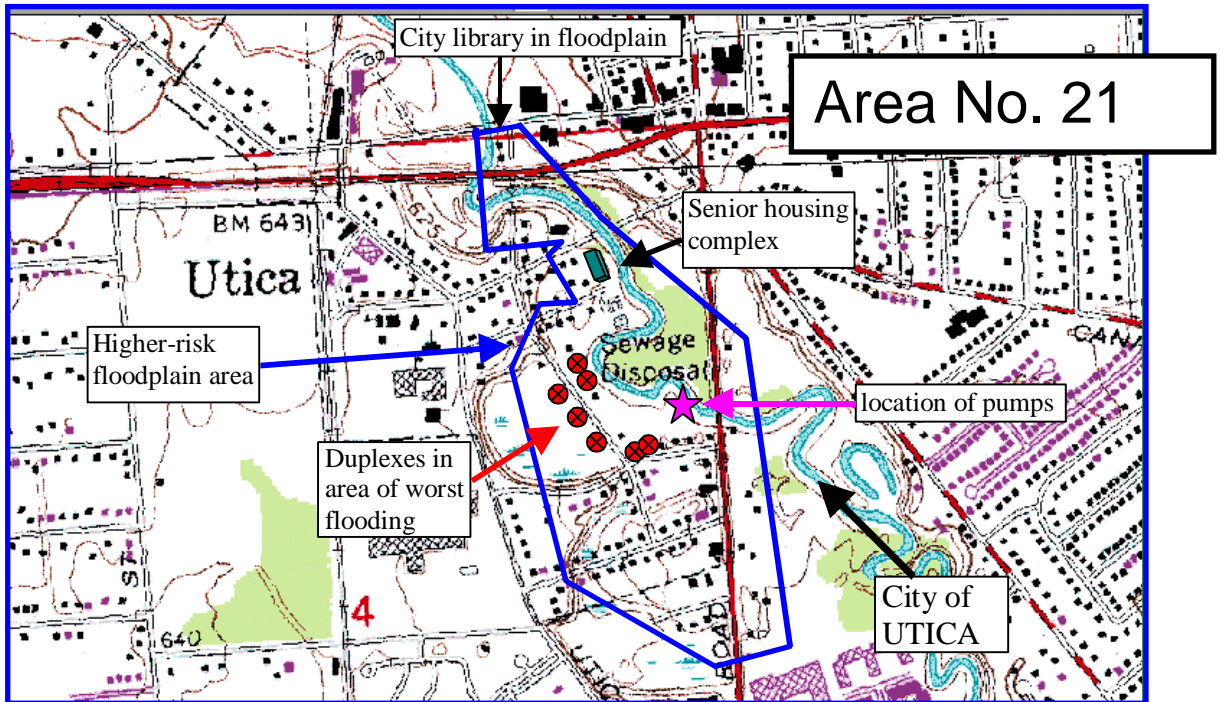


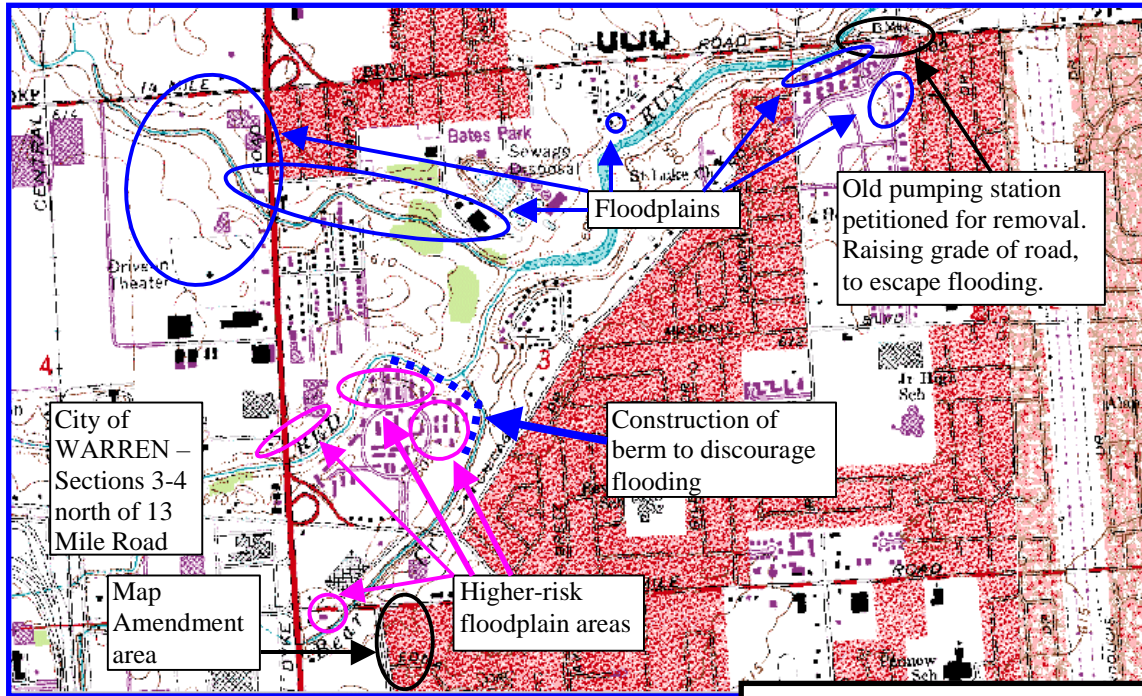
Area No. 18 & Area No. 19



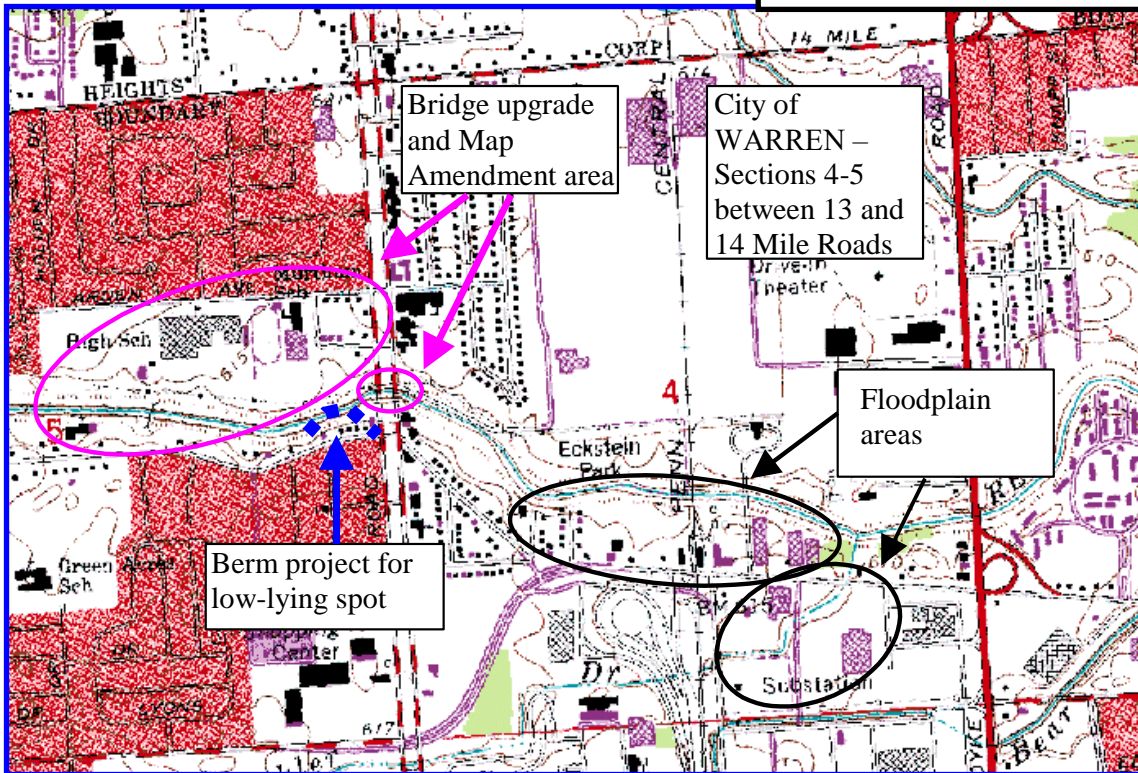
Area No. 20

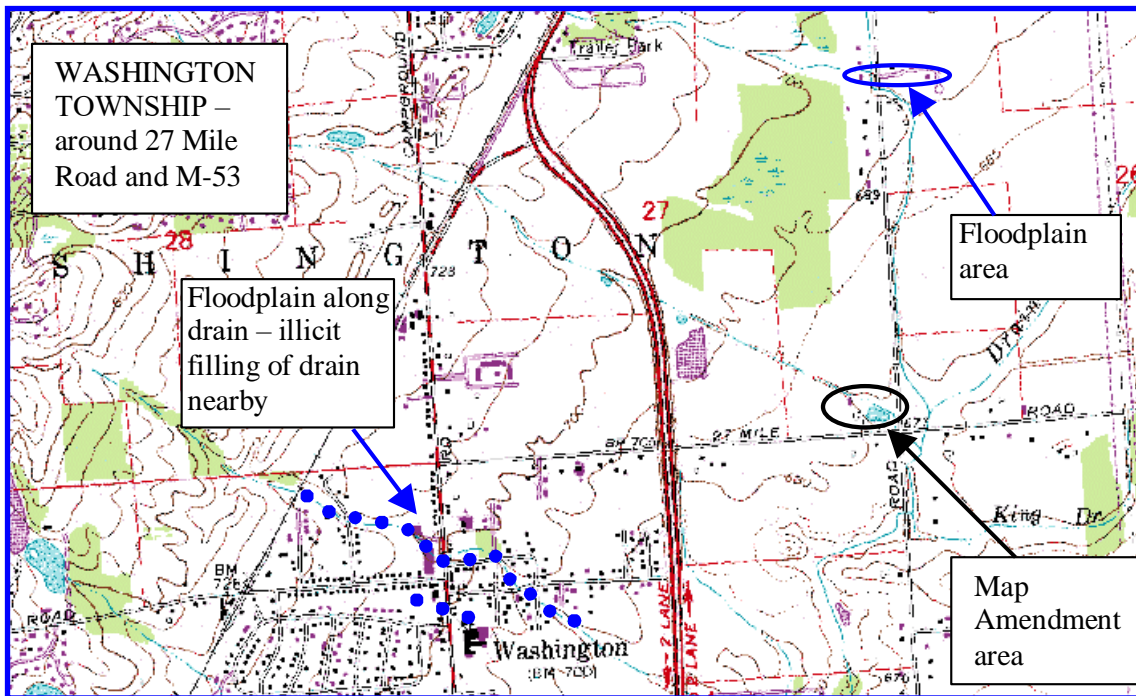
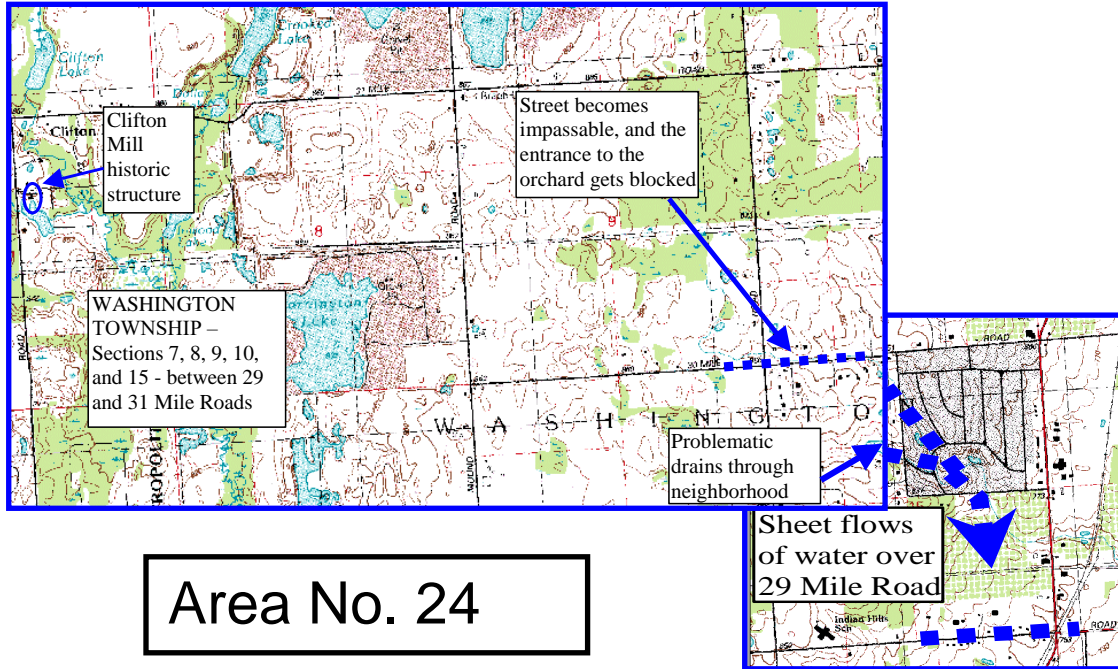


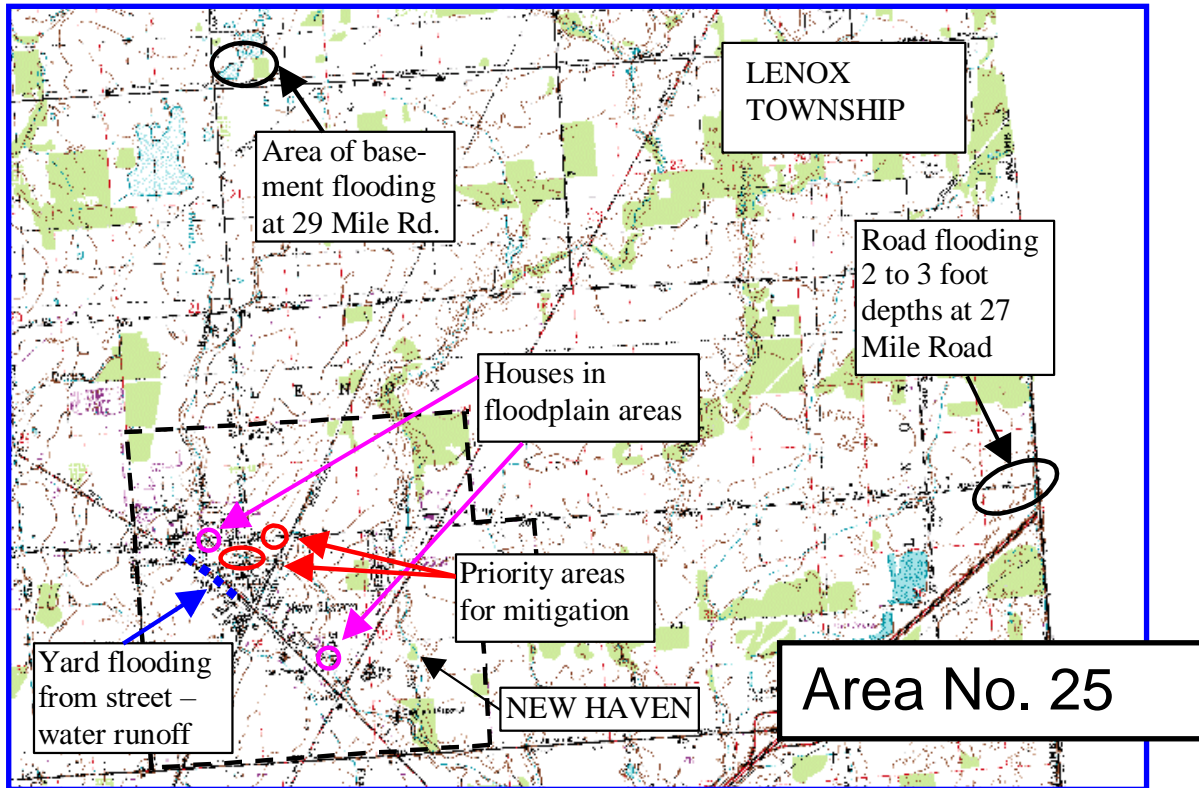




Area No. 23







3.2 DETAILED REPORTS BY COMMUNITY AREAS

3.2.1 Armada Township and Village of Armada

An NFIP floodplain map for the township and village was developed by FEMA and was made available to the County, village and township in September of 2006. Consideration of this information was made during the review of this document. The Armada Township and Village area has the Coon Creek and its branches running through it, and these communities have noticed that increased levels of runoff into this creek and its connecting drains are leading to some new and increasing flooding problems, most notably to a house near the center of town where water ponding in the yard is now coming right up to the back of the house during rainy weather conditions (second priority). Such problems are also increasing due to debris and sediment that have collected in area drains and waterways over the years.

In the village of Armada, a bridge on the north side of town was rebuilt in the early 1990s. This seems to have alleviated the risk to two homes to its east that otherwise appear to be located in the 100-year floodplain (township section 24). A house that appeared to be in the floodplain on maps was considered to have much lower-risk due to its elevation. A nursing home that appeared to be partially situated in a floodplain area was also currently considered to have no pressing problems. A sewage disposal plant structure also appears to be in the floodplain, but no problems of flood damage were known to officials. (All of these latter cases are in township section 23.)

Just north of the Village of Armada, in township section 14, the East Branch of the Coon Creek has been flooding over North Avenue and into homeowners' front yards, approaching their houses. Such waters have been damaging to driveways and yards. They also threaten at least one private bridge crossing over the creek. At the intersection of North Avenue and Dayton Road, just south of these houses, the depth of the water over the roadway is about half a foot. The creek continues to the southeast of this intersection. On the creek's eastside, to the west of the High School (in township section 13), about five houses appear to be in its 100-year floodplain.

A couple of miles farther north, in township section 1, a culvert passes under North Avenue leading to the East Branch Coon Creek. The culvert cannot handle the capacity of runoff waters at the point, and although the houses in this area are at safe elevations, at least three property owners have large amounts of standing water in their yards.

In the west of the township, straddling township sections 7 and 8, is the Newland Drain, which has a smaller, old drain that goes under Romeo Plank Road to flow into it just southeast of Reid Road. Romeo Plank at this point suffers from water going over it.

In the center of the township, just southwest of where the G.T.W. railroad crosses Coon Creek Road in township section 28, a house appears to be in the 100-year floodplain. However, local officials report that no damages to this house are currently known to have occurred.

In summary, in the Village and Township of Armada, there are no structures identified as NFIP repetitive loss structures, but there is one house that is at imminent risk of flood-related damages (second priority), about seven homes and a sewage disposal plant that seem to be in the 100-year floodplain (third priority), six property owners who have complained about the nature of the flooding on their properties even though their homes were not involved, and a house and nursing home that may be at some risk of eventual flood damages from a major (500-year) event (last in priority). There are also two areas with recurrent flooding over locally important roads.

3.2.2 Bruce Township and Village of Romeo

An NFIP floodplain map for the township and village was developed by FEMA and was made available to the County, village and township in September of 2006. At present time, Romeo has opted not to participate within the NFIP. The FEMA Community Status Book lists sanctions dating back to 1927, but it is unclear as to how these sanctions would be lifted to allow participation. Although there seem to be a few houses throughout the township that may be in a 100-year floodplain, no damages have been reported. In the far east of the township, where the Newland Drain joins the North Branch of the Clinton River and then runs alongside of 34 Mile Road, there is flooding over the roadway. Most notably, this water submerges the intersection of 34 Mile Road and Kanie Road.

A mile to the west of this, where the Mahaffy Drain crosses 34 Mile Road, the roadway similarly becomes flooded. The Mahaffy Drain needs to be upgraded to increase its capacity. There had been a residential development southwest of the intersection of 34 Mile Road and McKay Road which has been a source of significantly increased runoff to that drain. As a result, there are problems every year with flooding that goes over the roadways there, and two houses on 34 Mile Road near that drain had to install sump pumps to alleviate basement flooding problems.

A mile to the northwest of this area, another area of roadway floods over repeatedly. This flooding is on M-53 (Earl Memorial Highway) in the area where the Wilson Drain originates. The highway is the most important roadway going through the township and from the Metro-Detroit area to its south. Hence it is one of the least convenient roadways on which to tolerate flood problems.

Houses that appear to be in the 100-year floodplain in maps of this area were mostly considered to be at generally lower risk except for one located southwest of where the Wilson/Mahaffy Drain crosses McKay Road. Officials agree that this house is at risk. Other structures that appeared to be in the flood-plain on the maps were assessed as having a lower risk than the NFIP maps suggested, due either to the elevated nature of the buildings, or the limited precision of matching floodplain maps to USGS quad maps, which had suggested risks that did not seem as evident in field inspections of local topography, or in officials' local experiences. Damage is probably limited to yard flooding or possible basement flooding in these lower-risk cases, but eventual damages from a more severe (200-year or 500-year) event would seem to be a possibility. The number of structures that appear to be in the floodplain is as follows, sorted by township section:

- Section 1 – 2 structures (assessed as lower-risk by local officials)
- Section 5 – 1 structure (no further information known)
- Section 6 – 1 structure
- Section 14 – 3 structures (assessed as lower-risk)
- Section 18 – 1 structure (assessed as lower-risk)
- Section 22 – the one structure shown in floodplain area on USGS maps no longer exists
- Section 23 – 1 home in the 100-year floodplain
- Section 26 – 2 structures that have experienced basement flooding
- Section 27 – 1 structure (assessed as lower-risk)
- Section 29 – 2 structures (assessed as lower-risk), plus possible street flooding east of Nowlan Lake

Section 33 – 1 structure (field-assessed as lower-risk)

Section 36 – a sewage disposal plant (no known damages from flooding)

In summary, although Bruce Township and Romeo have no identified repetitive loss structures, there are two homes that have had basement flooding problems (second priority, but mitigated by sump pumps), three homes and a sewage disposal plant that appear to be in a 100-year floodplain but with no known structural damages (third priority), and ten structures that are probably within a 500-year floodplain but have suffered no known damages (last in priority). There are also three areas where road flooding regularly occurs – two of which are on locally important roads (2nd priority), and the last of which occurs on an important Michigan highway (top priority).

3.2.3 Center Line

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in September of 2006. The map showed no special flood hazard area for this community. The City of Center Line has no identified floodplain areas within it, and reports no problems with street or structural flooding. It is an NFIP member and had its combined sewer system separated in the 1970s. Downspouts have been disconnected from the new storm sewers, but footing drains are still tied to the sanitary sewer system. The city is proactive in system testing, and has been working on correcting the remaining problem of sanitary sewer overflows. During periods of very intense rainfall, it is still sometimes necessary to dump sanitary overflows so as to prevent basement flooding. The city will be trying out a pilot treatment facility for overflow waters. Environmental mitigation efforts can focus on improving the capacity of one lift station in the south of the city (sewer flows go south from the city), which can still become overloaded during major rain events.

3.2.4 Chesterfield Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in December of 2012. This jurisdiction has numerous problems needing mitigation. These are organized below into paragraphs for each section of the township. Descriptions for each section will start with the highest priority conditions and proceed to the lowest priority conditions.

Section 3 – One structure showed up on the maps as being in a floodplain. Apparently, this structure was part of a horse farm and tack shop, south of 26 Mile Road and east of Washington Road. It was reported that the house had no known problems, but the barn structure did (third priority).

Section 6 – One home appeared to be in a floodplain south of 26 Mile Road and east of Deer Creek, but it seemed subject to flooding damages only from a 300 or 500-year event (last in priority).

Section 9 – The Ridgewood subdivision, north of 24 Mile Road and east of Gratiot, has no reported structural damage, but gets to where water was reported as literally surrounding the houses. The main cause of this was suggested to be the nearby Crandall Drain, which, still is reported to have problems handling all the water draining through it. On the other hand, the Crandall Drain was designed to act as a retention basin, 120' wide. Standing water in yards can be expected in this area, and it may be that such water has caused undue concern over long-term flood risks (last in priority).

Section 11 – The F.O.P. Lodge building, just west of the Salt River, north of 24 Mile Road, appears to be in a floodplain area. The future use of this building apparently is uncertain; as reports are that an alternate site may later be used, with the current one taken down (third priority).

Section 14 – Three condominium buildings appear to be located in a floodplain area just northwest of a bend in the Salt River, but it was reported that they have been designed so as to avoid flooding (last in priority).

Section 15 – A business on the northeast corner of 23 Mile Road and Sass Road is within a floodplain area, and local officials report that its flood risks exceed those of base flood levels (second priority). NOTE: A structure that appears on USGS maps in a floodplain area west of Fish Creek no longer exists.

Section 21 – The Meldrum Drain needs cleaning. Water from this drain is backing up and approaching homes in a neighborhood to its west, on East Shamrock Street, but as in section 9, this drain was designed to act as a retention basin. Water ponding in area yards may be misinterpreted as posing a threat that shouldn't really be of any concern in most cases (last in priority).

Section 22 – The area where Sugarbush Road crosses the Meldrum Drain is an area of serious drainage back-up, apparently resulting from debris in the area of the bridge. Water goes over Sugarbush Road here and right up to four nearby apartment buildings when this happens. Many seniors live in that area. Three houses are located in the 100-year floodplain in this area along Callens Road, including one just west of Fish Creek. Five homes on the south side of Octavia Street are in the floodplain of the Salt River, as is one home to the west, on Sutton Road (third priority). There were four homes identified as being in a floodplain just east of Fish Creek, south of Callens Road, but these were evaluated as being at lower risk by local officials. Eighteen homes along Donahue and Menter Streets, near the Meldrum Drain, are in a lower-risk floodplain area (last in priority). NOTE: A home on the south side of 23 Mile Road,

east of Fish Creek, was identified on USGS quads but seemed no longer to exist in that location.

Section 23 – Two houses south of Callens Road and west of Hooker Road were identified as being in the 100-year floodplain area of the Salt River, and local officials consider these properties to be at significant risk (second priority). Just west of the Salt River, south of 23 Mile Road, is an ice cream shop that appears to be located in a flood plain (third priority).

Section 26 – In the area southeast of Jefferson, there are shoreline developments and numerous canals that pose flood risks to nearby homes. In the area around Schneider and Lotties Roads are about eighteen homes that are scattered in various 100-year risk zones (third priority), and fifty that are in zones of lesser risk. To the north of this area, off of Miller Court, are areas that are in floodplains, but local officials advised that many of the at-risk structures here have been replaced with new homes or have been rebuilt in ways that alleviate flood problems. Probably only about a dozen homes on the shoreline side of Miller Court may now be classed as in a lower-risk floodplain area (last in priority).

Section 27 – There is an NFIP repetitive-loss home in this area (highest priority). Along Sugarbush Road southeast of the high school, water floods over the road and around houses, to depths of 8 to 12 inches. The houses are set higher than the adjacent grounds and so, with the help of some sandbagging, are not damaged. They are "like islands," however, and can be very difficult to access. About 36 homes in this area are affected, and the area is clearly much more hazardous than the lower-risk FIRM classification would suggest (second priority). Shoreline flooding in this area still poses major risks. Along Harbor Drive and the lake-side of Jefferson Road, about 55 homes are in the 100-year floodplain. On the east side of the Salt River, in the Point Lakeview subdivision, 30 homes are in the 100-year floodplain. On the northwest side of the Salt River (and the northeast side of the Meldrum Drain) are some 23 homes in the 100-year floodplain. Farther inland in this area are three homes along Lakepointe Street, and 20 homes on Sutton Road along the south riverbank that are all in floodplain areas. About 16 homes along Killewald Street are in a floodplain. Although generally shown as a lower-risk area on the area's FIRM, officials report that the risks to these houses are probably closer to that of a 100-year floodplain (third priority). In the Harbor Drive area, about 29 homes are in lower-risk floodplain areas, and in the Point Lakeview area, about 19 homes are in lower-risk floodplains. Nineteen homes are in lower-risk floodplain areas along Sutton Road, as are six homes on Lakepoint Street, six homes and an apartment building on Riverpoint Street, and 12 homes in the adjacent neighborhood with Jamaica and Walled Streets. The addition of the Bay Harbor pump station at Jefferson and Forbes has markedly reduced inland flooding north of Jefferson. As a result, there were about 56 homes in a 100-year floodplain area there that have had their risks alleviated, and twenty seven homes that were in a lower-risk floodplain area that are now probably quite safe. This pump station was also important for the unimpeded functioning of a fire station that is located nearby (last in priority).

Section 28 – There is an NFIP repetitive-loss home in this area (highest priority). Southwest of Cotton Road, along the shoreline, is an area with about 13 homes that sees flooding of 6 to 8 inches from Lake St. Clair. Seventeen homes along Wand Street and the Auvase Creek are at higher risk of flooding than the 100-year floodplain indicated on the floodplain maps for that area. The homes were cottages and pumps and sandbags were needed to protect them. Dampness from water in crawlspaces and around homes doubtlessly promoted mildewing and lessening of wood integrity in some of these homes (second priority). The eleven homes south and west of the Auvase Creek at Jefferson are in a floodplain area. Along the southern end of Forton Street are six houses in a floodplain. Two commercial structures along Jefferson just north of Wand Street are in the 100-year floodplain as well. A house at the south end of Roger Street is in the floodplain of the Auvase Creek (third priority).

Seven homes and a commercial structure are in a lower-risk floodplain around the Auvase Creek at Jefferson and Forton Street, south of Cotton Road. The northwestern portion of the Seville Manor subdivision (along Hibbs Street, Craw Street, and intersecting portions of Wright, Douglas, Hawk, Hoenshell, Pearl, Biallas, and North Brooks Streets) appeared from the maps to have 59 homes in the 100-year floodplain and 30 homes in the 500-year floodplain. However, due to the cleaning and expanded capacity of the drainage channel that had been causing this flooding, these homes are now considered to be outside of the floodplain, and a letter of map amendment (LOMA) is being applied to these areas. In addition, a section along this water channel to the southwest has similarly been considered to have its flood hazards successfully mitigated. This was a section along Cotton Road and including homes on Sunray, Halo, Gallus, and Dino Streets which had fourteen homes in the 100-year floodplain and seventeen homes in the 500-year floodplain, all of which will be covered by the LOMA. Along the shoreline northeast of Cotton Road are 10 homes that are in a floodplain but currently protected by a new dike. Just northeast of this are five homes in a lower-risk floodplain and twenty six homes in a floodplain area but currently protected by an earthen berm that has been put in along the shoreline. The Dykeman Drain near this area has been cleaned recently, which also reduces flood risks in this area. Thus, 10 homes that are in a lesser-risk floodplain area along Forton Road and Jefferson just southwest of this drain are probably currently well-protected from flooding. The same applies for five floodplain homes to the north of this drain, on Jefferson Road and Forbes Drive. Fifteen homes in this area that are in lesser-risk floodplains are probably quite safe for the moment. Further northeast, about twenty six homes are in lesser-risk floodplain areas (last in priority).

Section 32 – There is an NFIP repetitive-loss home in this area (highest priority). This is an area with many problems from shoreline flooding. In the south, along the canal south of Field Street, is an area of about nine homes that are all subject to flooding during periods of high water levels in Lake St. Clair. In events in 1985 and 1986, flood waters were 6 to 12 inches deep in this area. The Schmidt Drain flows into a canal alongside Macon Street in this shoreline area. Where this canal meets the lake waters, a party store, marina office, and gas dock are situated and have had flooding depths up to 18 inches. There are a total of fourteen structures along this canal (around Teal and Macon Streets) that are in a 100-year floodplain, including the three just mentioned (the others being homes). In the 1970s and 1980s, these homes had 6 to 12 inches of water flooding them, and there is an NFIP repetitive-loss structure here. Pumps and sandbagging were used in the 1980s to reduce flood damages. There are seven more homes in a lower-risk flood area. The area is designated a Zone A3 floodplain. About 106 houses located east of Jefferson and south of Farwell (in addition to those already mentioned in this description) are considered at-risk. The roads and bridges in this area are privately owned and are underwater during flood events (mainly around Anchor Road.). These bridges also have low load limits, and have been weakened by past floods, so access to the entire area is severely impeded during flooding, especially for emergency vehicles. During the 1970s, many houses in this neighborhood had 2 to 4 inches of water flooding them, and sandbagging has been required to reduce damages since that time. Jefferson Avenue, the major road serving the shoreline areas, also floods over in this area. (Information from the FIRM for this area, with its "Zone B" classification, is somewhat ambiguous. These homes are probably subject to 100-year flooding of less than one foot of depth.) South of Anchor Road, flooding worsens; some basements were completely flooded in the 1970s! Many houses sit at or below road level, and both have suffered 6 to 8 inches of floodwaters. Improvements are expected from the proposed Schmidt Drain Pump House improvements. To the north of Anchor Road, sandbagging has been necessary to attempt to protect numerous structures there, comprising a party store, laundromat, and 17 homes, which are all in a floodplain area (second priority). In the neighborhood to the north of Farwell Street are three homes in 100-year

floodplain areas. About 39 homes appear to be in a 100-year floodplain area east of Jefferson and south of Farwell. Nineteen homes along Anchor Road, west of Jefferson are also in a floodplain area (third priority). On the west side of Jefferson to the west and south of Anchor Road are numerous structures presently at risk of flooding, and a new pump house across from Macon Street will be needed to alleviate this problem. Re-design and engineering to increase pump capacity and flow discharge will greatly lessen or remove the flood risks for eight homes south of Anchor Road, in the 100-year floodplain, and four inland homes along the Schmidt Drain at Hendrie and Kingsberry Streets. There are also an estimated two homes and two apartment buildings that are within a lower-risk floodplain area, west of Jefferson Avenue. To the north of Farwell Street are about 45 houses that are in a lower-risk floodplain area (last in priority).

In summary, there are three NFIP repetitive loss structures in this community (top priority). There are about 224 structures in floodplain areas that are known or assumed to have suffered damages or to be at greater than base-flood risk levels (second priority). There are also about 271 structures that are at risk due to their location in 100-year floodplain areas, but have not yet had damage reported (third priority). At lesser risk but still worthy of mitigation efforts to avert future damages are about 323 structures in lower-risk floodplain areas, and in addition there are about thirty six homes protected from flooding by dikes or berms which may be susceptible to weakness or failure at some point in the future (last in priority). This section also described other at-risk properties and a number of roadways which continue to be flooded over on a regular basis.

3.2.5 Clinton Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in December of 2012. This jurisdiction also has numerous problems needing mitigation. Descriptions of these problems are organized into paragraphs below according to the section of the township in which they are located. In general, one of the largest problems is that the Clinton River, with an 860 square mile watershed that is rapidly being urbanized, flows through this community and requires expensive cleaning and maintenance to prevent floods from occurring in the township. This would include removing debris from the main channel and middle branch, stabilizing riverbanks, and removing trees that are about to fall into the channel.

Section 2 – One house seems to be in a lesser-risk (probably 500-year) floodplain just west of Elizabeth Road in the far north of the section. Although it sits relatively high, it appears to be located very close to the floodway (last in priority).

Section 3 – Two houses next to the Miller Drain just east of Heydenreich may be at risk since they appear to be in the 100-year floodplain area (third priority).

Section 4 – One house on the east side of Romeo Plank Road just north of 19 Mile Road appears to be in a 100-year floodplain (third priority). A total of five houses on the western edge of the section seem to be in a lesser-risk floodplain (last in priority).

Section 5 – A total of 10 houses appear to be in lesser-risk floodplain areas around the Middle Branch of the Clinton River, the Groth Drain, and Sloede Ditch (last in priority).

Section 8 – Three houses appear to be in a lesser-risk (500-year?) floodplain—two near Romeo Plank and Greenfield Roads, and one on Canal Road. The three Chippewa Valley High School buildings also appear to be located in such an area (last in priority).

Section 9 – Along Heydenreich Road north of Cass Avenue, there are problems where the road crosses the Clinton River Middle Branch and the Miller Drain. The bridge over the Middle Branch floods over, and the roadway floods at the Miller Drain crossing. In addition, two nearby houses (one to the north and one to the south of the Miller Drain) are located in the drain's 100-year floodplain area. Two more structures are in the floodplain of the Clinton River on the south side of Cass Avenue (third in priority). Eight apartment buildings near Cass, east of Romeo Plank, appear to be located in a lesser-risk floodplain area. Another of these buildings seems to be located in a 100-year floodplain, but no known flooding of any of these was known to local officials. In a subdivision southeast of that area, some street flooding occurs on Ingram Drive, but no houses have been known to be affected. Farther to the east along Cass Avenue, about twenty four houses and two larger buildings are in lesser-risk floodplains (last in priority).

Section 10 – North of Cass Avenue and West of Little Road is a floodway/floodplain area placing five houses and a greenhouse at risk (third in priority).

Section 12 – There are three houses on the north side of South River Road, just east of the Mount Clemens city limits, which are in a lesser-risk floodplain area (last in priority).

Section 15 – South of Cass Avenue, along Belleview Street, are eight homes which appear to be in the 100-year floodplain. According to local officials, however, these houses sit on higher ground than the surrounding landscape and so are at lesser risk (last in priority). South and southwest of this, along the north of Moravian Drive, are two homes by the Clinton River that are in a floodplain. On Belleview, southeast of Moravian, are two houses in a floodplain, along with the snack bar and maintenance shack for the Hillcrest Country Club. One of these floodplain structures is scheduled to be acquired and removed, once approval is

received for the Macomb Hazard Mitigation Plan and authorizes funding for the project. Three other homes marked on USGS quads in this floodplain area were no longer known to be in the area (third priority). Eight homes along Moravian Drive, Balfour, and Gary Streets that had been located in the 100-year floodplain were assessed by local officials as being lower risk. In the same area (and on Harrington Road) are nineteen homes that are in lesser-risk floodplain areas (last in priority).

Section 16 – The top ongoing concern in this area once these structures have been removed is that Clinton River Road regularly floods over in the area south of Canal Road. This road is locally important for residential use in an area that is quite well-populated, and during these flood events, it no longer becomes safe to use (second priority). On the south shore of the Clinton River in this section are two houses that appear to still be in a 100-year floodplain area, on Riverhill Drive and Cypress Street (third priority). On the north side of Clinton River Road, there is a house in the 100-year floodplain which local officials have assessed as lower-risk, and there is another house identified in a lesser-risk floodplain. South of the Clinton River, on Shana Drive and Byriver Street, are eleven homes in a lesser-risk floodplain. There are two more such houses on Riverhill Drive (last in priority). Although the USGS quad for this area shows eleven houses in a floodplain on Kerner Street, these houses were removed in the mid 1980's and the land was purchased by the Township in the mid 1990's to turn the area into a park.

Section 17 – There are two houses on the south side of Clinton River Road, just west of Romeo Plank, that appear to be in the 100-year floodplain (third priority).

Section 19 – Three houses on the north side of River Lane are in 100-year floodplains, and their risks have been confirmed by the observations of local officials. Three houses just north of there, on the east side of Hayes Road, are also in floodplains, although no flood damages have been reported to officials. The same status applies to a house on Millar Road just south of the Clinton River (third priority). The fire station at the corner of Garfield and Clinton River Road appears to be in a floodplain, as is the DPW garage to its south and a house south of that (on Millar Road). Although these are all in 100-year floodplain locations, they were assessed by local officials as being at lower-risk. This was also the case with a house on the south side of River Lane at Hayes Road, and 18 other houses on the north side of Millar Road. There are also three houses near Clinton River Road and three on Millar Road that are in lesser-risk floodplain areas. Surfaces in the south end of a trailer park in this area have been reworked (cut and filled) to better handle drainage waters, since the area was originally identified as a floodplain. Water is still seen over some local streets, however, and Millar Road gets flooded over where it crosses the Crooked Brook Drain in the southwest of this section (last in priority). Sewage disposal facilities that were in a floodplain area next to the DPW garage no longer exist. An at-risk structure at the end of River Street also no longer exists there.

Section 20 – There is flooding over Clinton River Road in this area where it crosses over the Marsh Drain (third priority). Along Clinton River Road are fourteen houses in a lesser-risk flood area, and one that is in the 100-year floodplain but assessed as lower risk by local officials. There are also two apartment buildings in the lesser-risk floodplain, and there are two more that appear to be in the 100-year floodplain but which apparently were engineered to avoid flood damages and so are classed as lower-risk. Along the south side of the Clinton River (at scattered locations on numerous different streets) are six houses in 100-year floodplain areas but assessed as lower-risk by local officials, and about 28 houses in lesser-risk floodplains (last in priority).

Section 21 – Fifteen structures are in lesser risk floodplain areas at the ends of Delta and Byriver Streets. In addition, another three structures appear on the USGS maps on Joanne

Drive, and one more appears where Miles Street curves around near the Harrington Drain. Where Millar Road curves around into Nunneley Road, there are about five more houses in a lesser-risk floodplain, and nine houses that appear to be in the 100 year floodplain but which officials have assessed as being at lower risk (last in priority).

Section 24 – There is an erosion problem here, for which a bank stabilization project has been proposed, affecting about 2,000 feet of the drainage channel.

Section 28 – Next to the Harrington Drain are three structures that are in lesser-risk floodplains, at the end of Doty Lane and Nunneley Road (last in priority).

Section 29 – Only two houses were identified as being in lesser-risk floodplain areas in most of this section, with some possible risks in the southwest of the area probably having been mitigated by the engineering around subdivision developments in a former floodplain area (last in priority).

Section 30 – Around the Crooked Brook Drain in the northwest of this section are seven houses in the 100-year floodplain (third priority) and two others nearby that are in a lesser-risk floodplain area (last in priority). There is a pump station in this area that needs to be re-designed and engineered to increase its capacity and avoid back-ups.

Sections 35-36 – The Cottrell Drain causes some backyard flooding in this area, due to blockages that need to be cleared from its channel (last in priority).

In summary, Clinton Township has had one identified NFIP repetitive loss structure, and several surrounding it, removed (Section 16). It has some urban flooding problems along the M-97 Groesbeck Highway (especially between Kerry and Carlier Streets, which carries an average of about 40,000 to 50,000 vehicles per day) and frequent flooding over the road at Kelly Road and 15 and 16 Mile Road, which are also major streets in the area (these conditions were not described in the sections above.) Clinton River Road also floods over in section 16 of the township (second priority). There are about thirty two houses and three other structures throughout the township that are in 100-year floodplain areas, and two spots where flooding over important local roadways is a significant problem (third priority). There are about 208 houses and twenty other structures that are in lesser-risk floodplain areas or which have otherwise been considered at less than 100-year risks, along with at least one area of minor street flooding (last in priority).

3.2.6 Eastpointe

Although FEMA had not mapped a flood plain in Eastpointe, that may change in the future. The city of Eastpointe has no identified floodplain areas within it, and no open drainage ditches either—any flooding problems stem from its location in the midst of the most heavily urbanized areas of Macomb County. Thus, the city's flood problems are of the "urban flooding" variety. About 85% of the city is served by combined storm and sanitary sewer systems. Only the northeastern 15% has these systems separated from each other. As a result, sewer backups may result in basement flooding and accompanying health concerns due to the nature of that type of floodwater. Many homes in the city were built with backflow preventers, but some homeowners have removed them over the years, due to ignorance about their function in preventing sewer backups into the basement. The city uses restrictive catch basin covers, so that most of the excess water can be kept from overwhelming the sewer system and possibly going into basements.

The city's current focus is to videotape and clean appropriate sections of its sewer system, to keep it functioning as well as possible. Structural damage found in the system is also repaired in a timely fashion. The result is that there are no areas of the city specifically known to have higher risks of flooding than others, but in some exceptionally heavy rain events, basement flooding does occur. Up to a foot of water may collect in some basements. Sometimes there are very few houses with any basement flooding, but other times, quite a few houses may have problems. The city has 13,965 housing units, according to the 2000 census. In the last two years, there have been about three events where ten or more houses reported flooding. The largest event was in July of 2000, in which two to three hundred houses reported problems. In September of the same year (the time of the disaster event in neighboring Wayne County), there were also problems, but many of the affected houses had already been damaged by the July event. Since the areas with combined sewer systems are more prone to flooding, a solution could be to separate the sewer systems in the rest of the city. It has been estimated that such a project would cost more than a hundred million dollars and take more than 10 years to accomplish.

3.2.7 Fraser

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in September of 2006. In the city's southeast section is an area that floods regularly. It is a residential area known as Venetian Village, and includes such streets as Rainbow, Winsom, and Slumber Lane, but the area of worst flooding occurs around Breezeway and Eveningside Streets. About 200 homes in this neighborhood are considered at-risk for basement flooding. During each severe rain event, about fifteen to twenty houses report basement flooding, but they are not always the same houses—risk is evident throughout this neighborhood but isn't pinpointed so precisely. Flooding in these homes is usually about an inch or two of water, and so damages usually vary depending on the presence of carpets or other items at floor levels in the basements of these homes, or nearby items subject to ill effects from excessive dampness. Masonic Road, to this area's north, and 13 Mile Road to its south, also get flooded over regularly. The city has an extensive plan for cleaning out its drains to prevent flooding, but in this southeastern area, the nearest such drain is the Sweeney, a mile or more away to the west (second priority).

In the north of the city, between the Harrington and Faulman Drains, are two small neighborhoods that are within a 100-year floodplain, comprising twenty three homes in and around Garfield Circle, four buildings to its north, twenty three structures in Woodside Manor further north across Mulvey Avenue, nine more homes along Garfield Road, four homes along 15 Mile Road, and an industrial building and six more homes adjacent to the Harrington Drain itself. Twenty other homes nearby (mostly along Windham Lane) are in 100-year floodplain areas, and local officials agree that these homes are at-risk from flooding (third priority). In that same area, there are 19 homes in lesser risk floodplain areas (between 100-year and 500-year limits). Also, part or all of seven industrial buildings on Klein Avenue are in this kind of lesser-risk floodplain area (last in priority).

In the western part of the city, there are various homes in 100-year floodplain areas: two on 14 Mile Road, thirteen on Kingston Drive, twenty two on Norwich and Oxford Courts, fifteen on Cambridge Drive, and forty more houses on streets like McNamee and Grove, down to the geographic limits of the NFIP study (near Hanover Street) (third priority). In this same area, thirteen houses and two buildings on or near 14 Mile Road, three houses between Toulouse and Luxemburg Streets, four houses on Kingston Drive, and twenty two houses from Hampton Court to Sherwood Lane, are located in lesser-risk floodplain areas.

In the central area of the city, there appear to be three houses and one building within the 100-year floodplain surrounding the Sweeney Drain (third priority). Five houses are in lesser-risk floodplain areas along the Sweeney Drain just north of 14 Mile Road, and 15 houses and two buildings along this drain to the south of 14 Mile Road (last in priority).

The city has a plan for cleaning out its drain systems to improve their capacities and reduce flood risks. There are projects suggested for areas of each of the city's major drains, cleaning out muck, trees, sediment, cleaning culverts and gratings, and even re-grading sections of the Harrington Drain. However, as these types of projects may cost hundreds of thousands of dollars, it is difficult for the city to fund them at the present time. One project, to remove trees and brush from the Harrington Drain and excavate a new section of the drain, is expected to remove about forty homes from the floodplain if it can receive funding to complete it.

In summary, the city has a residential area (with up to 200 houses) that floods regularly, along with nearby streets (second priority). There are about 186 structures located in 100-year floodplains (third priority) and 92 in lesser-risk floodplains (last in priority).

3.2.8 Harrison Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in December of 2012. This area has some of the most severe flooding problems in the entire county. There are 10 NFIP-identified repetitive-loss structures. These houses are included in the counts of structures located in floodplains in the descriptions below (highest priority). It must be noted that although there are 10 NFIP “repetitive loss structures” in this jurisdiction-the official list had misclassified several of the addresses. One property had been classified as a St. Clair Shores property when, based on its address, it is actually located in Harrison Township. Another property has been classified in Harrison Township that was actually located in St. Clair Shores. These errors have been reported to FEMA for eventual correction.

In the strip of land west of the Selfridge A.N.G. Base, most structures are either located in lesser-risk floodplain areas (between 100-year and 500-year risk levels) or actually experience regular flooding. Of highest concern in this area is the area of manufactured homes (known as Willow Point) north of Joy Boulevard along Lenfesty Drive. Although the area is mainly considered only a lesser-risk floodplain (Zone B), local officials report that the area is subject to repeated urban flooding up to the L.C. Pankow Career Center from runoff waters which flow through there and the undersized nature of the Irwin Drain. It is a very flat area, with waters from north and south flowing toward the Irwin Drain that passes through from west to east. Waters cannot flow away from the area quickly enough through this drain, whose capacity is exceeded, and 2½ to three feet of floodwater have resulted, causing damages throughout the mobile home park. The flooding here probably affects about 90% of the units in this mobile home park to some degree, and this park has about 300 sites in it. Damage varies from personal property to structural damage to the units as most units are uninsured due to the lower incomes of the residents. Roads in the area are impassable and there is widespread surface flooding that affects all area residents. It is estimated that a higher capacity drain would reduce area damages by about 60%. Along with the need for a deeper drain, part of the problem is that the nearby I-94 crossing is too high. Some arrangement may be needed with the Michigan Department of Transportation on this issue, and costs may exceed two million dollars. It may also be possible to gain easements in court, and to use assessments on property owners to help fund the projects. There has been quite a bit of documentation on this area of flooding, including numerous photographs, a newspaper article (The Macomb Daily, December 19, 1997), and owner comments at a public hearing in the late 1990's. Money has already been spent on an engineering study (second priority). About thirty eight commercial/ industrial buildings and two houses along Charles Street, Executive Drive, Irwin Drive and Production Drive are in lesser-risk floodplain areas, but Executive Drive is frequently flooded over and impedes access to this important industrial area. The County will try to have the Blankenburg Drain established as a county drain so as to allow them to address this problem (last in priority).

In the section of the township along the north side of the Clinton River, there are numerous areas at risk from flooding. The far eastern end of North River Road, near Belvidere Bay, frequently floods over, as does Island Street, making access very difficult for residents in that area. All of the houses and structures located east of the Selfridge Air Force Base are within the 100-year floodplain area and therefore at risk from high lake levels, storm surges, shoreline flooding, riverine or canal flooding events. Although nearly all of these roads have canals running between them, the water level in Lake St. Clair is currently low and therefore temporarily alleviates most of these flood risks. From USGS quad information, there are estimated to be 351 houses and ten commercial or public structures in this floodplain area (second priority). Along North River Road (and Grandview Street) to the south and southwest of Selfridge, there are an additional twenty nine houses in the 100-year floodplain of the Clinton

River (third priority). In that same area (including Maplewood Street) there are about 67 houses that are in lesser-risk floodplains (last in priority). A recently developed area at the end of Sea Ray Boulevard was engineered to resist damages, and it contains a number of minor roads that service a marina, with boat condominiums built on filled and raised ground for their protection.

In the far eastern portion of the township to the south of the Clinton River is another area of severe flood risks—extending from Metropolitan Beach, over the Black Creek, and to the Campeau Bay on Lake St. Clair. Nine of the 10 repetitive loss properties in Harrison Township are located in this area, one of which is of a non-residential type. This area also has almost all of its residential roads adjacent to canals or water bodies, and almost all of the houses are in 100-year floodplain areas, but fortunately infill development in this area has been constructed above base flood elevations. According to USGS Quads, there were 569 houses in the 100-year floodplains in this area (second priority). South River Road regularly floods over at Lakeshore Drive and down toward the boat ramp at Sunshine Point (third priority). Most of the structures (about twenty buildings) in the Metropolitan Beach Recreational Area itself are in lesser-risk floodplain areas (last in priority).

Between the Clinton River and Metropolitan Parkway are some large neighborhoods. For ease of reference, the easternmost of these (northwest of Metro Beach, with Emerick Street running through it) will be referred to as the "eastern section," a middle area (the homes and neighborhoods on Columbia Street and Shoreline Drive over to those on Memory Lane) will be referred to as the "middle section," and a large western area (west of Memory Lane to the township edge) will be referred to as the "western section." In the western section is an area which USGS quads have marked with about twenty five apartment buildings, which now has even more developments around it, that local officials consider top-priority for mitigation efforts in the township. This priority comes from the amount of benefit that could accrue from a relatively minor outlay of expenses (about \$150,000) to improve pumping capabilities at the North Point Parkway Station and retention pond south of these apartments. Runoff has increased from new apartments to the west and full development of the area to the north of them with expensive homes. Existing pumping capabilities are now considered substandard for the area's needs, and they should be increased to mitigate drain overflow flooding (second priority). The eastern section has most of its houses located in 100-year floodplain areas. Using information from USGS quads, this means a total of about 253 homes and two buildings. Forty-one other homes that were classed as lesser-risk on the FIRM, located along and near the banks of the Clinton River (between Muffatt Street and Clearview) should instead be considered higher-risk floodplain properties because of runoff problems in that area, street and stream flooding. The middle section has about 116 homes in the 100-year floodplain. The western section has 46 houses in the 100-year floodplain, located along the River and drains running through that area (third priority). In the eastern section, there are about 40 homes and four buildings in lesser-risk floodplain areas, while the middle section has about 169 houses and the South River School building in lesser-risk floodplain areas. The western section has most of its structures located in lesser-risk floodplain areas, which are estimated from USGS quads as totaling 698 houses (last in priority). Many new developments are reported to now exist in the middle section, but such are typically designed to avoid damages from flooding, and so are not included as at-risk even if their locations had previously been considered floodplains.

In the southwestern part of the township, south of Metropolitan Parkway, but west of Cherry Lane, are numerous built-up areas, which will be referred to as the "northeast section" (extending from Cherry Lane to just west of Siesta Street), the "central section" (extending from just west of Siesta Street to the Clinton River Spillway, and the "south section" (from the Clinton River Spillway south to the borders of the township). The south section contains an NFIP repetitive loss property (highest priority). In the northeast section, most of the houses appear to

be in 100-year floodplain areas, which according to USGS information amount to about 292 houses. In addition to these, local officials identified about 30 others that they felt are at similar risk, due to their location near a drain that has difficulty bearing current runoff from inland areas. Also, by the waterfront in the northeast section, 160 houses that were classed as lesser-risk on the FIRM were assessed by local officials as having flood risks comparable to location in a 100-year floodplain. In the central section, there were about 76 houses and one shoreline building in 100-year floodplain areas. In addition, about 10 houses along Campeau Lane were assessed by local officials as being similarly at-risk due to the condition of the Murdock-Ballard Relief Drain. This drain will be worked on, but this is expected only to reduce rather than eliminate flooding there. Pump station and detention basin improvements had been prepared at one time but for some reason the projects died. In the south section, there are about 65 houses and two apartment buildings in the 100-year floodplain near the shoreline (third priority). In the northeast section, about 59 inland houses and St. Hubert's Church appear to be located in lesser-risk floodplain areas, the area all along the Vander de Buff Drain along Metropolitan Parkway suffers from flooding but doesn't impact any structures there, and pumping station adjustments at Jefferson and Siesta Street have alleviated problems from high lake levels causing inland flooding through those outlets. The Advance Measures program implemented some improvements to the drain at Jefferson Avenue. (Efforts were also directed at the Murdock-Ballard Drain and the Petit Colet improvement projects.) In the central section, there are about 432 houses and 13 other buildings in lesser-risk floodplain areas, including the Jefferson School, a hospital, and water works facility. New development has occurred in this area and those developments have been engineered to avoid flood damages. About eight houses on the waterfront near the spillway that were identified as at-risk are no longer located in that area, according to local officials. In the south section, there are about 106 houses, three buildings, and portions of two other buildings that appear to be located in lesser-risk floodplain areas (last in priority). More generally, there is a pump station in this area that has been re-designed and engineered in 2009 to increase its capacity and prevent back-ups.

Two public facilities had been identified in Harrison Township that are located in flood-prone areas—Harrison Fire Station 2 and St. John's Hospital. The township built a new fire station out of the flood plain area in 2007, and St. John's Hospital (which is not a primary care facility) is scheduled to close operations in the summer of 2010.

In summary, there were 10 repetitive-loss properties reported in the township by the NFIP (highest priority), a 300-unit trailer park affected by regular flooding, neighborhoods with about 920 houses and ten other structures in 100-year floodplains that are susceptible to regular shoreline flooding from Lake St. Clair, and a residential area that would greatly benefit from a proposed mitigation project (second priority). There are 1,118 additional houses, five buildings, and some roadways in 100-year floodplains (third priority). In lesser-risk floodplains, there are estimated to be 1,581 houses, eighty one buildings, and some roads (last in priority).

NOTE: Although the Selfridge Air National Guard Base is located in this township, flood information for that military facility was not available and was not taken into consideration for this plan.

3.2.9 Lenox and Richmond Townships

An NFIP floodplain map for the Township of Lenox was developed by FEMA and was made available to the County and township in September 2006. An NFIP floodplain map for the Township of Richmond was developed by FEMA and was made available to the County and township in 2007. These two townships are considered together in this section of the report because the same local officials were contracted for both of them. Richmond Township is at a high elevation in the county and has its surface waters easily drain off into other, lower-elevation areas. According to local officials, Richmond Township has no areas of significant flooding. Lenox Township has some flood concerns, however, which will be listed according to geographic section of the township. The township's latest flood mitigation project has been to clean the Hill Drain between 30 and 31 Mile Roads to restore its drainage capacity. Funds (\$25,000) for this project were approved by the Intra-County Drainage Board from its Drain Emergency Operations Fund, part of the County Public Works Department, and the drain cleaning has been completed. For the last fifteen years, the township has also been involved in floodplain management efforts.

Section 6 – Place Road experiences flooding in the north of the section up to 32 Mile Road. The depth of water over the road in 2002 was about two feet, which caused a couple of cars to become stuck there. According to SEMCOG data, average traffic volume on this road in both directions is just under 300 vehicles per day, so this hazard will be classed as a local road that is temporarily impassable (third priority). One house on 31 Mile Road at the East Branch of Coon Creek was considered to be in a lesser-risk floodplain (last in priority).

Section 7 – The Hill Drain in this section has been cleaned, to help alleviate property flooding nearby. Widening of the drain may also be necessary.

Section 8 – One house on 30 Mile Road to the east of Deer Creek appeared to possibly be in a floodplain location, although local officials knew of no problems for that structure. The township has not had any thorough mapping of its flood risks, so it is not known whether this house should be classified as being within a 100-year floodplain or one of lesser risk (last in priority).

Section 10 – Lowe Plank Road, between 30 Mile Road and 31 Mile Road, experiences severe flooding with water depths up to three and four feet. Every big rain puts this road under water. The worst area of flooding there is at the northern third of this stretch of road. Average daily traffic in both directions, according to SEMCOG data, is roughly 400 vehicles (third priority).

Section 11-12 – 30 Mile Road gets flooded over with one to two feet of water, between the Grand Trunk Western Railroad tracks and Gratiot Avenue. According to SEMCOG data, about 400 vehicles per day, on average, would pass through this area, most of them traveling west away from the city of Richmond (third priority).

Section 16 – Near some small lakes in the south of this section are about seven homes between Smith Street and 29 Mile Road that appear to be susceptible to basement flooding. Local officials have received complaints of such damages, one of which was then confirmed (second priority).

Section 17-18 – Two houses in section 17 near Smith Creek on 29 Mile Road appear to be in a lesser-risk floodplain area. Similarly, one house in section 18 on 29 Mile Road near the Hill Drain appears to be in a lesser-risk floodplain area (last in priority).

Section 20 – One house on 28 Mile Road near the Deer Creek appears to be in a floodplain. No specific information was obtained or available about its risk, and no damages

were known to local officials, but this house is estimated to be in the creek's 100-year floodplain (third priority).

Section 30 – Five houses in this section appear to be in floodplain areas. A more detailed assessment of their risks was not possible for the current study, so they will be considered to be in lesser-risk floodplain areas until more information becomes available (last in priority).

Section 36 – 27 Mile Road at County Line Road is an area that experiences serious road flooding, with water depths estimated at two to three feet deep. This area is a locally important traffic route, with County Line Road handling an average of 7,000 to 8,000 vehicles per day (in both directions). Flooding in this area also blocks access for emergency vehicles (second priority).

In summary, the township's top problems are the flooded roadways in its southeast section, and the seven homes that experience or are at risk of basement flooding in Section 16 (second priority). Three other areas of road flooding are of local concern, and a house appears to be in the floodplain in section 20 (third priority). A total of ten other houses throughout the township may be in floodplains as well, but these are probably lesser-risk floodplains (last in priority).

3.2.10 Macomb Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in November 2013. Macomb Township has a number of at-risk locations—most of which will be described below according to the geographic sections in which they are located. Included in these locations are four repetitive loss properties – a FEMA list had classified only three in the township, but there are actually four, including a property that had been listed for the City of Mount Clemens but whose address is actually in the Township. Some flood problems are more widespread than specific locations however. The top priority hazard in the township has to be the extensive, severe, and repeated flooding of North Avenue. Such flooding extends along this road for practically the entire length of the township, from roughly ¼ mile north of M-59 all the way to its northern boundary at 26 Mile Road. In the south of the township, this road averages 23,000 vehicles per day and is therefore a major local road. In the midst of the township its traffic counts are about 16,000 vehicles per day, and about 9,000 vehicles in the north of the township (highest priority). Some of the crossroads also experience flooding in the vicinity of North Avenue, such as 24 Mile Road for about a third of a mile to its west (over 1000 vehicles per day on average), and 23 Mile Road (which is in a floodplain for a third of a mile to either side of North Avenue and averages more than 20,000 vehicles per day) (second priority).

Section 8 – In the floodplain of the Middle Branch of the Clinton River, according to USGS quads, are three houses in the 100-year floodplain. In addition, local officials have identified three more houses that are now at similar risk, due to current river conditions (third priority). There are also two houses that appear to be located in lesser-risk floodplain areas (last in priority).

Section 9 – There is only one house in the section that was identified within a floodplain. It is near 24 Mile Road and the Hammond Drain, in the 100-year risk area (third priority).

Section 12 – There are two houses alongside Deer Creek that appear to be located in its 100-year floodplain area (third priority).

Section 13 – There are seven houses near the intersection of North Avenue and 23 Mile Road that are in a 100-year floodplain area (third priority).

Section 14 – There are two houses near the North Branch of the Clinton River that are in its 100-year floodplain (third priority).

Section 17 – In the 100-year floodplain along the Middle Branch of the Clinton River in this section are six houses (third priority). There is also one house in a lesser-risk floodplain (last in priority).

Section 20 – There is one house in the 100-year floodplain of the Clinton River Middle Branch, on the east side of Romeo Plank Road (third priority).

Section 21 – Just west of the Filch Drain is a house in its 100-year floodplain. There is another near a drainage ditch to its east (third priority). There are three houses in a lesser-risk floodplain area west of the Clinton River Middle Branch, at the intersection of Romeo Plank and 22 Mile Road (last in priority). New subdivision developments in this (and other) areas of the township are assumed to have been engineered to avoid flood damages.

Section 22 – There is a portion of Card Road that regularly floods over where it crosses the McBride Drain. About 12,000 vehicles use this part of the road on an average weekday (third priority). Two houses that used to be in a floodplain on Card Road in this area have been replaced by a new school development.

Section 23 – Along the perimeter of this section, along Card Road, North Avenue, and 23 Mile Road, are a total of about 43 houses in 100-year floodplain areas (third priority). There is also a house in a lesser-risk floodplain area on North Avenue (last in priority).

Section 24 – An NFIP repetitive loss property is located in this area (highest priority). Also in this section along North Avenue there are about 25 houses and two buildings (a hall and country club building) that appear to be located in a floodplain area (third priority). There are also two houses in a lesser-risk floodplain area (last in priority).

Section 25 – Near North Avenue are three houses identified in floodplain locations, and nineteen others along Rochelle Street. There are several new streets now located south of Rochelle in the floodplain area, which were designed to avoid flood damages (third priority). There are four houses in lesser-risk floodplain areas (last in priority).

Section 26 – There are an estimated seven houses and three buildings in the 100-year floodplain area in this section (four others shown on the USGS map have since been removed (third priority). There are an estimated twenty one houses in lesser-risk floodplains in this section (last in priority). New subdivisions have been built in this area but it is assumed their builders were cognizant of flood risks and designed their developments so as to avoid future damages.

Section 27 – There are only two houses identified in 100-year floodplains (third priority) and five in lesser-risk floodplains in this section (last in priority).

Section 28 – The top priority in this section is road flooding over 21 Mile Road just east of the Middle Branch of the Clinton River, which is encroaching on expensive homes in the vicinity. 21 Mile Road in this area carries a daily average of about 21,000 vehicles and is an important local road (second priority). There were only two houses identified in lesser-risk floodplains (last in priority).

Section 29 – Only one structure in a lesser-risk floodplain in this section (last in priority).

Section 30 – Only two structures were identified in 100-year floodplains in this section (third priority).

Section 31 – About four homes along Canterbury are in lesser-risk floodplain areas (last in priority).

Section 33 – Flooding over 21 Mile Road is encroaching on expensive homes in a nearby subdivision (as related in the description for section 28) (second priority). Three houses are in lesser-risk floodplain areas in this section (last in priority). One commercial building that had been in a floodplain has had its risks mitigated by the construction of a nearby retention pond.

Section 34 – Only one house identified in a 100-year floodplain in this section (third priority). Eight other houses appeared from USGS maps to be located in lesser-risk floodplain areas, but two or three of these have probably been replaced by new developments that have been designed to avoid flood damages (last in priority).

Section 35 – There are three repetitive loss properties located within this section of the township (highest priority). It was proposed in 2002 that four houses in a floodplain area on Patnik Street be elevated by four to six feet to avoid future flood hazards (second priority). These four houses were razed with the assistance of federal flood mitigation funds and local matching funds in 2005. Twenty-four other houses in this section appear to be located in 100-year floodplain areas (third priority). Twelve houses appear to be in lesser-risk floodplains (last in priority). One structure that is on the USGS map but is now gone was an old farmhouse that used to be in the 100-year floodplain.

In summary, Macomb Township's most pressing flood problems involve road flooding conditions which greatly impede traffic and in some cases even affect nearby houses, including four repetitive loss properties (highest priority and second priority). Four houses in a floodplain have been proposed for elevation to reduce risks from flood hazards (second priority). There are also about 153 houses and five buildings in 100-year floodplains throughout the township (third priority). Finally, 66 houses appear to be located in lesser-risk floodplain areas (last in priority).

3.2.11 Mount Clemens

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in December 2012. Although a FEMA list states that the city has one repetitive loss property, according to the street address, that property was determined to be located in Macomb Township and has been addressed in that section of this plan. FEMA has been informed about the error in their list.

Two-thirds of the city has separated sanitary and storm sewer systems, and one-third has these systems combined, which is less safe and efficient at handling their contents. The Clinton River runs through this city (along with part of a spillway to more directly allow its waters to reach Lake St. Clair) and groundwater levels rise along with those of the river, causing infiltration into sanitary interceptors. Sanitary back-ups result in basement flooding in a row of an estimated 20 homes along Wellington Crescent Road west of Gratiot. In one of the areas of combined sewers, there is street flooding that occurs on parts of a major highway that goes through town—northbound Gratiot (M-3), which carries an average of at least 15,000 to 20,000 vehicles per day toward downtown Mount Clemens. Most rainstorms that precipitate more than a quarter-inch of rain per hour will cause flooding along that street, particularly between Church and Robertson Streets, where waters can reach a depth of one foot and therefore seriously impede traffic flows (second priority). Other street flooding of concern occurs on portions of Rose Street—one property north of Cass Avenue, one property at the intersection with Hubbard Avenue, and another one north of Church Street. Next in priority for urban street flooding, as identified by local officials, is Hubbard Avenue between Washington and North Avenues, followed by Cass Avenue between South Gratiot and Lodewyck (in front of the Mount Clemens High School and library), Riverside Drive around Woodside Circle, Elizabeth Road near North Avenue, and Clinton River Drive east of the Edison Charter school. It must be noted that flooding near the school impedes emergency access (third priority). There are eight houses that appear to be located in a 100-year floodplain area in the southwest side of the city, northeast of McLaren Macomb Hospital, but which were assessed as lower-risk by local officials. Comparisons of USGS and FIRM data showed sixteen other houses and four buildings throughout the city that were shown as located in lesser-risk floodplain areas. In addition, various other areas are located in floodplains, but due to their higher densities of development, the USGS does not provide information on the specific number of structures in these areas, merely shading them on the maps to show their urban nature. It is estimated that there are 38 houses (along with the Edison Charter School and two trailers associated with it) in the area east of Barbara Street and south of Robertson Street, forty houses in the area east of Meadle Street and north of Robertson, 30 houses around Michigan, Gibbs, Judge, and Avery Streets, and probably six more around 1st Street and Riverside that are all in lesser-risk floodplain areas. This totals 142 structures throughout the city (last in priority). Two large buildings that appear on USGS quads as being in a floodplain are actually part of a marina and so are not considered vulnerable.

3.2.12 New Baltimore

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in December of 2012. Practically all of this community's flood problems are in the shoreline area south of Main Street, especially since the Crapeau Creek on the north side of the city underwent a dredging operation in 2008, which alleviated flood risks to many of the properties in that area. According to local officials, the highest priority among the city's flood problems should be given to a residential shoreline road (Base Street to the southeast of Front Street) which experiences regular flooding during high water levels but the road is only 10 feet wide and therefore very difficult to use to gain access to during such events. According to USGS information, there are ten houses in this area (classed as 100-year floodplain), and seven others in more inland locations around this road. Two of these houses are NFIP-identified repetitive-loss structures, and sandbagging activities have been observed to try to protect other floodplain structures from damage (highest priority). It must be noted that a FEMA list of repetitive loss properties had classified three properties as being within the jurisdiction of New Baltimore. Based on the street addresses it was determined that one of these properties is actually in Chesterfield Township, a correction that has been addressed in that section of this plan for that community. FEMA has been advised of the error in the official list.

There are about 18 other houses located in 100-year floodplain areas, south of that area. They are located on Taylor, Rose, Viola, Bal Clair, Schmid, and Lempke Streets. Due to their shoreline locations, it is assumed that most of these houses have actually experienced flood damages in the past (second priority). In the vicinity of these homes are about 28 others that are classified as lesser risk on the published FIRM. Due to the difficulty of accurately matching the Flood Insurance Rate Map to the precise locations of these homes, and their proximity to canals and other shoreline flood hazards, it could be advisable to consider them as if they were all located in the 100-year floodplain during periods of high lake water levels, as in the events of 1985-1986, or during periods of storm surges or strong winds (as occurred in a 1997 event). Use of sandbags and dikes are typical during periods with high lake levels to protect these areas from damage. A final, unique problem in this community is that because of some drainage problems on Green Street (the main business/commercial street through town), various businesses that are located close to the road suffer from water that is splashed by vehicles against them. This condition must surely also discourage many pedestrians from walking in this important business area. Drainage improvements have been proposed as part of a state highway (M-29) project, but no action has actually been taken on this idea yet. The highway averages 20,000 to 30,000 vehicles per day (third priority).

3.2.13 New Haven

An NFIP floodplain map for the village was developed by FEMA and was made available to the County and village in September of 2006. This village has some structures that appear to be in floodplain areas identified on the community's FIRM. The most serious risk area is probably where Haven Ridge Road crosses the Shook Drain. Local officials report that this bridge has undergone repairs. There are about eight houses here that seem to be classified in a 100-year floodplain area (third priority), and six more in the lesser risk floodplain area (last in priority). These houses either have Haven Ridge Road or Elk Street addresses. The area is known to have flooded in the past, although it has had no problems observed recently. The floodplain extends to the northeast of the area, and places some more houses at risk, along Clark Street, west of the railroad tracks. About two houses there are in the floodplain area (third priority) and two more are in a lesser-risk floodplain (last in priority).

Further north along the Shook Drain, where it crosses Clark Street (just east of Pine Street), there are about three houses in the 100-year floodplain (third priority). To the southeast, the Shook Drain passes by the dead-end of Morgan Street, where one house is also in the floodplain area (third priority). The drain also crosses Gratiot Road (M-19), where one structure is in a lesser-risk floodplain area (last in priority). Local officials have not received reports of any flooding in these areas.

On Main Street, between Carl Street and Will Street, heavy rains cause waters to flow off the road and pool in the yards of nearby homes which sit at lower elevations. Only the front yards of about twenty houses in this area have been affected (last in priority).

In summary, there are about fourteen houses in the 100-year floodplain in the village (third priority). There are also nine structures in the village that are in lesser-risk floodplain areas, with less than a one percent chance per year of flooding. There are also about 20 properties that experience yard flooding only (last in priority).

3.2.14 Ray Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in November of 2013. A problem that was noted by this community is that while homes that are built under elevated conditions are protected from flooding, such construction increases risks for low-lying homes due to fill and increased runoff. Local officials note that the Coon Creek must be cleaned, or it will fill in the area of New Haven Road and the water, having no place to drain, will back up over everything to the north. On the flip side, increased runoff from the Healy Brook being cleaned for a mile and a proposed 400-unit mobile home park at 28 Mile Road (which is being contested in court) will adversely affect the downstream community of Davis (a small unincorporated town).

There are several serious problems with flooding in Ray Township. North Avenue floods over just north of 29 Mile Road (average daily traffic—8,000 vehicles) and threatens nine structures in that area. Three of these structures are local businesses east of Ray Center, while the others are houses. All should be considered to be in a 100-year floodplain area. Water flows into yards and parking lots, to the front of a house, and in the worst case, one house had six to seven inches of water in it in February 2001. A house on North Avenue just north of 26 Mile Road was flooded in 2001 when the East Branch Coon Creek back flowed into the house, placing 18 inches of water into its basement. It is an older house with no backflow preventer. Twenty-six Mile Road, which carries an average of about 12,000 vehicles per day, was recently closed for three to four days due to flooding. Aerial rescue was needed for occupants of cars that were stuck in the water, which came right up to nearby houses, perhaps even damaging some of them. There are three houses on the north side of the road there that should be considered located in at least a 100-year floodplain (second priority).

At 30 Mile Road and Romeo Plank, the intersection floods over, and the road to its west had to be closed recently (average daily traffic about 400 vehicles). There are three houses nearby that these floodwaters approach during such events, but no known damages have yet occurred there. Thirty-one Mile Road experiences road flooding as well, between Hartway and Wolcott (a two-mile stretch), and the road was actually closed for a day due to this flooding. Vehicles range from 250 to 500 per day on average on this road, however there appears to be a house on it near the Priest Drain that is in a lower-risk floodplain area. An area of North Avenue with traffic averaging over 8,000 vehicles per day (near Coon Creek south of 31 Mile Road) also experiences road flooding. In section 25, there is a house just west of Coon Creek that should be considered to be in a 100-year floodplain. Floodwaters have been observed going up to this house, covering its driveway, and damages may be likely in the near future. Five houses on Indian Trail Road north of 26 Mile Road are also considered to be in 100-year floodplain locations (third priority).

The Tupper Brook is flooding over in the far north (in section 2), resulting in a yard-flooding complaint from a nearby homeowner. Farther south, yard flooding from this Brook occurs all along the east side of Indian Trail Road. Local officials state that this flooding is all from deposition into the drain, and that if the drains were cleaned, the problem would be alleviated (last in priority).

The following areas were also identified as problem areas during the flood event that occurred during the summer of 2004.

- North Avenue became impassable between 30 and 31 Mile Roads due to flooding
- North Avenue also became impassable north of 27 Mile Road due to flooding
- Indian Trail Road experienced flooding and erosion approximately 1/8 mile north of 26 Mile Road

- Romeo Plank Road became impassable north of 31 Mile Road
- Both Romeo Plank Road and 30 Mile Road experienced erosion of the shoulder and roadway
- Hartway Road became impassable north of 31 Mile Road due to flooding of the road and erosion
- Wolcott became impassable north of 31 Mile Road due to flooding of the road and erosion
- 27 Mile Road between Kunstman and Romeo Plank Road was made impassable due flooding and minor erosion problems
- The new bridge on 27 Mile Road east of Indian Trail Road was built too low and lies in the flood area which caused the road to be closed
- 28 Mile Road east of Indian Trail Road became impassable due to flooding
- 28 Mile Road east and west of Romeo Plank Road was impassable due to flooding
- A home along 29 Mile Road east of Romeo Plank Road flooded and had 3 feet of standing water in the living room.
- 29 Mile Road east of Hartway flooded
- 29 Mile Road west of Romeo Plank flooded
- 30 Mile Road between Hartway and Wolcott flooded
- 30 Mile Road between Hartway and North Avenue flooded
- 32 Mile Road between Wolcott and Hartway experienced flooding and road erosion

3.2.15 Richmond, City of

An NFIP floodplain map for the City of Richmond was developed by FEMA within the map for Richmond Township and was made available to the County and city in September 2007. The main problems experienced in this area involve runoff to low-lying areas in town, such as that south of Park Street and west of Main Street. The worst conditions involve snowmelt flowing over frozen ground, collecting in the yards of homes in this low-lying area. In some places, the water pools to depths of 2 1/2 feet. If connections could be made from these areas to street drains, the problem might be alleviated. Ridge Road has about eight homes that experience backyard flooding, which could be alleviated by the installation of a drain to carry waters away to the northeast. The affected yards are about 10 feet below street level.

Michigan Highway 19 (M-19) is prone to temporary flooding from heavy rains near the area of George Drive. The flooding generally reaches over the curb and subsides about one hour after the heavy rain event. M-19 is a major highway and flooding causes significant traffic backups, particularly during peak travel times. The cause of the flooding is believed to be due to insufficient pipe size and capacity.

Prior to 2006, the City of Richmond has had occasional reports of sewer backups into home basements during heavy rain events. The cause appeared to be surface water entering the sanitary sewer system and backing up to a bottle neck at the wastewater treatment plant. In 2006, the City of Richmond constructed a wet weather storage tank to temporarily store excess flow into the wastewater treatment plant. The city has also identified and corrected several cross connections allowing storm water to enter the sanitary sewer system.

3.2.16 Roseville

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and city in September 2006. The map showed no special flood hazard area within this community. The highest priority project for this city is to make improvements on their aging lift stations, which are relied on to prevent basement flooding. It is important to have reliable power backups for these stations. One station (on Washington between Little Mack and I-94) was built in the mid-1950s. The other station was upgraded in 1980 and is located on 13 Mile Road four blocks east of Hayes Road. Combined sanitary and storm sewer systems are located in the southern part of the city, and basement flooding is most common in the areas around Huron Park—usually amounting to a few inches of water on the floor in homes where there was backflow. There is restricted drainage capacity at and south of Frazho and Groveland that should be corrected. The idea of separating the sewer systems is currently lower priority and should be cleared with the downstream community of St. Clair Shores to ensure that it could handle water flows.

*Gratiot Avenue (M-3) was prone to temporary flooding from heavy rains just north of 12 Mile Road for a length four to five blocks long. This road flooding generally got about a foot deep and only lasts 1 to 1-½ hours, but since this is a major highway that carries an average of about 45,000 vehicles per day, such flooding during peak travel hours would cause probably 7,000 vehicles to be slowed or diverted onto other roads.

The basins along M-3 had been cleaned to help retain water away from the road in 2018.

3.2.17 Shelby Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and Township in November of 2013. Although official FIRM and USGS information had indicated numerous structures in floodplain areas of varying risk, local officials have observed very few incidents of flooding in the township. The area has sandy soils that drain water efficiently. Many new developments have included extensive use of retention ponds and detention basins to mitigate flooding. Although floodplains around the Middle Branch of the Clinton River have been identified as significantly overlapping developments in sections 9 and 16 of the township, local officials report that it is really only a creek with six inches of water that flows through this area. For the present, the FIRM is considered inaccurate (initially, 84 houses had been identified by this data source as being in 100-year floodplains, and 29 houses and one building in lesser-risk floodplains). By contrast, the only known area of flooding in the township is around the Recreation Area on either side of Ryan Road. Six structures are estimated to be in a 100-year floodplain in this area, the most significant of which is probably the Loft Bar near Ryan Road. Other structures in the area are generally little-used or less-important park-related buildings (third priority).

3.2.18 St. Clair Shores

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in December 2012. The city includes four properties that have been identified by the NFIP as repetitive loss properties. A FEMA list had mistakenly listed one Harrison Township property as part of St. Clair Shores, and vice versa, but this did not affect the total number of properties listed for each jurisdiction, and FEMA has been advised about the mistake.

The city still has risks from shoreline flooding, when lake levels are high, although things have greatly improved since the Flood Insurance Rate Map was made in 1979. Many problems had stemmed from the use of direct outlets to Lake St. Clair, which would provide an avenue for lake waters to flow inland under particular conditions. Only about a dozen direct-drainage outlets to the lake are still in use. Others discharge to the Jefferson area first, with pump stations to prevent back-ups, alleviating the major problems that used to exist. Flooding south of O'Conner Street is no longer a major problem, and the floodplain area north of that street will soon have a new pump installed by the U.S. Army Corps of Engineers. The flood problems in the city are now mainly to the east of Jefferson Avenue. A major project the city wishes to undertake involves the construction of a relief sewer from the northern city limits to the Hoffman Lift Station. The system currently cannot adequately transport rain-induced peak flows, with problems of untreated storm water discharges to Lake St. Clair resulting.

Four structures have been identified by the NFIP as having suffered repeated flood losses. Their locations are all near the shoreline of Lake St. Clair, on the eastern edge of the city (highest priority).

Between 9 Mile and 10 Mile Roads, a shoreline flood area includes marina buildings (which shouldn't suffer any major damages), a Coast Guard facility, and possibly a few restaurants. This area includes two properties (including one that is non-residential) that are on the NFIP repetitive loss list. A project has been proposed to reduce wave and flooding effects on the coast guard facility by replacing current culverts under its single-lane access road with either larger and more numerous culverts, or a bridge-like structure. 10 Mile Road east of Jefferson receives occasional street flooding, and a residential area extending four to five blocks north of 10 Mile Road (Statler Street) is still considered at risk from flooding. Houses in this area tend to have crawlspaces rather than basements, and flooding generally does not quite get above the first floor, but wave action worsens risks for these houses. Statler Street was shown in the FIRM as lesser-risk floodplain, but should instead be considered to be in a 100-year floodplain location, due to its problems of flood susceptibility. There are an estimated 150 houses in this area that are at-risk from flooding. Other areas of residential floodplain areas are the five or so streets south of Ardmore around Koerber Street (with about 150 houses), and the shoreline area east of Jefferson from 11 Mile Road up to about 13 Mile Road (with about 150 houses and two apartment buildings). Jefferson Avenue north of St. Gertrude experiences problematic street flooding, and it carries an average of about 20,000 vehicles per day (third priority).

The area around City Hall and the streets immediately to its south had previously been identified as a floodplain area, but are no longer considered a big problem area, meriting a Letter of Map Amendment (LOMA) to the FIRM. Structures north of 13 Mile Road currently have no more known problems, due to changes made in the drainage system, although the area includes one property that was designated by the NFIP as one of the repetitive loss type.

3.2.19 Sterling Heights

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in September 2006. This city has been extremely proactive in its flood mitigation efforts. Most of the risks identified on old FIRM and USGS data has now been eliminated, through home elevations, creation of retention ponds, and planned redevelopment of hazard-prone areas. Although a number of homes were identified from the old data as possibly at risk, there are currently no reports of homes in the city experiencing such flood risks. For example, apartment buildings located in a 100-year floodplain in one area near Van Dyke Road have their lowest level used for parking. The city actively participates in both the National Flood Insurance Program (NFIP) and the Community Rating System (CRS). A CRS information sheet reports that the city has qualified for discounts in its residents' insurance rates as a result of its activities. The city still has identified projects to keep drainage conditions acceptable for all parts of the community. For example, a section of the Plumbrook Drain has been identified as needing a capacity improvement and riprap protection on its banks, while other segments of the drain need sediment and underbrush removed, so as to restore full water-carrying capacities.

There is also an NFIP repetitive loss property located in the area northwest of Utica and Hayes Roads (highest priority).

3.2.20 Utica

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in September 2006. Two repetitive-loss structures are located in this city, both to the southwest of M-59 and Van Dyke, and one of them is a multi-unit structure (top priority). The Clinton River flows through this city, but the river has debris problems and needs dredging, so there are flooding problems on the south side of town. The city library and another building are in the river's 100-year floodplain just north of M-59. The other at-risk structures are all on the south side of M-59 and practically all on the west side of the Clinton River. There are about 54 houses, seven duplexes, and four buildings in this floodplain area. One of these is a relatively new building with 54 units for senior housing, which is three stories and has parking underneath it to help elevate the living areas above floodplain levels. However, an elevator shaft and related equipment is still affected by floodwaters. The equipment must be elevated, or the water at least pumped away from it. Other buildings include a collision shop, gas station, and car wash on Van Dyke Avenue, but these are elevated above likely flood levels. The worst area of flooding is around Davis Street south of Nichols Street, around where the duplexes are located. In some spots, the water depths are four to five feet over ground level, and homes are accessible only by boat. In 2000, the area flooded four times. Another flood event occurred in February 2001. It is proposed that the most affected homes be elevated so their living areas are above the base flood elevation. Davis Street itself suffers excessive heaving and cracking from the effect of these waters, and this could be addressed by replacing the base course and road surface of the road, with perforated edge drains added on each side of it (second priority). An automated pump to prevent street flooding used to be in this area. Currently, gas pumps are used, which are more cost-effective but need to be manned to operate. About five other houses in the city are in lesser-risk floodplain areas (last in priority).

3.2.21 Warren

An NFIP floodplain map for the city was developed by FEMA and was made available to the County and the city in September of 2006. Initial data from the FIRM and USGS indicate that it is the northern-central part of the city that has the most problems from flooding. These problems will be identified and discussed according to the sections in which they are located. Although these sections have extensive listings, local officials report that most buildings have been constructed slightly above ground level, and that no specific flood damages have recently been reported in the city from riverine flooding.

A broader goal throughout the city is one of public awareness—how residents can get water to drain away from the foundations of their houses to prevent basement flooding. Footing drains in many houses are tied into the city's sanitary sewers. A couple years ago, more than a hundred houses reported basement flooding. In a typical rainstorm, about eight or ten properties report basement flooding. There are a total of about 54,000 occupied housing units in the city, and those with problems are scattered throughout the city rather than in any specific area. The one exception to this is an area with the lowest elevation that has recurrent basement flooding, on Autumn Lane and Jane Court. About ten to twelve houses in this area have had recurrent basement flooding, with depths of six to twelve inches. Sump pumps have been employed in some of these homes to try to reduce the amount of damage from these floodwaters (second priority). There is also some residential street flooding in this same area on Blossom Court, west of De La Salle School, around Common Road. The depth of the water is as much as twelve to eighteen inches, rendering these streets temporarily impassable, before the water finally begins to drain off after one to two hours (third priority). The city's storm and sanitary sewer systems are separate. Six to seven years ago, a pumping station at 9 Mile Road and Schoenherr Road was upgraded, along with a sewer main, to reduce basement flooding problems. Basement sump pumps also helped to solve the problem in many homes.

Section 2 – Just south of 14 Mile Road and the Red Run River, there is a residential area with six houses and five apartment buildings in a 100-year floodplain. A pumping station just north of there was built in 1980. Raising the grade of the road may also help mitigate flood problems in this area (third priority). Just south of 14 Mile Road and the Red Run River are about 23 homes and six apartment buildings in a lesser-risk floodplain. At similar risk but a bit more distant is a church building, two other homes on Hoover Road and some small portions of a few residential neighborhoods to its west (last in priority).

Section 3 – To the southwest of this area is an apartment community on the streets around Bear Creek Drive that contains about 26 buildings and one house in the 100-year floodplain. A berm was constructed along the Bear Creek and Red Run River to try to alleviate flood risks in that area. South and west of this Bear Creek Drive area are at least two houses and possibly some industrial buildings in the floodplain. In the north of the section, along the Big Beaver Creek, 12 houses and three buildings are in the floodplain, including a wastewater treatment plant. Floodwaters have so far only been observed going up to the park across from this plant (third priority). In the Bear Creek Drive area, there are about twenty two buildings and four houses in lesser-risk floodplain areas, with at least three more houses and possibly one industrial structure in areas to the south. In the north and along the Beaver Creek are about thirty one houses and four buildings (last in priority).

Section 4 – In the northeast, the Big Beaver Creek has a floodplain that places some structures at risk. Two restaurants, a couple of golf club buildings, two other buildings, and a couple houses are all in the 100-year floodplain there. There is another floodplain area along the Red Run Creek, which seems to have two commercial and two light industrial buildings (a factory and a warehouse), a bank, a Knights of Columbus Hall, three other buildings, and about

25 houses in it. There are also a few General Motors buildings in this area, but re-cutting of area topography has doubtlessly allayed risks to those buildings (third priority). In lesser-risk floodplain areas are three buildings by the Big Beaver Creek, and four buildings, about eight houses, and a large General Motors building. Lesser-risk floodplains in Warren refer to those somewhere between 100-year and 500-year assessments on the FIRM (last in priority).

Section 5 – Area's like this one that are located west of Mound Round have had flooding problems greatly reduced by an upgraded bridge (on Mound Round at the Red Run Creek). This alteration has resulted in a letter of map amendment (LOMA) for the area's FIRM, removing about 90 houses and some other buildings from the 100-year floodplain. Nearby, there is a low-lying spot that will have a berm constructed to help protect the several houses in that area.

Section 6 – As in section 5, there were a few houses that were originally identified within the floodplain of the Red Run Creek that are now at lower-risk as a result of the bridge upgrade at Mound Road which has improved drainage in the area.

Section 9 – There are many large buildings in this area that seem to be in lesser-risk floodplain areas. These are seven very large industrial buildings, and about fourteen other buildings that appear to be at-risk according to the FIRM (last in priority).

Section 10 – There is a small business in a 100-year floodplain area, by the Bear Creek at Van Dyke and 13 Mile Road (third priority). An office zone that had appeared to be in a floodplain was addressed by a LOMA and no longer considered at significant risk (last in priority). Four buildings and part of a residential neighborhood that had appeared to be within a lesser-risk floodplain area near that addressed by the LOMA area probably do not need to be worried about since their risk is probably now even lower than is normally identified.

In summary, there is a low-lying area with street and basement flooding (second priority), a total of about 45 houses and 24 buildings in 100-year floodplain (third priority), and at least 69 homes and 59 buildings in lesser-risk floodplain areas (last in priority).

3.2.22 Washington Township

An NFIP floodplain map for the township was developed by FEMA and was made available to the County and township in November of 2013. Areas at risk from flooding are identified below according to the geographic section of the township in which they are located. Seven other structures (not listed below) that had been tentatively identified as within floodplains have been evaluated by local officials as either not at risk (primarily due to elevated location) or as no longer existing. The township has a high elevation and local officials know of no serious structural flooding.

Section 7 – The Clifton Mill is a historic structure (although not officially registered as such with the State of Michigan) that is in the 100-year floodplain area of Stony Creek. The culvert near it is two-thirds full and should be replaced (third priority).

Section 9 to 10 – 30 Mile Road experiences street flooding for about a half-mile stretch, impeding access to the entrance to an orchard here. The area of section 9 has up to three structures may be in a floodplain there. In section 10, the road flooding was serious enough to close 30 Mile Road for eight hours (in a February, 2001 incident) with as much as eighteen inches of water depth in this area. About 700 vehicles use this road per day, on average (third priority). Two houses along the road in the floodplain are elevated above risk levels.

Section 15 – The drain running through the neighborhood in the northeast of this section floods over regularly for about a hundred feet on either of its banks, with floodwaters reaching up to 18 inches in depth. It is not clear how threatened these houses are from actual surface flooding, but at least one of the local roads becomes temporarily impassable in this area. To the south, toward 29 Mile Road, water drains down hills (with sheet flows of four to five inches in some spots!) and builds up in the yards of condominium units. Two houses have experienced basement flooding, with at least a foot of water needing to be pumped out of them (second priority). Water builds up and then goes down and over 29 Mile Road in sheet flows. Twenty-nine Mile Road at this point carries a daily average of about 3,500 vehicles (third priority).

Section 26-27 – A drain flowing through these sections has a 100-year floodplain that includes two houses on or near Jewell Road (third priority). In the lesser-risk floodplain of this drain exist three houses (last in priority). A separate drain/floodplain in the very south of section 27 has a LOMA removing its two houses from floodplain designations, due to a channelization that has been completed there.

Sections 33-34 – The town of Washington has a string of buildings and houses alongside a drain that are considered by the FIRM to be in a 100-year floodplain. A post office, commercial structure, and seven homes are at least partly located in this floodplain area. (Four other houses in this area were assessed by local officials as not at-risk) Southeast of town, east of M-53, is a drain going through a residential area and causing some flooding problems. An area with condominiums experiences street flooding, and some units of a mobile home park are directly affected by these waters. Due to elevations, not much damage has been observed there by local officials, but the skirtings are affected (third priority).

In summary, there is an area in the township with serious street flooding and two homes that have suffered basement flooding (second priority). At least 12 structures are located in 100-year floodplain areas in the township, and other areas of street flooding have been noted. (third priority) It was also found that three more structures are located in lesser-risk floodplains. (last in priority)

4 Mitigation Strategy

The mission of the Macomb County Hazard Mitigation Plan is to protect the health and safety of the public and property of the community by taking action to permanently eliminate or reduce the long-term risk to human life and property from natural and human-caused hazards. In order to accomplish this mission, specific goals and objectives have been established. These goals and objectives are based on the county's hazard analysis, as well as input from the public, home and business owners, community organizations, and other interested entities.

Section 4.1 identifies the goals and objectives as determined by the Hazard Mitigation subcommittee. Each generalized goal has a number of specific objectives associated with it. Section 4.2 discusses the identification of alternative solutions and the filtering criteria used to screen projects. Section 4.3 present the list of hazard and flood mitigation projects identified for Macomb County. The list presented is intended to be a living document to be updated as these projects are implemented and new projects are identified. The table below once again reviews the top ten threats to Macomb County as was determined under the Hazard Analysis conducted with all 25 jurisdictions and the county.

Top 10 Hazards

Hazard	Rank

4.1 GOALS AND OBJECTIVES FOR 2020-2025

4.1.1 Goal 1: Integrate hazard mitigation considerations into the community's comprehensive planning process.

Encourage hazard provisions in local building codes.

- A. Encourage relocation of power lines below ground.
- B. Incorporate hazard mitigation into basic land use regulation mechanisms.
- C. Update local zoning ordinances to reflect new building code and shoreline protection rules.
- D. Develop code enforcement and zoning ordinances in urban/wildland intermix areas.
- E. Incorporate hazard area classifications into standard zoning classifications.
- F. Develop/upgrade community warning systems in areas of the county not presently covered.
- G. Strengthen anchoring requirements for propane tanks and hazardous material tanks in the floodplain/floodway.
- H. Integrate hazard mitigation into the capital improvement planning process so that public infrastructure does not lead to development in hazard areas.
- I. Integrate hazard mitigation into the community's planning enabling legislation.

4.1.2 Goal 2: Apply available resources to hazard mitigation.

- A. Provide a list of desired community mitigation measures to the State of Michigan for possible future funding.
- B. Encourage the Macomb County Department of Roads to review roads, bridges, and related transportation infrastructure for hazard vulnerability.
- C. Encourage the Macomb County Public Works Commission to review drains, sewers, flood pump stations infrastructure for hazard vulnerability.
- C. Encourage private business involvement in hazard mitigation projects.

4.1.3 Goal 3: Increase public awareness of hazard mitigation.

- A. Increase awareness of hazard provisions in local building codes.
- B. Increase awareness of the National Flood Insurance Program.

4.1.4 Goal 4: Complete all hazard mitigation projects as scheduled.

- A. Track projects at County level to maximize support and efforts to implement.
- B. Update Hazard Mitigation Projects annually.

4.1.5 Goal 5: Increase local participation in hazard mitigation.

- A. Encourage cooperation and communication between urban planning and emergency management officials in local communities.
- B. Encourage local agencies, such as the fire, police, planning, and building departments, to participate in the hazard mitigation process.
- C. Encourage public and private organization participation.

4.2 IDENTIFICATION OF ALTERNATIVES FOR SOLVING PROBLEMS

Macomb County used a variety of sources in developing a range of potential solutions for solving identified problems associated with the various hazards addressed in this plan.

First, a series of brainstorming sessions were held to solicit ideas and suggestions from local public officials, citizens, home and business owners, community organizations, the county planning department, the state and federal government. At these meetings, suggestions were made on possible ways to reduce or eliminate community vulnerability to natural and technological hazards. Those suggestions were grouped by hazard type. A list of potential projects was developed and arranged based on community need rather than county impact as a whole.

Each local jurisdiction then set up their own committee consisting of the local leaders in government, business and citizenry to review that jurisdictions threats and needs. Those committees referred to the 2015-2020 Plan to determine the status of the projects that were listed, determine what projects would be carried over to the new plan and what projects would be added. They then ranked those projects based on current needs of the community and referred those projects to be included in the 2020-2025 Plan.

4.2.1 Filtering Criteria Used to Select and Prioritize Alternatives

Next, a set of filtering criteria was developed in order to determine which of the mitigation alternatives were best suited to address the identified problems within the current framework of mitigation programs and policies within the county. The following filtering criteria were used to select and prioritize alternatives for this plan:

Filtering Criteria

-
- The cost of the measure must be less than the cost of repetitive repairs that would be necessary if the measure were not implemented.
 - The measure must be acceptable to those participating and/or primarily impacted.
 - The measure must be affordable to all it affects, and not discriminate against those who are unable to bear the cost.
 - The measure must not result in an inequitable distribution of essential public services.
 - The measure must be environmentally sound and not cause any permanent, significant environmental concerns.
 - The measure must technically be feasible.

County decision-makers then reviewed the list of alternatives against the established filtering criteria to come up with the list of the most desired alternatives for each county goal.

4.3 MACOMB COUNTY COMPREHENSIVE MITIGATION PROJECTS

After analyzing the range of hazards which affect the county and developing a “Top Ten” list based on severity, generalized county actions and projects pertaining to these hazards were determined using the filtering criteria method mentioned in the previous section. Section 4.4 of this chapter will identify specific mitigation actions and projects for each community within Macomb County and for the county. The actions are listed under each hazard that they pertain to. The hazards are listed in order of priority as determined by the local jurisdictions committee that was formed to identify and rate those projects on behalf of that community. This is a change from the 2015-2020 Plan where each project was ranked based on the need and importance of that project to the county as a whole. As each community is responsible for the application and management of their own projects, it was determined that the projects would be prioritized by importance to that community. Each recommended action is addressed similarly and includes the following analysis components:

- Title
- Project Number – The number refers to the type (HM-Hazard Mitigation or FMP – Flood Mitigation Project) and Year identified by the local jurisdiction-2015 (15) or 2020 (20)
- Hazard Category
- Priority – denotes the priority of this project by the submitting community.
- Description of the action
- Lead manager assigned
- Schedule to initiate action
- Potential sources of technical assistance
- Estimated Cost of Project
- Potential sources of financial assistance
- Project Status – Update on project, either as a new project for that community or status of project as a carry-over from the 2015-2020 Plan.

4.4 INDIVIDUAL COMMUNITY MITIGATION PROJECTS

As discussed in Section 4.3 of this chapter, this section identifies specific mitigation actions and projects for individual communities within Macomb County. Many communities within the county experience repetitive flood damages. This section will list the communities in alphabetical order. However, the 'Structural Vulnerability Flood Projects' and 'Road Vulnerability Flood Projects' will be listed in order of priority as explained in the next paragraph. Where communities have not identified current projects or actions for their jurisdiction, they may find that the Comprehensive Mitigation Actions for Macomb County section will suffice at a later date.

As described in a previous section, identified flood hazard areas have been broadly classified into four different levels of priority. It is necessary to further assess the risks and hazards facing some areas that have been assessed as "second priority," along with some of those that were categorized as "third priority." This section contains an assessment that also suggests the priority that should be given to specific mitigation projects that the hazard analysis has identified as being top priority or second priority. Not all of the listed projects will be appropriate for funding from the Flood Mitigation Assistance Program, but are included anyway because they are important to alleviate current or potential flood problems in the county. The structural and road vulnerability flood projects below have been assigned a priority based on the number of structures and major roads at risk, and the flood depth and risk levels affecting those structures and roads. Some of the projects may be easier to implement than others, and so the priorities may not be the only determinant of the order in which the projects will be accomplished. Rather, actual project implementation will depend on gaining the approval of stakeholders, identifying specific factors to implement mitigation actions, and demonstrating that the costs of mitigation actions will be less than the benefits that result for the community or communities involved.

Many of these flood projects are beneficial for NFIP compliance because they will reduce future flood damages to NFIP flood protected properties. Projects such as the removal of properties from floodplain zones or the dredging/maintenance of flood zone waterways will reduce the amount of claims to the NFIP Program. Most communities have given top priorities to these type of projects/initiatives.

As there were no mitigation funds available to address any of the proposed projects from the 2015-2020 Hazard Mitigation Plan, there has been no actions or progress made from those projects as is reflected in the project list for this current 2020-2025 Plan. Several additional projects may have been added or the priority of that project may have changed due to current awareness or needs within the community.

Any project that involves a private homeowner or private business would only be undertaken with the full knowledge and consent of the property owner, local community and the county.

4.4.1 Village of Armada

PROJECT NUMBER: FMP-05 PRIORITY: 0 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD PROOF HOME

LEAD MANAGER: MARVIN WOLAK, PRESIDENT, ARMADA VILLAGE, 586-784-9151

DESCRIPTION OF ACTION: A LOW-SITTING HOUSE IN THE VILLAGE OF ARMADA IS PROPOSED FOR MITIGATION ACTIVITIES BECAUSE PONDING WATER IN ITS YARD GOES RIGHT UP TO THE BACK OF THE HOUSE DURING RAINY WEATHER CONDITIONS. THE VILLAGE IS AN NFIP PARTICIPATING COMMUNITY AND THE HOUSE IS LOCATED JUST OUTSIDE THE 100-YEAR FLOODPLAIN (ZONE AE) ON THE VILLAGE’S FIRM (FLOOD INSURANCE RATE MAP). POSSIBLE MITIGATION STRATEGIES INCLUDE CREATION OF A NEARBY RETENTION POND OR BERM TO KEEP FLOOD WATERS FROM COLLECTING IN THE HOMEOWNERS YARD.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION, MACOMB COUNTY DEPARTMENT OF ROADS, MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: DROPPED – LACK OF NEED HAS BEEN DETERMINED FOR THIS PROJECT

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, VILLAGE’S GENERAL FUND.

PROJECT STATUS: REMOVED FROM PLAN FOR LACK OF FUNDING-THREAT IS NOW LESS THAN WAS ORIGINALLY DETERMINED BY THE VILLAGE PROJECT TEAM FOR THE 2020-2025 PLAN. NO ADDITIONAL PROJECTS WERE DEVELOPED AT THIS TIME.

4.4.2 Armada Township

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: KEVIN KANEHL, FIRE CHIEF, EMERGENCY MANAGEMENT LIAISON, 586-784-9464

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR REMAINING (2) ARMADA TOWNSHIP CRITICAL INFRASTRUCTURE TO ALLOW FOR CONTINUED AND BUSINESS AND SHELTERING OPERATIONS DURING POWER OUTAGES AND OTHER EMERGENCY EVENTS. THE TWO BUILDINGS IDENTIFIED FOR THIS PROJECT ARE THE TOWNSHIP HALL AND SENIOR CENTER.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$700 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 **PRIORITY: COMPLETED** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: EMERGENCY SIREN SYSTEM

LEAD MANAGER: JOHN PATEREK, SUPERVISOR, ARMADA TOWNSHIP, 586-784-5200

DESCRIPTION OF ACTION: ARMADA TOWNSHIP IS STILL VERY UNDEVELOPED BUT IT IS PREDICTED TO HAVE SIGNIFICANT DEVELOPMENT INCREASES IN THE UPCOMING YEARS. INSTALLING AN EMERGENCY SIREN SYSTEM EARLY ON WILL ENSURE ALL AREAS OF THE COMMUNITY ARE COVERED BEFORE RESIDENTIAL AND COMMERCIAL DEVELOPMENT BEGINS PLAYING A MAJOR ROLE IN LAND DISPUTES FOR PLACEMENT OF THESE SIRENS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: COMPLETED

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: PROJECT WAS COMPLETED IN 2018 USING TOWNSHIP'S GENERAL FUND.

PROJECT NUMBER: HM-05 PRIORITY: REMOVE HAZARD CATEGORY: INFRASTRUCTURE

TITLE: TRAILER PARK SHELTER

LEAD MANAGER: JOHN PATEREK, SUPERVISOR, ARMADA TOWNSHIP, 586-784-5200

DESCRIPTION OF ACTION: MOBILE AND MANUFACTURED HOME CONSTRUCTION OFTEN TIMES LENDS IT TO BE EXTREMELY VULNERABLE DURING HIGH WIND EVENTS AND TORNADOES. THE TOWNSHIP WISHES TO CONSTRUCT "SAFE ROOMS" IN THE MOBILE HOME PARKS TO PROVIDE SHELTER DURING THESE EVENTS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: REMOVED

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS.

PROJECT STATUS: THIS PROJECT WAS REMOVED FROM THE 2020-2025 PLAN BY THE TOWNSHIP PLANNING COMMITTEE CITING THE NEED FOR THE PROJECT NO LONGER EXISTED.

4.4.3 Bruce Township

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BRIDGE REPAIR PROJECT

LEAD MANAGER: RICHARD CORY, SUPERVISOR, BRUCE TOWNSHIP, 586-752-4585

DESCRIPTION OF ACTION: RAISE/RECONSTRUCT HIPP ROAD BRIDGE, NORTH OF 36 MILE ROAD TO AVOID ROAD FLOODING.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MICHIGAN MACOMB’S COUNTY PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$200 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, CITY’S GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A NEW PROJECT SUBMITTED BY THE TOWNSHIP’S EMERGENCY PLANNING COMMITTEE IN 2018.

PROJECT NUMBER: HM-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: EMERGENCY SIREN PROJECT

LEAD MANAGER: RICHARD CORY, SUPERVISOR, BRUCE TOWNSHIP, 586-752-4585

DESCRIPTION OF ACTION: BRUCE TOWNSHIP IS STILL VERY UNDER-DEVELOPED BUT IS EXPECTED TO EXPERIENCE A SURGE IN THE NEXT DECADE. INSTALLING 1 EMERGENCY SIREN IN THE NORTH WEST CORNER OF THE TOWNSHIP WILL ADDRESS THE ALERTING NEEDS OF THAT SECTION OF THE TOWNSHIP.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$50 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A NEW PROJECT SUBMITTED BY THE TOWNSHIP’S EMERGENCY PLANNING COMMITTEE IN 2018.

PROJECT NUMBER: FMP-05 PRIORITY: 0 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE FLOODING OF ROADS OVER M-53

LEAD MANAGER: RICHARD CORY, SUPERVISOR, BRUCE TOWNSHIP, 586-752-4585

DESCRIPTION OF ACTION: TOWNSHIP ROADS THAT CROSS M-53 CONTINUE TO FLOOD OVER MAJOR RAIN EVENTS. THE TRAFFIC COUNT FOR THAT AREA IS ROUGHLY 18,500 VEHICLES DAILY. RETENTION PONDS OR DREDGING OF EXISTING CULVERTS MAY ALLEVIATE THE FLOODING PROBLEMS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WILL BE ACCOMPLISHED WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: COMPLETED

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, MICHIGAN DEPARTMENT OF AGRICULTURE INTER-COUNTY DRAIN PROGRAM.

PROJECT STATUS: PROJECT WAS BEGUN IN 2012. COMPLETION DATE WAS IN 2014.

4.4.4 City of Centerline

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: SANITARY SEWER OVERFLOW PROJECT

LEAD MANAGER: DAVID HANSELMAN, MAYOR, CENTER LINE, 586-757-6800

DESCRIPTION OF ACTION: BELOW LISTED PROJECTS ARE REQUIRED BY THE MI-DNR&E TO COMPLY WITH SANITARY SEWER OVERFLOW REQUIREMENTS: 1. LIFT STATION & OUTFALL SEWER IMPROVEMENT; 2. OPEN CUT SANITARY REHABILITATION; 3. FULL LENGTH CURED-IN-PLACE PIPE LINING; 4. SECTIONAL CURED-IN-PLACE PIPE LINING; 5. SANITARY MANHOLE REHABILITATION; 6. SANITARY JOINT & SERVICE GROUTING.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MICHIGAN DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT.

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, CITY'S GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: TRIM TREES THAT ENCROACH ON POWER LINES

LEAD MANAGER: DAVID HANSELMAN, MAYOR, CENTER LINE, 586-757-6800

DESCRIPTION OF ACTION: IDENTIFY AND TRIM THOSE TREES THAT ARE BEGINNING TO ENCROACH INTO THE SAFETY ZONE OF OVERHEAD POWER LINES THROUGHOUT THE CITY. THE INITIAL PROJECT WILL BE TO SURVEY THE ENTIRE STOCK OF TREES WITHIN THE CITY TO ASSESS THE SCOPE OF THE TRIMMING PROJECT.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, DTE

ESTIMATED COST OF PROJECT: \$50 THOUSAND- ANNUALLY

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, CITY'S GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05

PRIORITY: 3

HAZARD CATEGORY: LIFE SAFETY

TITLE: ESTABLISH ORDINANCE TO LOCATE ALL FUTURE POWER LINES UNDERGROUND

LEAD MANAGER: DAVID HANSELMAN, MAYOR, CENTER LINE, 586-757-6800

DESCRIPTION OF ACTION: POWER OUTAGES ARE A RECURRING THEME ASSOCIATED WITH DAMAGE TO ABOVEGROUND POWER LINES DURING SEVERE WIND STORMS, THUNDERSTORMS, SNOW & ICE STORMS AND OTHER SEVERE WEATHER EVENTS. THE ACTION WOULD BE TO HAVE THE CITY PASS AN ORDINANCE TO REQUIRE ALL NEW INSTALLATIONS OR POWER LINES TO BE PLACED UNDERGROUND.

SCHEDULE: CURRENT STUDY BEING UNDERTAKEN BY LOCAL CITY OFFICIALS AND LEGAL COUNSEL.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, DTE

ESTIMATED COST OF PROJECT: \$0

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: FUNDING NOT REQUIRED

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM 2010-2015, ORDINANCE CURRENTLY UNDER REVIEW.

4.4.5 Chesterfield Township

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE FLOODING OF CANAL, S. OF FIELD STREET-SECTION 32

LEAD MANAGER: DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: NINE HOMES AND THREE BUSINESSES LOCATED IN SECTION 32, FIELD STREET ALONG THE CANAL, IS HEAVILY AFFECTED BY FLOODING DURING PERIODS OF HIGH WATER LEVELS IN LAKE ST. CLAIR. THIS AREA IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE A3). MITIGATION STRATEGIES INCLUDE THE ERECTION OF A FLOOD WALL TO PROTECT FROM STORM SURGES, HOUSING ELEVATION, CANAL RE-DESIGN AND AN ADDITIONAL PUMP STATION WOULD ALL BE CONSIDERED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$2.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: INSTALL FIXED GENERATORS AT TOWNSHIP SEWER LIFT STATIONS

LEAD MANAGER: DONALD CODDINGTON, PUBLIC WORKS, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: INSTALLATION OF EMERGENCY GENERATORS AT EACH OF THE TOWNSHIPS 6 LIFT STATIONS TO MAINTAIN THE FLOW OF WATER/SEWAGE DURING A STORM OR LOSS OF POWER EVENT.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$360 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A NEW PROJECT SUBMITTED BY THE TOWNSHIP EMERGENCY PLANNING COMMITTEE IN 2018.

PROJECT NUMBER: FMP-05**PRIORITY: 2****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF ELEVEN RESIDENCES IN SECTION 32****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: IN SECTION 32 ALONG JEFFERSON ROAD, A 100 YEAR FLOOD PLAIN, ELEVEN HOUSES EXPERIENCE FLOODING OF 6 TO 12 INCHES REGULARLY DURING PERIODS OF HEAVY RAINS. MITIGATION STRATEGIES INCLUDE ACQUISITION OF REPETITIVE LOSS PROPERTY; ELEVATION OF SAME PROPERTIES; RE-ENGINEERING THE CANAL AND/OR A NEW PUMP STATION TO ALLEVIATE FLOODING TO THESE PROPERTIES ALONG JEFFERSON ROAD.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$2.3 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND. MICHIGAN DEPARTMENT OF AGRICULTURE INTER-COUNTY DRAIN PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 3****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 106 RESIDENCES ALONG SHORELINE-SECTION 32****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: ONE HUNDRED AND SIX RESIDENCES LOCATED IN SECTION 32, ALONG THE SHORELINE OF LAKE ST. CLAIR-E. OF JEFFERSON ROAD AND S. OF FARWELL, IS HEAVILY AFFECTED BY FLOODING DURING PERIODS OF HIGH WATER LEVELS IN LAKE ST. CLAIR. THIS AREA IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE A3). MITIGATION STRATEGIES INCLUDE THE ERECTION OF A FLOOD WALL TO PROTECT FROM STORM SURGES, HOUSING ELEVATION OR ACQUISITION, CANAL RE-DESIGN WOULD ALL BE CONSIDERED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$21.2 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 4****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 13 RESIDENCES ON COTTON ROAD-SECTION 28****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: IN SECTION 28, S.W. OF COTTON ROAD ALONG THE LAKE ST. CLAIR SHORELINE, A 100 YEAR FLOOD PLAIN, THIRTEEN HOUSES EXPERIENCE FLOODING OF 6 TO 8 INCHES REGULARLY DURING PERIODS OF HEAVY RAINS. POSSIBLE MITIGATION STRATEGIES INCLUDE REPLACING OR RE-ENGINEERING THE EXISTING DIRT BERM, ACQUISITION OF THE REPETITIVE LOSS PROPERTY; ELEVATION OF THOSE SAME PROPERTIES; RE-ENGINEERING THE CANAL COULD ALSO HELP TO ALLEVIATE FLOODING TO THESE PROPERTIES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$3.6 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND. MICHIGAN DEPARTMENT OF AGRICULTURE INTER-COUNTY DRAIN PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 5****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 36 RESIDENCES ALONG SUGARBUSH ROAD-SECTION 27****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: THIRTY SIX RESIDENCES LOCATED IN SECTION 27, ALONG THE SUGARBUSH ROAD IS HEAVILY AFFECTED BY FLOODING DURING PERIODS OF HIGH WATER LEVELS IN LAKE ST. CLAIR. AREA IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE A3). STRATEGIES INCLUDE THE ERECTION OF A FLOOD WALL TO PROTECT FROM STORM SURGES, HOUSING ELEVATION OR ACQUISITION, CANAL RE-DESIGN WOULD ALL BE CONSIDERED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$7.2M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 6****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF STRUCTURES W. OF JEFFERSON; N. OF ANCHOR-SECTION 32****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: IN SECTION 32, W. OF JEFFERSON, N. OF ANCHOR ROAD ALONG THE LAKE ST. CLAIR SHORELINE, A 100 YEAR FLOOD PLAIN, SEVENTEEN HOUSES AND TWO BUSINESSES EXPERIENCE FLOODING OF 6 TO 8 INCHES REGULARLY DURING PERIODS OF HEAVY RAINS. POSSIBLE MITIGATION STRATEGIES INCLUDE REPLACING OR RE-ENGINEERING THE EXISTING DIRT BERM, ACQUISITION OF THE REPETITIVE LOSS PROPERTY; ELEVATION OF THOSE SAME PROPERTIES; RE-ENGINEERING THE CANAL COULD ALSO HELP TO ALLEVIATE FLOODING TO THESE PROPERTIES. A NEW PUMP STATION ON JEFFERSON MAY ALSO HELP ALLEVIATE THIS FLOODING PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$3.8 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND. MICHIGAN DEPARTMENT OF AGRICULTURE INTER-COUNTY DRAIN PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 7****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 4 APARTMENT BUILDINGS-SECTION 22****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: FOUR APARTMENT BUILDINGS LOCATED IN SECTION 32, ALONG THE SHORELINE OF LAKE ST. CLAIR-E. OF JEFFERSON ROAD AND N. OF ANCHOR, IS HEAVILY AFFECTED BY FLOODING DURING PERIODS OF HIGH WATER LEVELS IN LAKE ST. CLAIR. THIS AREA IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE A3). MITIGATION STRATEGIES INCLUDE THE ERECTION OF A FLOOD WALL TO PROTECT FROM STORM SURGES, HOUSING ELEVATION OR ACQUISITION, CANAL RE-DESIGN AND A NEW PUMP STATION ON JEFFERSON MAY ALSO HELP ALLEVIATE THIS FLOODING PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$2 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 8****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 17 RESIDENCES ON AUVASE CREEK-SECTION 28****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: SEVENTEEN RESIDENCES IN SECTION 28, ON WAND ALONG THE AUVASE CREEK, A 100 YEAR FLOOD PLAIN, EXPERIENCE FLOODING REGULARLY DURING PERIODS OF HEAVY RAINS. POSSIBLE MITIGATION STRATEGIES INCLUDE REPLACING OR RE-ENGINEERING THE EXISTING DIRT BERM, ACQUISITION OF THE REPETITIVE LOSS PROPERTY; ELEVATION OF THOSE SAME PROPERTIES; RE-ENGINEERING THE CANAL COULD ALSO HELP TO ALLEVIATE FLOODING TO THESE PROPERTIES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$3.4 M**POTENTIAL SOURCES OF**

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND. MICHIGAN DEPARTMENT OF AGRICULTURE INTER-COUNTY DRAIN PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 9****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF 2 RESIDENCES NEAR SALT RIVER-SECTION 23****LEAD MANAGER:** DANIEL ACCIAVATTI, SUPERVISOR, CHESTERFIELD TOWNSHIP, 586-949-0400

DESCRIPTION OF ACTION: TWO RESIDENCES LOCATED IN SECTION 23, ALONG THE SALT RIVER, S. OF CALLENS ROAD AND W. OF HOOKER, IS HEAVILY AFFECTED BY FLOODING DURING PERIODS OF HEAVY RAINFALL. THIS AREA IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE A3). MITIGATION STRATEGIES INCLUDE HOUSING ELEVATION OR ACQUISITION.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$700 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. LOCAL SOURCES, FOUNDATIONS, NON-PROFIT ORGANIZATIONS, CORPORATE GIVING PROGRAMS, TOWNSHIP GENERAL FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PREVIOUS 2010/2015 PROJECT STATUS UPDATE: THE PROJECT FROM THE 2015-2020 PLAN, **MITIGATE FLOODING OF BUSINESS-SECTION 15** HAS BEEN REMOVED FROM THIS 2020-2025 PLAN CITING LACK OF NEED.

4.4.6 Clinton Township

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: MILLAR PUMP STATION REHABILITATION

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: RELOCATION OF ELECTRICAL PANEL OUT OF THE FLOOD ZONE.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. STATE NFIP PROGRAM, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT HAS BEEN FUNDED BY A HAZARD MITIGATION GRANT AND IS EXPECTED TO BE COMPLETED-APRIL, 2019.

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE FLOODING OF SINGLE RESIDENCE WITHIN MORAVIAN MANOR

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: PUBLIC ACQUISITION AND MANAGEMENT OF LANDS VULNERABLE TO FLOOD HAZARDS. THIS PROPERTY, WITHIN THE MORAVIAN MANOR SUBDIVISION, IS LOCATED WITHIN A 100 YEAR FLOODPLAIN (ZONE AE). THE HOME SITS ON 2.752 ACRES WITH AN ESTIMATED APPRAISED VALUE OF \$102 THOUSAND.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. STATE NFIP PROGRAM, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE FLOODING OF PROPERTY ADJACENT TO FRANK H. BUDD PARK

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: ACQUISITION OF REMAINING PROPERTIES ADJACENT TO FRANK H. BUDD PARK TO COMPLETE THE ACQUISITION AND RAZING OF ALL PROPERTIES WITHIN THAT FLOOD PLAIN.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WILL BE ACCOMPLISHED WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$800 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05**PRIORITY: 3****HAZARD CATEGORY: INFRASTRUCTURE****TITLE: MITIGATE ROAD FLOODING OF CLINTON RIVER ROAD****LEAD MANAGER:** PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069**DESCRIPTION OF ACTION:** CLINTON TOWNSHIP AREA OF ROAD FLOODING ON CLINTON RIVER ROAD. ROAD BECOMES UNSAFE AND OFTEN IMPASSABLE DURING HEAVY RAIN EVENTS. POSSIBLE MITIGATION STRATEGIES INCLUDE DRAIN DREDGING OR IMPROVEMENT TO EXPAND ITS' CAPACITY, OR OTHER STRUCTURAL PROJECTS TO SLOW OR DIVERT THE FLOW OF RUNOFF WATERS.**SCHEDULE:** INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.**POTENTIAL SOURCES OF****TECHNICAL ASSISTANCE:** MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.**ESTIMATED COST OF PROJECT: \$500 THOUSAND****POTENTIAL SOURCES OF****FINANCIAL ASSISTANCE:** HMGP, FMAP & PDMP GRANTS. STATE NFIP PROGRAM, MICHIGAN STORMWATER FLOODPLAIN ASSOCIATION.**PROJECT STATUS:** THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 **PRIORITY: 4** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: MITIGATE FLOODING OF GROESBECK, S. OF 16 MILE ROAD

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: CLINTON TOWNSHIP AREA OF ROAD FLOODING ON GROESBECK ROAD, S. OF 16 MILE ROAD. ROAD BECOMES UNSAFE AND OFTEN IMPASSABLE DURING HEAVY RAIN EVENTS. POSSIBLE MITIGATION STRATEGIES INCLUDE DRAIN DREDGING OR IMPROVEMENT TO EXPAND ITS' CAPACITY, OR OTHER STRUCTURAL PROJECTS TO SLOW OR DIVERT THE FLOW OF RUNOFF WATERS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$500 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 5 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE FLOODING OF KELLY ROAD, BETWEEN 15 & 16 MILE ROADS

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: CLINTON TOWNSHIP AREA OF ROAD FLOODING ON KELLY ROAD, BETWEEN 15 & 16 MILE ROADS. ROAD BECOMES UNSAFE AND OFTEN IMPASSABLE DURING HEAVY RAIN EVENTS. POSSIBLE MITIGATION STRATEGIES INCLUDE DRAIN DREDGING OR IMPROVEMENT TO EXPAND ITS' CAPACITY, OR OTHER STRUCTURAL PROJECTS TO SLOW OR DIVERT THE FLOW OF RUNOFF WATERS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$500 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN STORMWATER FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 6 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE FLOODING OF RESIDENCE IN SECTION 15

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: SINGLE RESIDENCE IN A 100 YEAR FLOOD PLAIN (ZONE AE) HAS BEEN IDENTIFIED FOR ACQUISITION AND REMOVAL WITH THE PROPERTY TRANSFORMED TO FLOODPLAIN.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$300 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN STORMWATER FLOODPLAIN ASSOCIATION.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-10**PRIORITY: 7****HAZARD CATEGORY: STRUCTURAL****TITLE: MITIGATE FLOODING OF PROPERTIES ALONG RIVER LANE****LEAD MANAGER:** PAUL BROUWER, EMERGENCY COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: ACQUISITION AND MANAGEMENT OF LANDS THAT ARE DEEMED VULNERABLE TO DAMAGE FROM FLOOD HAZARDS ALONG RIVER LANE. THIS AREA IS LOCATED WITHIN THE 100 YEAR FLOODPLAIN (ZONE AE). RESIDENTIAL UNITS MAY ALSO BE ELEVATED OUT OF THE FLOOD ELEVATION LINE.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WILL BE ACCOMPLISHED WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF**TECHNICAL ASSISTANCE:** MACOMB COUNTY OFFICE OF EMERGENCY MANAGEMENT AND COMMUNICATIONS**ESTIMATED COST OF PROJECT: \$1 M****POTENTIAL SOURCES OF** HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN**FINANCIAL ASSISTANCE:** STORMWATER-FLOODPLAIN ASSOCIATION.**PROJECT STATUS:**

ONE RESIDENCE WAS ACQUIRED AND REMOVED. THERE ARE STILL SEVERAL PROPERTIES TO BE ADDRESSED WITH FUTURE FUNDING.

PROJECT NUMBER: FMP-10 **PRIORITY: 8** **HAZARD CATEGORY: STRUCTURAL**

TITLE: MITIGATE FLOODING OF PROPERTIES ALONG BELLEVIEW

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-8069

DESCRIPTION OF ACTION: ACQUISITION AND MANAGEMENT OF LANDS THAT ARE DEEMED VULNERABLE TO DAMAGE FROM FLOOD HAZARDS ALONG BELLEVIEW. THIS AREA IS LOCATED WITHIN THE 100 YEAR FLOODPLAIN (ZONE AE). RESIDENTIAL UNITS MAY ALSO BE ELEVATED OUT OF THE FLOOD ELEVATION LINE.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS.

ESTIMATED COST OF PROJECT: \$1 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS. FMA, CDBG, STATE NFIP, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION.

PROJECT STATUS: ONE PROPERTY IS CURRENTLY UNDER CONSIDERATION UNDER AN MDEQ GRANT. THE OTHER PROPERTY IS STILL BEING CONSIDERED WHEN ADDITIONAL GRANT FUNDS ARE MADE AVAILABLE.

PROJECT NUMBER: HM-05

PRIORITY: 9

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: DEVELOP DISASTER MITIGATION/EMERGENCY RESPONSE GIS

LEAD MANAGER: PAUL BROUWER, E. M. COORDINATOR, CLINTON TOWNSHIP, 586-723-069

DESCRIPTION OF ACTION: DEVELOPMENT OF A GEOGRAPHICAL INFORMATION SYSTEM (GIS) THAT WOULD BE UTILIZED FOR DISASTER MITIGATION AND EMERGENCY RESPONSE PLANNING. THIS SYSTEM MAY BE USED TO IDENTIFY FLOOD PLAIN AREAS PRONE TO NATURAL FLOODING, SURFACE WATER MODELING FOR FLOOD CONTROL AND STORM WATER MANAGEMENT AND IDENTIFYING THE SPATIAL RELATIONSHIPS BETWEEN RESIDENTIAL, SPECIAL POPULATIONS, POTENTIAL HAZARDS AND EMERGENCY SERVICES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, AND THE MACOMB COUNTY PLANNING & ECONOMIC DEVELOPMENT DEPARTMENT

ESTIMATED COST OF PROJECT: \$35 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: FMA, HMGP, CDBG, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.7 City of Eastpointe

PROJECT NUMBER: HM-05 PRIORITY: 0 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: GEORGE ROUHIB, EASTPOINTE DPS DIRECTOR, 586-445-5100

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR THE REMAINING 2 EASTPOINTE CRITICAL INFRASTRUCTURE AT THE POLICE STATION AND PUBLIC WORKS TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES. THOSE TWO LOCATIONS ARE CURRENTLY BEING CONSIDERED FOR ACTION IN 2019 UTILIZING CITY GENERAL FUND ASSETS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WILL BE ACCOMPLISHED WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$600 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN. THE PROJECT IS EXPECTED TO BE COMPLETED IN 2019 USING FUNDS FROM THE CITY'S GENERAL FUND.

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: OUTDOOR WARNING SYSTEM UPGRADES PROJECT

LEAD MANAGER: GEORGE ROUHIB, EASTPOINTE DPS DIRECTOR, 586-445-5100

DESCRIPTION OF ACTION: ASSESS NEED AND THEN REPAIR/REPLACE AGING OUTDOOR WARNING SYSTEM-SIRENS

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI FUNDING

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.8 City of Fraser

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE BASEMENT FLOODING IN SOUTH EAST FRASER

LEAD MANAGER: DIR. MICHAEL PETTYES, E. M. LIAISON, FRASER, 586-293-1425

DESCRIPTION OF ACTION: IN THE SOUTH EAST SECTION OF FRASER, THERE IS AN AREA OF RESIDENCES (200 HOMES) THAT REGULARLY FLOOD (2-3 INCHES) DURING RAIN EVENTS. RE-ENGINEERING OF THE STORM WATER SYSTEM OR ADDITIONAL RETENTION PONDS MAY SOLVE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, STATE NFIP PROGRAM, FRASER CAPITAL IMPROVEMENT FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: PUMP STATION IMPROVEMENT

LEAD MANAGER: DIR. MICHAEL PETTYES, E. M. LIAISON, FRASER, 586-293-1425

DESCRIPTION OF ACTION: ALL PUMP STATIONS IN FRASER NEED TO BE REPAIRED OR REPLACED DUE TO AGE (40-50 YEARS).

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$800 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, STATE NFIP PROGRAM, FRASER CAPITAL IMPROVEMENT FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: DIR. MICHAEL PETTYES, E. M. LIAISON, FRASER, 586-293-1425

DESCRIPTION OF ACTION: INSTALL A BACKUP GENERATOR AT FRASER'S SENIOR HI-RISE RESIDENTIAL COMPLEX (34950 HIDDEN PINE DRIVE).

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$350 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, STATE NFIP PROGRAM, FRASER CAPITAL IMPROVEMENT FUND.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: TREE TRIMMING PROJECT

LEAD MANAGER: DIR. MICHAEL PETTYES, E. M. LIAISON, FRASER, 586-293-1425

DESCRIPTION OF ACTION: ASSESS, IDENTIFY AND TRIM ALL TREES WITHIN THE CITY LIMITS THAT CURRENTLY OR MAY ENCROACH ON EXISTING POWER LINES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$25 THOUSAND- ANNUALLY

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.9 Harrison Township

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL**TITLE: FLOOD MITIGATION TO PROPERTIES ADJACENT TO CLINTON RIVER SPILLWAY****LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406****DESCRIPTION OF ACTION:** PROPERTY ALONG THE CLINTON RIVER SPILLWAY, LOCATED IN THE 100 YEAR FLOODPLAIN COULD BE MITIGATED INTO WETLANDS THAT WOULD SERVICE THE COMMUNITY AS PARKLAND. CLEARING OBSTRUCTIONS IN THIS FLOODPLAIN WOULD ALLEVIATE THE FLOOD PROBLEMS CURRENTLY EXPERIENCED.**SCHEDULE:** INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.**POTENTIAL SOURCES OF****TECHNICAL ASSISTANCE:** MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS**ESTIMATED COST OF PROJECT: \$250 THOUSAND****POTENTIAL SOURCES OF****FINANCIAL ASSISTANCE:** HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.**PROJECT STATUS:** THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL**TITLE: FLOOD MITIGATION OF THREE RESIDENCES****LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406****DESCRIPTION OF ACTION:** HARRISON TOWNSHIP HAS IDENTIFIED THREE RESIDENTIAL UNITS THAT SUFFER REPETITIVE LOSSES DURING RAIN EVENTS. EITHER THE STRUCTURES COULD BE RAISED ABOVE THE FLOOD LEVEL OR ACQUIRED AND RAZED.**SCHEDULE:** INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.**POTENTIAL SOURCES OF****TECHNICAL ASSISTANCE:** MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS**ESTIMATED COST OF PROJECT: \$900 THOUSAND****POTENTIAL SOURCES OF****FINANCIAL ASSISTANCE:** HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.**PROJECT STATUS:** THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF MOBILE HOME PARK

LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406

DESCRIPTION OF ACTION: HARRISON TOWNSHIP HAS IDENTIFIED 300 MOBILE HOME RESIDENTIAL UNITS THAT SUFFER REPETITIVE LOSSES DURING RAIN EVENTS. EITHER THE STRUCTURES COULD BE RAISED ABOVE THE FLOOD LEVEL OR ACQUIRED AND RAZED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$4 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 4 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 350 RESIDENCES

LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406

DESCRIPTION OF ACTION: HARRISON TOWNSHIP HAS IDENTIFIED 350 RESIDENTIAL UNITS THAT SUFFER REPETITIVE LOSSES DURING RAIN EVENTS. THESE STRUCTURES ARE LOCATED EAST OF THE SELFRIDGE AIR NATIONAL GUARD BASE AND ARE EITHER LOCATED ON CANALS OR THE LAKE ST. CLAIR SHORELINE. EITHER THE STRUCTURES COULD BE RAISED ABOVE THE FLOOD LEVEL OR ACQUIRED AND RAZED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WILL BE ACCOMPLISHED WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$70 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 5 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 569 RESIDENCES SOUTH OF CLINTON RIVER

LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406

DESCRIPTION OF ACTION: HARRISON TOWNSHIP HAS IDENTIFIED 569 RESIDENTIAL UNITS THAT SUFFER REPETITIVE LOSSES DURING RAIN EVENTS. THESE STRUCTURES ARE LOCATED EAST OF THE METROPOLITAN BEACH COUNTY PARK. EITHER THE STRUCTURES COULD BE RAISED ABOVE THE FLOOD LEVEL OR ACQUIRED AND RAZED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$113.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 6 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF 294 STRUCTURES AND RESIDENCES

LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406

DESCRIPTION OF ACTION: HARRISON TOWNSHIP HAS IDENTIFIED 294 RESIDENTIAL UNITS THAT SUFFER REPETITIVE LOSSES DURING RAIN EVENTS. THESE STRUCTURES ARE LOCATED SOUTH OF THE CLINTON RIVER AND WEST OF 16 MILE ROAD AND ARE LOCATED IN A 100 YEAR FLOODPLAIN. EITHER THE STRUCTURES COULD BE RAISED ABOVE THE FLOOD LEVEL OR ACQUIRED AND RAZED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$58.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, CLEAN MICHIGAN INITIATIVE, AND USACE CHALLENGE 21 PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10

PRIORITY: 7

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: KEN VERKEST, SUPERVISOR, HARRISON TOWNSHIP, 586-466-1406

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL (4) HARRISON TOWNSHIP CRITICAL INFRASTRUCTURE TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.10 Lenox Township

PROJECT NUMBER: FMP-05 **PRIORITY: 1** **HAZARD CATEGORY: INFRASTRUCTURE****TITLE: FLOOD MITIGATION TO LOWE PLANK ROAD****LEAD MANAGER:** RON TROMBLY, SUPERVISOR, LENOX TOWNSHIP, 586-727-2085**DESCRIPTION OF ACTION:** AREA OF SEVERE ROAD FLOODING OCCURS DURING MAJOR RAIN EVENTS ON LOWE PLANK ROAD BETWEEN 30 & 31 MILE ROADS. RE-ENGINEERING OF CULVERTS, DRAINS AND RETENTION PONDS ARE BEING CONSIDERED.**SCHEDULE:** INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.**POTENTIAL SOURCES OF****TECHNICAL ASSISTANCE:** MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS**ESTIMATED COST OF PROJECT: \$1 MILLION****POTENTIAL SOURCES OF****FINANCIAL ASSISTANCE:** HMGP, FMAP & PDMP GRANTS.**PROJECT STATUS:** THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 **PRIORITY: 2** **HAZARD CATEGORY: STRUCTURAL****TITLE: FLOOD MITIGATION TO BASEMENTS FOR 7 RESIDENCES****LEAD MANAGER:** RON TROMBLY, SUPERVISOR, LENOX TOWNSHIP, 586-727-2085**DESCRIPTION OF ACTION:** IN SECTION 16 OF LENOX TOWNSHIP, 7 RESIDENTIAL STRUCTURE SUFFER FROM REPETITIVE FLOOD ISSUES DURING MAJOR RAIN EVENTS. INSTALL OF SUMP PUMPS, ELEVATION OF STRUCTURES MAY ALLEVIATE THE PROBLEM.**SCHEDULE:** INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.**POTENTIAL SOURCES OF****TECHNICAL ASSISTANCE:** MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS**ESTIMATED COST OF PROJECT: \$700 THOUSAND****POTENTIAL SOURCES OF****FINANCIAL ASSISTANCE:** HMGP, FMAP & PDMP GRANTS.**PROJECT STATUS:** THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: WATER SUPPLY LINE PROJECT

LEAD MANAGER: RON TROMBLY, SUPERVISOR, LENOX TOWNSHIP, 586-727-2058

DESCRIPTION OF ACTION: DUE TO THE INCOMPLETE DEVELOPMENT OF LENOX TOWNSHIP AND THEREFORE THE INFRASTRUCTURE, THE TOWNSHIP IS VULNERABLE TO WATER SUPPLY NEEDS SHOULD A SIGNIFICANT INFRASTRUCTURE FAILURE OCCUR. AN EMERGENCY SUPPLY LINE FROM THE DETROIT WATER SYSTEM WOULD SUPPORT THE NEEDS OF THE RESIDENTS, BUSINESSES AND EMERGENCY SERVICES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, GREAT LAKES WATER AUTHORITY

ESTIMATED COST OF PROJECT: \$1.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: EMERGENCY SIREN PROJECT

LEAD MANAGER: RON TROMBLY, SUPERVISOR, LENOX TOWNSHIP, 586-727-2085

DESCRIPTION OF ACTION: LENOX TOWNSHIP IS STILL VERY UNDER-DEVELOPED BUT IS EXPECTED TO EXPERIENCE A SURGE IN THE NEXT DECADE. INSTALLING 8 EMERGENCY SIRENS THROUGHOUT THE TOWNSHIP WILL ENSURE ALL AREAS OF THE COMMUNITY ARE COVERED BEFORE RESIDENTIAL AND COMMERCIAL DEVELOPMENT BEGINS PLAYING A MAJOR ROLE IN LAND DISPUTES FOR PLACEMENT OF THESE SIRENS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$240 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

ALL PRIORITY CHANGES WERE APPROVED BY THE TOWNSHIP'S PLANNING COMMITTEE FOR THE 2020-2025 PLAN.

4.4.11 Macomb County

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: COUNTY DRAINS REGIONAL MASTER PLAN

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: DEVELOP REGIONAL MASTER PLAN TO FOCUS ON FLOW METERING, HYDRAULIC MODEL UPDATE, IMPROVED OPERATIONS PLAN AND REDUCTION AND ELIMINATION OF CSO'S.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$500 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: BASIN EXPANSION STUDY

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: EVALUATION OF BASIN EXPANSION TO THE EAST WITH COASTAL WETLANDS, SEWER SEPARATION ANALYSIS, UTILIZING IN-SYSTEM STORAGE, AND GREEN INFRASTRUCTURE IMPROVEMENTS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$120 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: ELIMINATION OF 75% OF SEWAGE OVERFLOWS INTO LAKE ST. CLAIR

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: A TWO-PRONG APPROACH THAT WILL INCREASE THE TOTAL STORAGE CAPACITY OF THE 50-YEAR OLD CHAPATON RETENTION BASIN. 1ST PHASE WILL WIDEN CANAL AND OVERFLOW GATES WILL BE MOVED CLOSER OUT TO THE LAKE PROPER. THE 2ND PHASE WILL BE THE INSTALL OF INTERNAL GATES IN UNDERGROUND SEWER PIPES TO ALLOW STATION OPERATORS BETTER CONTROL OF THE FLOW OF SEWAGE. THIS WILL INCREASE SEWAGE STORAGE BY SOME 30 MILLION GALLONS.

SCHEDULE: RECEIVED \$3M GRANT FROM STATE OF MICHIGAN. BIDS WERE PUBLISHED AND EXPECTED DUE EARLY JANUARY, 2019. CONSTRUCTION ON BOTH PHASES TO BE UNDERWAY AT END OF 2019.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$30M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM. \$3M GRANT FROM STATE OF MICHIGAN, APPROVED 12/21/2018. OTHER FEDERAL, STATE AND COUNTY RESOURCES.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN. CONSTRUCTION TO BEGIN 2019.

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: SEGMENTATION & DISINFECTION STUDY

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: ANALYSIS OF SEGMENTING THE EXISTING BASIN TO CAPTURE THE "FIRST FLUSH" WHICH TYPICALLY HAS THE HIGHEST POLLUTANT LOADS. THE STUDY WILL ALSO PERFORM FLUID MODELING USING NEWLY CREATED BIM MODEL TO BETTER TREAT FLOWS GOING INTO THE BASIN AND REPLACEMENT ALTERNATIVES FOR THE DISINFECTION SYSTEM WHICH HAS REACHED THE END OF ITS LIFE-CYCLE.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$140 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: PUMP AND SCREENING IMPROVEMENTS

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: ADDITION OF A REDUNDANT DRY-WEATHER PUMP TO ADD RELIABILITY TO DRY WEATHER PUMPING OPERATIONS. REPLACEMENT OF THE BAR SCREENS TO CAPTURE MORE DEBRIS AND REMOVE IT BEFORE ENTERING THE BASIN AND POSSIBLE ADDITION OF AUTOMATED BAR SCREEN

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$1 M

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: PERMANENT FLOW METERS

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: PURCHASE AND INSTALL 4 PERMANENT FLOW METERS TO SATISFY NEW MDEQ PERMIT REQUIREMENTS FOR FLOW BASED SAMPLING.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$150 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: WATER QUALITY PILOT STUDY

LEAD MANAGER: BRIAN BAKER, CHIEF DEPUTY, MACOMB PUBLIC WORKS COMMISSION, 586-307-8210

DESCRIPTION OF ACTION: PURCHASE AND INSTALL A REAL-TIME WATER QUALITY SENSOR IN THE BASIN. THIS WOULD ALLOW OPERATORS TO MONITOR TOTAL RESIDUAL CHLORINE NUMBERS IN REAL-TIME, HELPING TO ENSURE BETTER WATER QUALITY NUMBERS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$30 THOUSAND

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PROJECT NUMBER: HM-05 **PRIORITY: 1** **HAZARD CATEGORY: STRUCTURAL**

TITLE: SEA WALL CONSTRUCTION PROJECT

LEAD MANAGER: CAPT. DAVID DANIELS, MACOMB COUNTY SHERIFF’S OFFICE, 586-307-9335

DESCRIPTION OF ACTION: ERECT A NEW SEA WALL TO PROVIDE PROTECTION FROM THE RISING LAKE LEVEL THREAT IMPACTING THE STRUCTURAL STABILITY AND USEFULNESS OF THE MACOMB COUNTY SHERIFF’S MARINE DIVISION BUILDING.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1 MILLION

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: NEW PROJECT FOR 2020-2025 PLAN

PREVIOUS TWO PROJECTS FOUND IN THE 2015-2020 PLAN WERE DROPPED FOR LACK OF INTEREST OR NEED WAS RESOLVED, AS IN THE TREE TRIMMING PROJECT.

4.4.12 Macomb Township

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: JANET DUNN, TOWNSHIP SUPERVISOR, MACOMB TOWNSHIP, 586-992-0721

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL (6) MACOMB TOWNSHIP CRITICAL INFRASTRUCTURE TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: TRAILER PARK SHELTER PROJECT

LEAD MANAGER: JANET DUNN, SUPERVISOR, MACOMB TOWNSHIP, 586-992-0721

DESCRIPTION OF ACTION: TOWNSHIP WOULD LIKE TO CONSTRUCT "SAFE ROOMS" SUFFICIENT TO SATISFY THE RESIDENTIAL POPULATION OF THE TRAILER PARKS WITHIN THE TOWNSHIP.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$5 MILLION

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: STRUCTURAL

TITLE: MITIGATE FOUR RESIDENCES IN SECTION 35

LEAD MANAGER: JANET DUNN, SUPERVISOR, MACOMB TOWNSHIP, 586-992-0721

DESCRIPTION OF ACTION: FOUR RESIDENCES IN SECTION 35 OF MACOMB TOWNSHIP ARE LOCATED IN A 100 YEAR FLOODPLAIN (ZONE A7) RECEIVE REPETITIVE FLOODING ISSUES EVERY MAJOR RAIN EVENT. ELEVATION OR ACQUISITION AND REMOVAL PROJECTS ARE SUGGESTED.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MICHIGAN STORMWATER-FLOODPLAIN ASSOCIATION

ESTIMATED COST OF PROJECT: \$850 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF NORTH AVENUE

LEAD MANAGER: JANET DUNN, SUPERVISOR, MACOMB TOWNSHIP, 586-992-0721

DESCRIPTION OF ACTION: SEVERE AND REPETITIVE FLOODING OCCURS ANNUALLY ON NORTH ROAD WITHIN THE TOWNSHIP. RETENTION PONDS, RE-ENGINEERING OF CULVERTS MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05

PRIORITY: 5

HAZARD CATEGORY: STRUCTURAL

TITLE: TRAILER PARK SHELTER PROJECT

LEAD MANAGER: JANET DUNN, SUPERVISOR, MACOMB TOWNSHIP, 586-992-0721

DESCRIPTION OF ACTION: TOWNSHIP WOULD LIKE TO CONSTRUCT "SAFE ROOMS" SUFFICIENT TO SATISFY THE RESIDENTIAL POPULATION OF THE TRAILER PARKS WITHIN THE TOWNSHIP.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$3.7 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.13 City of Mount Clemens

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: WATER TREATMENT FACILITY IMPROVEMENT PROJECT

LEAD MANAGER: GREGG SHIPMAN, EM LIAISON, MOUNT CLEMENS, 586-469-6840

DESCRIPTION OF ACTION: REPLACE CURRENT CHLORINE TREATMENT SYSTEM WITH AN ULTRA VIOLET LIGHT SYSTEM. THE CURRENT SYSTEM REQUIRES STORAGE OF GREAT QUANTITIES OF HAZARDOUS MATERIALS WHICH ARE DANGEROUS TO THE SURROUNDING COMMUNITY. THE UV SYSTEM WILL ELIMINATE THE NEED TO STORE AND UTILIZE THESE HAZARDOUS CHEMICALS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$5.4 M

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT FOR CITY CRITICAL INFRASTRUCTURE

LEAD MANAGER: GREGG SHIPMAN, EM LIAISON, MOUNT CLEMENS, 586-469-6840

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL MOUNT CLEMENS CRITICAL INFRASTRUCTURE TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES (WATER TREATMENT PLANT, CITY HALL/EOC, PUBLIC WORKS).

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.05 M

POTENTIAL SOURCES OF FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: FIRE STATION RECEIVED GENERATOR (2017) USING GENERAL FUNDS. THE NEED STILL EXISTS FOR GENERATORS AT THE OTHER CRITICAL INFRASTRUCTURES OF THE CITY.

PROJECT NUMBER: HM-10 **PRIORITY: 3** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: PUMP STATION IMPROVEMENT PROJECT

LEAD MANAGER: GREGG SHIPMAN, EM LIAISON, MOUNT CLEMENS, 586-469-6840

DESCRIPTION OF ACTION: REPAIR OR REPLACE, AS NECESSARY, ALL PUMP STATIONS IN THE CITY OF MOUNT CLEMENS. THESE STATIONS ARE UTILIZED TO MAINTAIN AN ACCEPTABLE RATE OF DISCHARGE FOR STORM WATER DURING RAIN EVENTS. ALL PUMPS ARE 40-50 YEARS OF AGE AND NEED EXTENSIVE UPGRADES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$5.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: NEW PROJECT DEVELOPED AND ASSIGNED CURRENT PRIORITY IN 2018 BY CITY COMMITTEE.

PROJECT NUMBER: HM-10 **PRIORITY: 4** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: TREE TRIMMING PROJECT

LEAD MANAGER: GREGG SHIPMAN, EM LIAISON, MOUNT CLEMENS, 586-469-6840

DESCRIPTION OF ACTION: IDENTIFY AND TRIM ALL TREES THAT CURRENTLY OR ARE EXPECTED TO ENCROACH ON OVERHEAD POWER LINES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, LOCAL UTILITIES.

ESTIMATED COST OF PROJECT: \$30 THOUSAND- ANNUALLY

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, CITY'S GENERAL FUND

PROJECT STATUS: ANNUAL PROJECT RE-AFFIRMED BY CITY COMMITTEE IN 2018. TRIMMING PROJECT HAS BEEN IMPLEMENTED, BUT AT A SLOWER RATE THAN NECESSARY TO ADDRESS ISSUE DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-10

PRIORITY: 5

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MONITORING EQUIPMENT PROJECT

LEAD MANAGER: GREGG SHIPMAN, EM LIAISON, MOUNT CLEMENS, 586-469-6840

DESCRIPTION OF ACTION: INSTALL FLOOD SENSORS AT KEY POINTS IN THE CITY ALONG THE CLINTON RIVER TO WARN OF HIGH WATER LEVELS AND EVENTUAL FLOODING OF PRE-DETERMINED AREAS OF THE CITY.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, U.S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$100 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, NFIP.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.14 City of New Baltimore

PROJECT NUMBER: HM-05

PRIORITY: 1

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: MICHAEL MERTENS, NEW BALTIMORE POLICE CHIEF, 586-725-9546

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATOR FOR NEW BALTIMORE CRITICAL INFRASTRUCTURE (POLICE STATION-37885 GREEN STREET, NEW BALTIMORE, MI 48047) TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, CITY GENERAL FUND

PROJECT STATUS: NEW BALTIMORE IS CURRENTLY (2018) WRITING A GRANT PROPOSAL TO COMPLETE THIS PROJECT.

PROJECT NUMBER: FMP-05

PRIORITY: 1

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: IMPROVE DRAINAGE THROUGHOUT THE NORTHRIDGE SUBDIVISION

LEAD MANAGER: JOHN T. MONTE, P.E., (810) 794-1931. Ex. 222

DESCRIPTION OF ACTION: THE EXISTING CULVERTS AND DITCHES ALONG COUNTY LINE ROAD FROM 25 MILE ROAD SOUTH TO CRAPEAU CREEK ARE NOT ADEQUATELY SIZED FOR THE FLOOD EVENTS THAT HAVE OCCURRED. THE CULVERT LOCATED UNDER THE ENTRANCE AT NORTH RIDGE SUBDIVISION IS BURIED APPROXIMATELY TWO FEET BELOW THE INVERTS OF THE DOWNSTREAM CULVERTS. DRAINAGE IMPROVEMENTS INCLUDE THE REPLACEMENT OF APPROXIMATELY 1,415 FEET OF 48 INCH STORM SEWER AND REPLACE WITH 12 X 8 FOOT CONCRETE BOX CULVERT AND RE-GRADING APPROXIMATELY 1,970 FEET OF DITCHES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$7.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE FLOODING OF 17 RESIDENCES ALONG BASE STREET, E. OF FRONT

LEAD MANAGER: JOHN T. MONTE, P.E., (810) 794-1931. Ex. 222

DESCRIPTION OF ACTION: BASE STREET HAS 17 RESIDENCES, E. OF FRONT STREET, WITHIN THE 100 YEAR FLOODPLAIN (ZONE A3). THE STREET IS ONLY 10 FEET WIDE AND ACCESS TO THE HOMES DURING FLOOD EVENTS IS EXTREMELY DIFFICULT. ACQUISITION AND RAZING OR ELEVATION PROJECTS WOULD ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.4 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE FLOODING OF 18 RESIDENCES ALONG BASE STREET, W. OF FRONT

LEAD MANAGER: JOHN T. MONTE, P.E., (810) 794-1931. Ex. 222

DESCRIPTION OF ACTION: BASE STREET HAS 18 RESIDENCES, W. OF FRONT STREET, WITHIN THE 100 YEAR FLOODPLAIN (ZONE A3). THE STREET IS ONLY 10 FEET WIDE AND ACCESS TO THE HOMES DURING FLOOD EVENTS IS EXTREMELY DIFFICULT. ACQUISITION AND RAZING OR ELEVATION PROJECTS WOULD ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$3.6 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE FLOODING OF 1 RESIDENCE AT FAR EASTERN BORDER OF NEW BALTIMORE

LEAD MANAGER: JOHN T. MONTE, P.E., (810) 794-1931. Ex. 222

DESCRIPTION OF ACTION: ONE RESIDENCE ON THE FAR EAST BORDER OF NEW BALTIMORE IS WITHIN THE 100 YEAR FLOODPLAIN (ZONE A3). ACQUISITION AND RAZING OR ELEVATION PROJECTS WOULD ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 5 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: REVISE FIRM FOR CRAPEAU CREEK

LEAD MANAGER: JOHN T. MONTE, P.E., (810) 794-1931. Ex. 222

DESCRIPTION OF ACTION: THE FIRM FOR NEW BALTIMORE WAS REVISED IN SEPTEMBER, 2006. AT THAT TIME FEDERAL FUNDING WAS NOT AVAILABLE TO COMPLETE A DETAILED STUDY OF THE CRAPEAU CREEK. PROJECT WOULD DEVELOP THAT STUDY WHICH WOULD ADDRESS EXTENSIVE FLOOD PROBLEMS THAT HAVE OCCURRED UPSTREAM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$100 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, FMA PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.15 Village of New Haven

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 10 RESIDENCES NEAR SHOOK DRAIN

LEAD MANAGER: CHRIS DILBERT, SR., PRESIDENT, NEW HAVEN, 586-749-5301

DESCRIPTION OF ACTION: TEN RESIDENCES LOCATED WITHIN THE 100 YEAR FLOODPLAIN (ZONE A6) ARE AT CONTINUED RISK OF FLOODING DURING MAJOR RAIN EVENTS. PROJECTS SUCH AS ACQUISITION AND RAZING OR ELEVATION OF THESE STRUCTURES WOULD BE OF BENEFIT.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$2.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: CHRIS DILBERT, SR., PRESIDENT, NEW HAVEN, 586-749-5301

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL NEW HAVEN CRITICAL INFRASTRUCTURE (VILLAGE HALL, FIRE STATION & DPW YARD) TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$750 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05

PRIORITY: 2

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: SEVERE WEATHER SHELTERS FOR MOBILE HOME COMMUNITY PARKS

LEAD MANAGER: ROBERT BRAZEE, E.M. LIAISON, NEW HAVEN, 586-749-9351

DESCRIPTION OF ACTION: DEVELOP SEVERE WEATHER SHELTERS FOR THE TWO MOBILE HOME COMMUNITY PARKS (MEADOW CREEK & RIVERBROOK) WITHIN NEW HAVEN.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$4.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.16 Ray Township

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 9 RESIDENCES AT NORTH AND 29 MILE ROADS

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: NINE RESIDENCES AT NORTH AND 29 MILE ROADS ARE ADJACENT TO THE 100 YEAR FLOODPLAIN. REPETITIVE FLOODING OCCURS DURING MAJOR RAIN EVENTS. RE-ENGINEERING OF EXISTING DRAINS, CULVERTS AND DITCHES MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 4 RESIDENCES AT NORTH AND 26 MILE ROADS

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: FOUR RESIDENCES AT NORTH AND 26 MILE ROADS ARE ADJACENT TO THE 100 YEAR FLOODPLAIN. REPETITIVE FLOODING OCCURS DURING MAJOR RAIN EVENTS. RE-ENGINEERING OF EXISTING DRAINS, CULVERTS AND DITCHES MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$800 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF 26 MILE ROAD

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: 26 MILE ROAD IS ADJACENT TO AND IN SEVERAL LOCATIONS WITHIN THE 100 YEAR FLOODPLAIN. REPETITIVE FLOODING OCCURS DURING MAJOR RAIN EVENTS. RE-ENGINEERING OF EXISTING DRAINS, CULVERTS AND DITCHES MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$2.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: EMERGENCY SIREN PROJECT

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: INSTALL AN EMERGENCY SIREN SYSTEM TO COVER THE GEOGRAPHICAL BOUNDARIES OF RAY TOWNSHIP. RAY IS STILL VERY UNDER-DEVELOPED, YET URBAN SPRAWL IS A CONTINUED EVENT. INSTALLING A SIREN SYSTEM (14 SIRENS) TO COVER THE WHOLE OF RAY TOWNSHIP WOULD ENSURE ALL AREAS OF THE COMMUNITY ARE COVERED BEFORE RESIDENTIAL AND COMMERCIAL DEVELOPMENT BEGINS PLAYING A ROLE IN LAND DISPUTES FOR PLACEMENT OF THOSE SIRENS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$550 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 5 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF 31 MILE ROAD

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: 31 MILE ROAD IS ADJACENT TO AND IN SEVERAL LOCATIONS WITHIN THE 100 YEAR FLOODPLAIN. REPETITIVE FLOODING OCCURS DURING MAJOR RAIN EVENTS. RE-ENGINEERING OF EXISTING DRAINS, CULVERTS AND DITCHES MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$2.6 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 6 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF 29 MILE ROAD/ROMEO PLANK DRAINS

LEAD MANAGER: JOE JARZYNA, SUPERVISOR, RAY TOWNSHIP, 586-749-5171

DESCRIPTION OF ACTION: THE COUNTY DRAINS THAT RUN NORTH AND SOUTH OF 29 MILE ROAD, WEST OF ROMEO PLANK ROAD EXPERIENCES REPETITIVE FLOODING DURING MAJOR RAIN EVENTS. RE-ENGINEERING OF THE EXISTING DRAINS, CULVERTS AND DITCHES IN THIS AREA MAY ALLEVIATE THIS PROBLEM.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS IS A NEW PROJECT FOR THE 2020/2025 PLAN, DEVELOPED BY THE RAY TOWNSHIP PLANNING COMMITTEE.

4.4.17 City of Richmond

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: ELEVATED TANK AND MUNICIPAL WELL STAND-BY GENERATOR

LEAD MANAGER: JIM GOETZINGER, PUBLIC SERVICE DIRECTOR, RICHMOND, 586-727-7575

DESCRIPTION OF ACTION: INSTALLATION OF PERMANENT STAND-BY GENERATOR FOR BACKUP POWER TO THE CITY'S 400,000 GALLON ELEVATED STORAGE TANK AND ONE MUNICIPAL GROUNDWATER WELL. WELL #10 OF THE CITY OF RICHMOND'S COMMUNITY WATER SUPPLY SYSTEM IS LOCATED ON THE SAME SITE AS THE ELEVATED STORAGE TANK.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO WEEKS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$45 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: NEW PROJECT DEVELOPED BY CITY PLANNING COMMITTEE FOR THE HAZARD MITIGATION PLAN IN 2018

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL

TITLE: TRAILER PARK SHELTER

LEAD MANAGER: JON MOORE, CITY MANAGER, RICHMOND, 586-727-7571

DESCRIPTION OF ACTION: CONSTRUCT "SAFE ROOMS" TO ADDRESS THE POPULATION NEEDS OF ALL TRAILER PARKS WITHIN THE CITY OF RICHMOND.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$2.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT STATUS: THE CITY OF RICHMOND PASSED A RESOLUTION TO REQUIRE ALL NEW INSTALLATIONS OF POWER LINES AND ELECTRICAL SERVICES UNDERGROUND IN 2018. THIS PROJECT FROM THE 2015/2020 PLAN IS NOW CLOSED.

4.4.18 Richmond Township

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: CRITICAL INFRASTRUCTURE GENERATOR REPLACEMENT

LEAD MANAGER: CYNTHIA GREENIA, SUPERVISOR, RICHMOND TOWNSHIP, 586-727-8997

DESCRIPTION OF ACTION: REPLACE 20 YEAR OLD BACKUP GENERATOR FOR RICHMOND TOWNSHIP'S CRITICAL INFRASTRUCTURE FACILITY, COMMUNITY EOC AND SHELTER, TO ALLOW FOR CONTINUED BUSINESS/EMERGENCY OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$150 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: NEW PROJECT FOR THE 2020-2025 PLAN, CREATED BY THE TOWNSHIP'S PLANNING COMMITTEE.

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: LIFE SAFETY

TITLE: ESTABLISH ORDINANCE TO LOCATE ALL FUTURE POWER LINES UNDERGROUND

LEAD MANAGER: CYNTHIA GREENIA, SUPERVISOR, RICHMOND TOWNSHIP, 586-727-8997

DESCRIPTION OF ACTION: THIS ACTION WOULD REQUIRE THE LOCAL GOVERNMENT TO PASS AND ENFORCE AN ORDINANCE TO REQUIRE ALL NEW INSTALLATIONS OF POWER LINE AND ELECTRICAL SERVICES UNDERGROUND.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: NO FUNDING REQUIRED

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: FUNDING NOT REQUIRED

PROJECT STATUS: CARRY OVER FROM 2015-2020, ORDINANCE STILL BEING CONSIDERED BY LOCAL TOWNSHIP OFFICIALS.

PROJECT NUMBER: HM-05 **PRIORITY: 3** **HAZARD CATEGORY: LIFE SAFETY**

TITLE: EQUIPMENT PACKAGE FOR A COORDINATED RESPONSE TEAM FOR AN ACTIVE ASSAILANT/MASS CASUALTY EVENT

LEAD MANAGER: CYNTHIA GREENIA, SUPERVISOR, RICHMOND TOWNSHIP, 586-727-8997

DESCRIPTION OF ACTION: THIS PROJECT WOULD FUND THE PURCHASE OF EMERGENCY MEDICAL/RESCUE EQUIPMENT THAT WOULD BE UTILIZED DURING AN ACTIVE ASSAILANT EVENT OR ANY OTHER MASS CASUALTY EVENT.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$50 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, DEPARTMENT OF HEALTH GRANTS.

PROJECT STATUS: NEW PROJECT FOR THE 2020-2025 PLAN, CREATED BY THE TOWNSHIP'S PLANNING COMMITTEE.

PROJECT NUMBER: HM-05 **PRIORITY: 0** **HAZARD CATEGORY: INFRASTRUCTURE**

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: JEFF WHITE, EM LIAISON, 586-727-2184

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATOR FOR RICHMOND TOWNSHIP'S CRITICAL INFRASTRUCTURE FACILITY AT THE RICHMOND/LENOX EMERGENCY MEDICAL SERVICES HEADQUARTERS AND DISPATCH CENTER TO ALLOW FOR CONTINUED BUSINESS/EMERGENCY OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: COMPLETED

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE:

PROJECT STATUS: THIS PROJECT WAS COMPLETED IN 2017.

PROJECT NUMBER: HM-05

PRIORITY: 0

HAZARD CATEGORY: INFRASTRUCTURE

TITLE: EMERGENCY SIREN PROJECT

LEAD MANAGER: CYNTHIA GREENIA, SUPERVISOR, RICHMOND TOWNSHIP, 586-727-8997

DESCRIPTION OF ACTION: INSTALL AN EMERGENCY SIREN SYSTEM (20 SIRENS) TO COVER THE GEOGRAPHICAL BOUNDARIES OF RICHMOND TOWNSHIP. RICHMOND IS STILL VERY UNDER-DEVELOPED, YET URBAN SPRAWL IS A CONTINUED EVENT. INSTALLING A SIREN SYSTEM TO COVER THE WHOLE OF RICHMOND TOWNSHIP WOULD ENSURE ALL AREAS OF THE COMMUNITY ARE COVERED BEFORE RESIDENTIAL AND COMMERCIAL DEVELOPMENT BEGINS PLAYING A ROLE IN LAND DISPUTES FOR PLACEMENT OF THOSE SIRENS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: NO COST

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE:

PROJECT STATUS: THIS PROJECT WAS REMOVED FOR LACK OF INTEREST FROM THE 2020-2025 PLAN

4.4.19 Village of Romeo

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACKUP GENERATOR PROJECT

LEAD MANAGER: DAN SOKOLNICKI, EMERGENCY MANAGEMENT LIAISON, 586-725-3587

DESCRIPTION OF ACTION: PURCHASE AND INSTALL BACKUP GENERATOR FOR ROMEO POLICE STATION, A CRITICAL INFRASTRUCTURE FOR THE VILLAGE, TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.20 City of Roseville

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP HYDRANT PROJECT

LEAD MANAGER: SCOTT ADKINS, CITY MANAGER, ROSEVILLE, 586-445-5410

DESCRIPTION OF ACTION: INSTALL A BACK-UP WATER MAIN HYDRANT SYSTEM ON THE SOUTH SIDE OF 14 MILE ROAD, EAST OF GRATIOT. THIS WILL BE UTILIZED IN THE EVENT OF A POWER LOSS. SYSTEM WILL BE SUPPLIED FROM THE MARSACK GRAVEL PITS ON 14 MILE ROAD, EAST OF GRATIOT.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY DEPARTMENT OF ROADS

ESTIMATED COST OF PROJECT: \$5.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: SCOTT ADKINS, CITY MANAGER, ROSEVILLE, 586-445-5410

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL ROSEVILLE CRITICAL INFRASTRUCTURE (CITY HALL, POLICE STATION, FIRE STATIONS) TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: TRAILER PARK SHELTER PROJECT

LEAD MANAGER: SCOTT ADKINS, CITY MANAGER, ROSEVILLE, 586-445-5410

DESCRIPTION OF ACTION: THE CITY WOULD LIKE TO CONSTRUCT "SAFE ROOMS" SUFFICIENT TO SATISFY THE RESIDENTIAL POPULATION OF THE LESLIE MOBILE HOME PARK.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$350 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: THIS NEW PROJECT WAS DEVELOPED BY THE CITY'S PLANNING COMMITTEE FOR THE 2020-2025 PLAN.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: OUTDOOR WARNING ALERT SYSTEM-SIRENS

LEAD MANAGER: SCOTT ADKINS, CITY MANAGER, ROSEVILLE, 586-445-5410

DESCRIPTION OF ACTION: IDENTIFY NON-COVERAGE AREAS OF CITY AND INSTALL OUTDOOR WARNING SYSTEM-SIREN TO COMPLETE WARNING COVERAGE FOR ENTIRE CITY

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$600 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.21 City of St. Clair Shores

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: 10 MILE WATER RESERVOIR GENERATOR

LEAD MANAGER: BRYAN BABCOCK, PUBLIC WORKS DIRECTOR, ST. CLAIR SHORES, 586-445-5363

DESCRIPTION OF ACTION: 10 MILE WATER RESERVOIR GENERATOR - THE CITY OF ST. CLAIR SHORES OWNS AND OPERATES A 4,000,000 GALLON DRINKING WATER STORAGE RESERVOIR. THE CITY PROPOSES TO HAVE A NATURAL GAS GENERATOR INSTALLED AT THE PUMP STATION. THE RESERVOIR IS CURRENTLY POWERED FROM A SINGLE ELECTRICAL FEED FROM DTE ENERGY. ON MULTIPLE OCCASIONS THE CITY HAS LOST POWER TO THE PUMP STATION. ON EACH OCCASION THE CITY HAS EXPERIENCED MULTIPLE WATER MAIN BREAKS FROM THE POWER LOSSES THROUGHOUT THE CITY. THE LOSS OF POWER QUICKLY CAUSES THE FLOWS THROUGHOUT THE CITY TO CHANGE AND THE WATER FEEDS TO THE CITY TO QUICKLY OPEN UP TO MAINTAIN THE REQUIRED PRESSURES THROUGHOUT THE CITY. THESE QUICK CHANGES OFTEN CREATE A "WATER HAMMER" TO OCCUR THROUGHOUT THE CITY CAUSING WATER MAIN BREAKS. ADDITIONALLY A GENERATOR WOULD HELP THE PUMP STATION CONTINUE TO SUPPLY DRINKING WATER AND FIREFIGHTING WATER TO THE CITY IF THERE WAS A POWER OUTAGE AND/OR INTERRUPTION TO THE DRINKING WATER BEING SUPPLIED TO THE CITY FROM THE GREAT LAKES WATER AUTHORITY.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND ROADS DEPARTMENT, EMERGENCY MANAGEMENT AND COMMUNICATIONS, AEW (PRIVATE ENGINEERING CONSULTING FIRM), U. S. ARMY CORPS OF ENGINEERS

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$400 THOUSAND

PROJECT STATUS: THIS NEW PROJECT WAS DEVELOPED FOR THE 2020-2025 PLAN BY THE CITY'S PLANNING COMMITTEE.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL

TITLE: 10 MILE SANITARY RELIEF-SEWER STORM WATER LIFT STATION

LEAD MANAGER: BRYAN BABCOCK, PUBLIC WORKS DIRECTOR, ST. CLAIR SHORES, 586-445-5363

DESCRIPTION OF ACTION: THE BENJAMIN STORM SEWER PUMP STATION (NORTH OF 10 MILE AND EAST OF JEFFERSON) HAS A TEMPORARY GAS PUMP TO REMOVE WATER FROM THE STORM SEWERS, OVER THE SEAWALL AND INTO THE CANAL. THESE GENERATORS MUST BE MONITORED CONTINUOUSLY DURING A HEAVY RAIN EVENT. THE CITY PROPOSES TO INSTALL A PERMANENT STORM WATER LIFT STATION TO BYPASS THE RAIN WATERS FROM THE SEWER SYSTEM ABOVE THE HIGH LAKE LEVELS. THIS WILL INSURE THE THAT THE STREETS WILL NOT FLOOD, HOMES WILL NOT BE IMPACTED BY FLOODING STREETS AND EMERGENCY VEHICLES WILL BE ABLE TO ACCESS THE HOMES EAST OF BENJAMIN STREET WHICH IS A DEAD-END CANAL STREET WITH ONLY THE ONE ACCESS POINT.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND ROADS DEPARTMENT, EMERGENCY MANAGEMENT AND COMMUNICATIONS, AEW (PRIVATE ENGINEERING CONSULTING FIRM), U. S. ARMY CORPS OF ENGINEERS

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$700 THOUSAND

PROJECT STATUS: THIS NEW PROJECT WAS DEVELOPED FOR THE 2020-2025 PLAN BY THE CITY'S PLANNING COMMITTEE.

PROJECT NUMBER: FMP-05 PRIORITY: 3 HAZARD CATEGORY: STRUCTURAL

TITLE: 10 MILE WATER RESERVOIR GENERATOR-L'ANSE STORM SEWER PUMP STATION

LEAD MANAGER: BRYAN BABCOCK, PUBLIC WORKS DIRECTOR, ST. CLAIR SHORES, 586-445-5363

DESCRIPTION OF ACTION: JEFFERSON AVENUE AT THE L'ANSE STORM SEWER PUMP STATION EXPERIENCES HIGH WATER LEVELS, FLOODING JEFFERSON AVENUE CAUSING ROAD CLOSURES. THE CITY PROPOSES TO INSTALL A PERMANENT STORM WATER LIFT STATION TO BYPASS THE RAIN WATERS FROM THE SEWER SYSTEM ABOVE THE HIGH LAKE LEVELS. THIS WILL INSURE THE THAT THE STREETS WILL NOT FLOOD, HOMES WILL NOT BE IMPACTED BY FLOODING STREETS AND EMERGENCY VEHICLES WILL BE ABLE TO EFFECTIVELY RESPOND TO EMERGENCIES AS JEFFERSON IS A MAJOR ROAD UTILIZED BY EMERGENCY VEHICLES IN THE CITY.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND ROADS DEPARTMENT, EMERGENCY MANAGEMENT AND COMMUNICATIONS, AEW (PRIVATE ENGINEERING CONSULTING FIRM), U. S. ARMY CORPS OF ENGINEERS

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$700 THOUSAND

PROJECT STATUS: THIS NEW PROJECT WAS DEVELOPED FOR THE 2020-2025 PLAN BY THE CITY'S PLANNING COMMITTEE.

PROJECT NUMBER: FMP-05 PRIORITY: 4 HAZARD CATEGORY: STRUCTURAL

TITLE: STORM DRAIN OUTFALL CLEANING AND MAINTENANCE

LEAD MANAGER: BRYAN BABCOCK, PUBLIC WORKS DIRECTOR, ST. CLAIR SHORES, 586-445-5363

DESCRIPTION OF ACTION: THE CITY HAS FOUND THAT THE LAKES HIGH WATERS CAUSE DEBRIS TO GET TRAPPED AT THE LAKE ST. CLAIR OUTFALLS. LAKE DEBRIS ALSO GETS PUSHED BACK INTO THE DRAINS DURING EASTERLY WIND EVENTS. THE COMBINATION OF THESE EVENTS CAUSES THE OUTFALLS TO GET PLUGGED, CAUSING THE STORM SEWER SYSTEM TO BACK-UP AND CAUSE FLOODING ISSUES ON MANY MAJOR ROUTES. THE CITY PROPOSES TO HAVE THESE OUTFALL CLEANED TO PREVENT THIS FLOOD EVENT FROM RE-OCCURRING.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND ROADS DEPARTMENT, EMERGENCY MANAGEMENT AND COMMUNICATIONS, AEW (PRIVATE ENGINEERING CONSULTING FIRM), U. S. ARMY CORPS OF ENGINEERS

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$100 THOUSAND

PROJECT STATUS: THIS NEW PROJECT WAS DEVELOPED FOR THE 2020-2025 PLAN BY THE CITY'S PLANNING COMMITTEE

PROJECT NUMBER PRIORITY: COMPLETED HAZARD CATEGORY: STRUCTURAL

TITLE: 10 MILE SANITARY RELIEF SEWER

LEAD MANAGER: BRYAN BABCOCK, PUBLIC WORKS DIRECTOR, ST. CLAIR SHORES, 586-445-5363

DESCRIPTION OF ACTION: TO PROVIDE RELIEF SEWER BY DOUBLING EXISTING CAPACITY.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND ROADS DEPARTMENT, EMERGENCY MANAGEMENT AND COMMUNICATIONS, AEW (PRIVATE ENGINEERING CONSULTING FIRM), U. S. ARMY CORPS OF ENGINEERS

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.5 MILLION

PROJECT STATUS: THIS PROJECT WAS COMPLETED IN 2018 FOR A COST OF 2.5 MILLION.

4.4.22 Shelby Township

PROJECT NUMBER: HM-05 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: EMERGENCY SIREN UPGRADE

LEAD MANAGER: DUANE STATEN, EMERGENCY MANAGEMENT LIAISON, SHELBY, 586-731-3476

DESCRIPTION OF ACTION: REPLACE AND/OR UPGRADE CURRENT SIREN HEADS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$150 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: DUANE STATEN, EMERGENCY MANAGEMENT LIAISON, SHELBY, 586-731-3476

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATOR FOR TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES AT THE SENIOR CENTER WHICH WILL ALSO BE USED AS A COMMUNITY SHELTER WHEN CONDITIONS REQUIRE.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE HALF YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$400 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: NEW PROJECT FOR THE 2020-2025 PLAN, CREATED BY THE TOWNSHIP'S PLANNING COMMITTEE.

PROJECT NUMBER: HM-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: MITIGATE BASEMENT FLOODING IN SECTION 30 OF TOWNSHIP

LEAD MANAGER: DUANE STATEN, EMERGENCY MANAGEMENT LIAISON, SHELBY, 586-731-3476

DESCRIPTION OF ACTION: MOST RESIDENCES IN SECTION 30 OF THE TOWNSHIP EXPERIENCE BASEMENT FLOODING DURING RAIN EVENTS. A DRAIN IN THE ADJACENT QUARRY WOULD REDUCE THE CHANCES OF THE WATER LEVEL TO RISE IN THE WET SEASON, THEREBY REDUCING THE CHANCES OF FLOODING IN THIS AREA.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$300 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 3 HAZARD CATEGORY: STRUCTURAL

TITLE: TRAILER PARK SHELTER

LEAD MANAGER: DUANE STATEN, EMERGENCY MANAGEMENT LIAISON, SHELBY, 586-731-3476

DESCRIPTION OF ACTION: CONSTRUCT "SAFE ROOMS" TO ACCOMMODATE THE POPULATIONS OF ALL TRAILER PARKS WITHIN THE TOWNSHIP.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$6.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05

PRIORITY: 4

HAZARD CATEGORY: STRUCTURAL

TITLE: ESTABLISH ORDINANCE TO LOCATE ALL FUTURE POWER LINES UNDERGROUND

LEAD MANAGER: DUANE STATEN, EMERGENCY MANAGEMENT LIAISON, SHELBY, 586-731-3476

DESCRIPTION OF ACTION: THIS ACTION WOULD REQUIRE THE LOCAL GOVERNMENT TO PASS AND ENFORCE AND ORDINANCE TO REQUIRE ALL NEW INSTALLATIONS OF POWER LINE AND ELECTRICAL SERVICES UNDERGROUND.

SCHEDULE: CURRENT STUDY BEING UNDERTAKEN BY LOCAL TOWNSHIP OFFICIALS AND LEGAL COUNSEL.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, DTE

ESTIMATED COST OF PROJECT: \$0

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: FUNDING NOT REQUIRED

PROJECT STATUS: CARRYOVER FROM 2015-2020, ORDINANCE CURRENTLY UNDER REVIEW.

4.4.23 City of Sterling Heights

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: STORM WATER RETENTION POND UPGRADES

LEAD MANAGER: MICHAEL MOORE, DIRECTOR, DPW, STERLING HEIGHTS, 586-446-2440

DESCRIPTION OF ACTION: OVERHAUL AND REBUILD FOUR RETENTION POND WET-WELLS AND UPGRADE THE PUMPS INSIDE OF EACH WELL. THESE RETENTION PONDS HELP TO CONTROL FLOODING IN SEVERE RAIN EVENTS SO AS NOT TO OVERBURDEN THE STORM SYSTEM OF THE CITY.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY PUBLIC WORKS COMMISSION

ESTIMATED COST OF PROJECT: \$2.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: STREET DRAIN UPGRADE-ALMONT EAST AND WEST DRIVES

LEAD MANAGER: MICHAEL MOORE, DIRECTOR, DPW, STERLING HEIGHTS, 586-446-2440

DESCRIPTION OF ACTION: DESIGN AND IMPLEMENT NEW DRAINAGE FOR ALMONT EAST AND WEST DRIVES. APPROXIMATELY 75 RESIDENCES ARE IMPACTED WITH FLOOD ISSUES DURING RAIN EVENTS AND MAJOR SNOW MELT-OFF.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 3 HAZARD CATEGORY: LIFE SAFETY

TITLE: EMERGENCY OUTDOOR WARNING SIREN UPGRADE

LEAD MANAGER: CHRISTOPHER MARTIN, EM LIAISON, STERLING HEIGHTS, 586-446-2951

DESCRIPTION OF ACTION: REPLACE EXISTING SIREN POLES WITH TALLER POLES TO MITIGATE THE INTERFERENCE FROM TALL BUILDINGS AND TREES. REPLACE CURRENT SIREN HEADS WITH 360 DEGREE MULTI-DIRECTIONAL HEADS, PER FEDERAL RADIO REQUIREMENT 2013.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$700 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: LIFE SAFETY

TITLE: WEB STREAMING FOR EMERGENCY NOTIFICATIONS

LEAD MANAGER: CHRISTOPHER MARTIN, EM LIAISON, STERLING HEIGHTS, 586-446-2951

DESCRIPTION OF ACTION: PURCHASE AND INSTALL OF EQUIPMENT TO PROVIDE WEB STREAMING THROUGH THE CITY'S WEB SITE AS A MEANS TO CONTACT CITY RESIDENTS AND BUSINESSES IN THE EVENT OF AN EMERGENCY.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$200 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 5 HAZARD CATEGORY: LIFE SAFETY

TITLE: INTEGRATED PUBLIC ALERT WARNING SYSTEM

LEAD MANAGER: CHRISTOPHER MARTIN, EM LIAISON, STERLING HEIGHTS, 586-446-2951

DESCRIPTION OF ACTION: ENHANCEMENT OF THE STATEWIDE EMERGENCY ALERT SYSTEM BY IMPLEMENTING THE INTEGRATED PUBLIC ALERT WARNING SYSTEM UTILIZING EM-NET, WITH LOCAL SATELLITE BACK-UP TO FACILITATE EMERGENCY COMMUNICATION BETWEEN THE STATE AND LOCAL GOVERNMENTS AND TO DISSEMINATE EMERGENCY WARNINGS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$20 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-05 PRIORITY: 6 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: CHRISTOPHER MARTIN, EM LIAISON, STERLING HEIGHTS, 586-446-2951

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL STERLING HEIGHTS CRITICAL INFRASTRUCTURE (CITY HALL, POLICE STATION, DPW YARD, FIRE STATIONS) TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.75 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, UASI GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10**PRIORITY: 7****HAZARD CATEGORY: INFRASTRUCTURE****TITLE: CLINTON RIVER PROJECT****LEAD MANAGER:** CHRISTOPHER MARTIN, EM LIAISON, STERLING HEIGHTS, 586-446-2951

DESCRIPTION OF ACTION: CLEAR A PORTION OF THE CLINTON RIVER IN ORDER TO MAINTAIN THE PROPER FLOW OF THIS ESTUARY. A SECOND PROJECT INCLUDES RIVERBANK STABILIZATION AND RESTORATION TO PARTS OF THE RIVERBANKS TO PREVENT FUTURE FLOODWATER EROSION OF THE STREAM BANK. MANY AREAS WILL REQUIRE DREDGING THAT HAVE BECOME CLOGGED WITH DEBRIS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY PUBLIC WORKS COMMISSION, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$1.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, FMA PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.24 City of Utica

PROJECT NUMBER: FMP-10 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD MITIGATION OF 61 STRUCTURES IN SOUTH UTICA.

LEAD MANAGER: WILLIAM LANG, SUPERINTENDENT-DPW, UTICA, 586-731-6110

DESCRIPTION OF ACTION: IN THE SOUTH SECTION OF UTICA THERE EXISTS A 100 YEAR FLOODPLAIN THAT ROUTINELY CAUSES EXTENSIVE FLOOD DAMAGE DURING MAJOR RAIN EVENTS AND SNOW MELT. SUGGESTED MITIGATION STRATEGIES INCLUDE ELEVATION OF THOSE STRUCTURES, ELEVATION OF ELECTRICAL AND ELEVATOR EQUIPMENT IN THE SENIOR HI-RISE BUILDING, DRAIN IMPROVEMENTS, RIVERBANK STABILIZATION AND SUMP PUMP SYSTEM FOR THE SENIOR HOUSING PARKING STRUCTURE.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, U. S. ARMY CORPS OF ENGINEERS, STATE NFIP PROGRAM

ESTIMATED COST OF PROJECT: \$2.8 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: CLINTON RIVER FLOOD MITIGATION PROJECTS

LEAD MANAGER: WILLIAM LANG, SUPERINTENDENT-DPW, UTICA, 586-731-6110

DESCRIPTION OF ACTION: DUE TO THE SEVERITY OF FLOOD ISSUES RELATED TO THE CLINTON RIVER FOR THE CITY OF UTICA, MULTIPLE PROJECTS TO ADDRESS THE CLINTON RIVER ARE PROPOSED. DREDGING, RIVERBANK STABILIZATION, DEBRIS REMOVAL, RETENTION BASIN CONSTRUCTION, EARLY FLOOD WARNING SYSTEMS ALL WOULD HELP TO ADDRESS THE FLOOD PROBLEMS OF THIS RIVER.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY PUBLIC WORKS COMMISSION, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$3.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, CORPS OF ENGINEERS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 3 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BROWNFIELD RE-DEVELOPMENT ZONE

LEAD MANAGER: WILLIAM LANG, SUPERINTENDENT-DPW, UTICA, 586-731-6110

DESCRIPTION OF ACTION: UTICA IS INVESTIGATING A MEASURE TO HAVE ALL DESIGNATED BRZ EVALUATED BY HAVING BASELINE ENVIRONMENTAL ASSESSMENTS UPDATED OR COMPLETED. AFTER THE ASSESSMENT, UTICA WOULD LIKE TO ADDRESS THE CONTAMINATION AND RETURN THE PROPERTIES USABLE FOR COMMERCIAL OR RESIDENTIAL DEVELOPMENT.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, MI-BROWNFIELD REDEVELOPMENT ASSOCIATION

ESTIMATED COST OF PROJECT: \$1.2 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: BACK-UP GENERATOR PROJECT

LEAD MANAGER: WILLIAM LANG, SUPERINTENDENT-DPW, UTICA, 586-731-6110

DESCRIPTION OF ACTION: INSTALL BACKUP GENERATORS FOR ALL UTICA CRITICAL INFRASTRUCTURE (CITY HALL, POLICE STATION, FIRE STATION, DPW YARD) TO ALLOW FOR CONTINUED BUSINESS OPERATIONS DURING POWER OUTAGES.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$1.25 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.25 City of Warren

PROJECT NUMBER: FMP-05 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD CONTROL MITIGATION - CITY OF WARREN CONNECTOR TO OAKLAND/MACOMB INTERCEPTOR

LEAD MANAGER: CHRISTOPHER LIVINGSTON, EM COORDINATOR, WARREN, 586-574-4853

DESCRIPTION OF ACTION: CONSTRUCTION OF TWO (2) CONNECTIONS TO THE OAKLAND/MACOMB INTERCEPTOR (OMI) PIPE TO CONVEY FLOW AWAY FROM WARRENS EAST TRUNK SEWER TO REDUCE/ELIMINATE BASEMENT FLOODING DURING WET WEATHER EVENTS..

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$21 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, LOCAL WATER & SEWER REVENUE BONDS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-05 PRIORITY: 2 HAZARD CATEGORY: STRUCTURAL

TITLE: FLOOD CONTROL MITIGATION - 12 MILLION GALLON RETENTION BASIN CONSTRUCTION PROJECT

LEAD MANAGER: CHRISTOPHER LIVINGSTON, EM COORDINATOR, WARREN, 586-574-4853

DESCRIPTION OF ACTION: CONSTRUCTION OF A 12 MILLION GALLON RETENTION BASIN IN SOUTH WARREN TO HOLD EXCESSIVE FLOW FROM THE EAST TRUNK SANITARY SEWER TO REDUCE/ELIMINATE BASEMENT FLOODING DURING WET WEATHER EVENTS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$29 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, LOCAL WATER & SEWER REVENUE BONDS

PROJECT STATUS: NEW PROJECT RESULTING FROM THE 2016 WARREN HAZARD MITIGATION COMMITTEE MEETING. NO PROGRESS TO REPORT DUE TO LACK OF FUNDS. PROJECT CONTINUED FOR THE 2020-2025 PLAN.

PROJECT NUMBER: FMP-05 **PRIORITY: 3** **HAZARD CATEGORY: STRUCTURAL**

TITLE: FLOOD CONTROL MITIGATION – PROPERTY ACQUISITION IN FLOOD PLAINS

LEAD MANAGER: CHRISTOPHER LIVINGSTON, EM COORDINATOR, WARREN, 586-574-4853

DESCRIPTION OF ACTION: PURCHASE AND REMOVE MULTIPLE HOMES THAT EXPERIENCE REPETITIVE FLOODING.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$4 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS

PROJECT STATUS: NEW PROJECT RESULTING FROM 2016 WARREN HAZARD MITIGATION COMMITTEE MEETING. NO PROGRESS TO REPORT DUE TO LACK OF FUNDS. PROJECT CONTINUED FOR THE 2020-2025 PLAN.

PROJECT NUMBER: FMP-05 **PRIORITY: 4** **HAZARD CATEGORY: STRUCTURAL**

TITLE: FLOOD MITIGATION OF 12 RESIDENCES AT AUTUMN LANE & JANE COURT

LEAD MANAGER: CHRISTOPHER LIVINGSTON, EM COORDINATOR, WARREN, 586-574-4853

DESCRIPTION OF ACTION: THIS AREA IS CURRENTLY NOT IN A NFIP FLOODPLAIN BUT DUE TO THE RELATIVELY LOW ELEVATION, BASEMENT FLOODING OCCURS REGULARLY DURING MAJOR RAIN EVENTS AND SNOW MELT. POSSIBLE MITIGATION PROJECTS INCLUDE PUBLIC AWARENESS ON ISSUES SUCH AS DIVERTING RAIN WATER FROM HOUSE FOUNDATIONS, INSTALL OF SUMP PUMPS, ADJUSTING OF FOOTING DRAINS IN AFFECTED STRUCTURES.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$120 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS.

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-10 PRIORITY: 5 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: FLOOD MITIGATION OF CITY RESIDENCES

LEAD MANAGER: CHRISTOPHER LIVINGSTON, EM COORDINATOR, WARREN, 586-574-4853

DESCRIPTION OF ACTION: THERE ARE APPROXIMATELY 55,000 OCCUPIED HOUSEHOLDS IN THE CITY OF WARREN THOSE HOMES THAT EXPERIENCE FLOODING ARE SCATTERED THROUGHOUT THE CITY RATHER THAN ANY ONE LOCATION OR SPECIFIC AREA. AS FUNDING BECOMES AVAILABLE, THE CITY WOULD UTILIZE THOSE GRANTS TO ADDRESS FLOOD ISSUES IN RESIDENCES THAT EXPERIENCE THE MOST FREQUENT FLOODING PROBLEMS. PROJECTS THAT COULD ADDRESS THESE ISSUES WOULD BE INSTALL OF SUMP PUMP, RE-DIRECT DOWNSPOUTS TO DIRECT THE RAIN WATERS AWAY FROM THE FOUNDATIONS, DRAIN IMPROVEMENTS, RE-ENGINEERING OF RETENTION PONDS.

SCHEDULE: INITIATE HMGP, FMAP & PDMP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN FIVE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, STATE NFIP PROGRAM, U.S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: TOO BROAD OF A PROJECT TO DEVELOP A COST ESTIMATE.

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HMGP, FMAP & PDMP GRANTS, U. S. ARMY CORPS OF ENGINEERS

Project Status: new project in 2015. This project is a carryover from the 2015-2020 Plan due to lack of funding. Project continued for the 2020-2025 plan.

4.4.26 Washington Township

PROJECT NUMBER: HM-10 PRIORITY: 1 HAZARD CATEGORY: STRUCTURAL

TITLE: TRAILER PARK SHELTER

LEAD MANAGER: DAN O'LEARY, SUPERVISOR, WASHINGTON TOWNSHIP, 586-677-4219

DESCRIPTION OF ACTION: CONSTRUCT "SAFE ROOMS" TO ACCOMMODATE THE POPULATIONS OF ALL TRAILER PARKS WITHIN THE TOWNSHIP.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN TWO YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$4.5 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: FMP-10 PRIORITY: 2 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: RE-ENGINEERING OF EXISTING SEWER SYSTEM

LEAD MANAGER: DAN O'LEARY, SUPERVISOR, WASHINGTON TOWNSHIP, 586-677-4219

DESCRIPTION OF ACTION: REPLACE OR UPDATE THE EXISTING SEWER SYSTEMS THAT HAVE BEEN DETERMINED STRUCTURALLY COMPROMISED AND INADEQUATE FOR EXISTING AND FUTURE CAPACITY OF SEWAGE PROCESSING.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS, MACOMB COUNTY'S PUBLIC WORKS COMMISSION AND DEPARTMENT OF ROADS, U. S. ARMY CORPS OF ENGINEERS

ESTIMATED COST OF PROJECT: \$15 M

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM, U. S. ARMY CORPS OF ENGINEERS

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 3 HAZARD CATEGORY: STRUCTURAL

TITLE: EMERGENCY OPERATION CENTER

LEAD MANAGER: DAN O'LEARY, SUPERVISOR, WASHINGTON TOWNSHIP, 586-677-4219

DESCRIPTION OF ACTION: CREATE AN EMERGENCY OPERATION CENTER IN THE BASEMENT OF TOWNSHIP HALL FOR REDUNDANCY OF EXISTING COMMUNICATIONS SYSTEMS AND THE MANAGEMENT OF LARGE AND REGIONAL EMERGENCY EVENTS.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN ONE YEAR OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$250 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

PROJECT NUMBER: HM-10 PRIORITY: 4 HAZARD CATEGORY: INFRASTRUCTURE

TITLE: REVERSE 911 SYSTEM

LEAD MANAGER: DAN O'LEARY, SUPERVISOR, WASHINGTON TOWNSHIP, 586-677-4219

DESCRIPTION OF ACTION: INSTALL A REVERSE 911 SYSTEM TO NOTIFY RESIDENTS OF EMERGENCY EVENTS. THIS SYSTEM WOULD WORK IN CONCERT WITH THE TOWNSHIP'S OUTDOOR EMERGENCY SIREN SYSTEM.

SCHEDULE: INITIATE HMGP APPLICATION WHEN NOTIFIED BY MSP-EMHSD OF START OF GRANT APPLICATION PERIOD. RESUBMIT GRANT APPLICATION FOLLOWING EVERY PRESIDENTIAL DISASTER DECLARATION WITHIN THE STATE OF MICHIGAN. COMPLETION OF PROJECT WITHIN THREE YEARS OF RECEIVING FUNDING.

POTENTIAL SOURCES OF

TECHNICAL ASSISTANCE: MACOMB COUNTY EMERGENCY MANAGEMENT AND COMMUNICATIONS

ESTIMATED COST OF PROJECT: \$45 THOUSAND

POTENTIAL SOURCES OF

FINANCIAL ASSISTANCE: HAZARD MITIGATION GRANT PROGRAM

PROJECT STATUS: THIS PROJECT IS A CARRYOVER FROM THE 2015-2020 PLAN DUE TO LACK OF FUNDING.

4.4.27 Conclusion

The original 2005-2010 Hazard Mitigation Plan had developed a list of projects based on local input and those projects were ranked by a committee of local emergency management coordinators on a county priority system. These projects were ranked based on the impact to the county as a whole with no regard to the impact to the local jurisdiction. Those projects were updated for both the 2010-2015 and 2015-2020 Plans.

The changes to this 2020-2025 Hazard Mitigation Plan List of Projects either reflect a lack of funds available to the local communities to complete those projects, lack of need for the projects to be resumed and/or the projects have been completed utilizing general funds grants or other sources of revenue. Each local jurisdiction is responsible for their application of either a Hazard Mitigation Grant, Flood Mitigation Grant, or any other type of grant that is made available by Federal, State or independent sources. That local is wholly responsible for the application process, grant and project management and possible matching funds. It was unrealistic to expect that a separate committee would be able to complete their projects without a well-funded grant program. This however did not deter those local committees from reviewing and proposing projects that would better serve their community.

Each community has developed a committee which consists of their chief elected official, department heads and community leaders to review the current 2015–2020 Plan, identify the needs based on the identified threats to that community and made a list of projects that were deemed current and proper for that community. That committee then prioritized each project based on those needs of their community.

If a project was dropped or re-prioritized by the committee, it was done based on current threat and need assessments that had been conducted by that committee. As there were limited mitigation funds available during the 2015-2020 Plan tenure, progress on many of those projects that required funding during that time frame were never addressed; although there were several projects that received funding from various other sources other than the Federal Grant Programs to either start or complete those projects in the 2015-2020 time frame. Some of the projects that did not require funding are either currently still in consideration by the local jurisdictions who proposed those projects or they have been dropped for lack of interest or need.

Since the adoption of the first 2005-2010 County Hazard Mitigation Plan and consequently in the 2020-2025 planning time frame, each participating local jurisdiction has identified that the utilization of this plan has been significant with the current local planning processes at the local government level, such as Master Plan Development. Several of these community Land Use Plans began the update process within the last five year time period and many others are making preparations to begin that process with guidance from this 2020-2025 Hazard Mitigation Plan.

5 Plan Maintenance Process

Once the hazards affecting Macomb County have been identified, goals and objectives established, and an initial list of mitigation actions and projects has been developed, the critical step becomes implementation and follow-up.

In this chapter of the document, a minimum timeframe for updating the document was established. The procedures for reviewing the Hazard Mitigation Plan are also laid out in this section and they explain the specific steps needed to reassess the county's hazards, goals, and vulnerabilities. Also, this section provided a list of current documents and plans that the county utilizes and which the HMP will be incorporated into to ensure a smooth adoption and implementation process into normal county practices. Finally, methods of public involvement are provided at the end as a means to keep the public and the residents educated and informed when updates or changes occur.

5.1 RESPONSIBILITY FOR HAZARD MITIGATION PLAN

Macomb County Emergency Management and Communications has the responsibility for development coordination and maintenance of the Macomb County Hazard Mitigation Plan and overseeing its implementation through coordination and interaction with Macomb County departments and agencies and the community governments within and adjacent to Macomb County. Ms. Lindsay Schwan, the Point of Contact for the Plan, can be reached at (586) 469-6390 or lindsay.schwan@macombgov.org.

5.2 PROJECT TRACKING

The list of flood and hazard mitigation projects will be reviewed and updated annually by the Local Emergency Planning Committee (LEPC) and the Local Emergency Management Liaisons. As projects are accomplished, their status will be updated. New projects will be identified and added to the project list. This is intended to be a living document to allow projects to easily be updated, modified, added, or deleted based on Macomb County and the Local Community's needs. Macomb County Emergency Management will work closely with the LEPC and community leaders to generate support for and implement the hazard and flood mitigation projects identified.

Any changes to the plan will be placed on the county's web site to keep the public apprised of those changes and upgrades.

5.3 MAINTENANCE CYCLE

Mitigation planning is an ongoing process and the Hazard Mitigation Plan needs to be reviewed, revised, and updated on a periodic basis in order to maintain pace with the County's growth and changes regarding hazard vulnerability. The Disaster Mitigation Act of 2000 requires the plan to be reviewed and updated at least once every five years for the County to remain eligible for federal funding. However, with the rapid growth of Macomb County, several levels of review and analysis will occur on an annual basis.

Every year, during the last quarter of the calendar year, Macomb County Emergency Management will conduct a review of the Macomb County Hazard Mitigation Plan to determine its adequacy and completeness as discussed in the following section. If the plan needs to be updated, Emergency Management will then take the steps necessary to update the plan. All reviews will be documented and the updated plan will replace the previous plan on the web site.

In October 2018, Macomb County Emergency Management began the process for the complete revision and coordination of the plan. The process was completed in February of 2019 for the Town Hall meeting presentations and then the Plan was sent to the Michigan State Police-Emergency Management & Homeland Security Division (MSP-EMHSD) for their review. The MSP/EMHSD will then submit this plan to FEMA Region V in order to have the revised Plan fully approved by May 2020.

5.4 REVIEW AND EVALUATION PROCEDURES

Regular maintenance and review of the Plan, as in the case of the 5-year review, consists primarily of three main steps. These steps are taken from the “State and Local Mitigation Planning How-To Guide” (FEMA 386-4). The first step is to review the factors affecting the county’s planning context. This step will help determine what changes to the Plan are warranted. The second step is to analyze the findings and determine whether to revise the planning process or the mitigation strategy. The third step is to incorporate the findings into the Plan. These steps and the specific actions associated with them are listed below in more detail.

5.4.1 Review those factors that affect your community’s planning context.

Revisit the risk assessment to incorporate updated estimates of:

- ◆ Costs of Living
- ◆ Replacement Costs
- ◆ New Scientific Data on Hazard Areas
- ◆ Effect of Hazards on the Community
- ◆ Changes in Growth Patterns
- ◆ Reductions in Vulnerability due to Completion of Projects

There are many methods available for obtaining this data. The planning team will determine whether there are changes in the development patterns that could influence the effects of hazards in the community or create additional risks. Areas affected by recent disasters can provide new information in the sense that the effects of the event can be compared with what the loss analysis estimated. Updated information can be obtained from recent hydrological, watershed, traffic, demographic studies, or new mitigation techniques that are being developed. Planning may also be affected by projects scheduled to be implemented or already completed. When new information arises, often times the cost/benefit analysis needs to be revised to reflect the increasing or declining potential for losses.

Revisit capability assessment and determine changes in:

- ◆ Laws
- ◆ Authorities
- ◆ Community and State Resources
- ◆ Availability of Financial and Technical Tools

Some examples of what the county is capable of with regard to mitigation actions can be greatly affected by things like the strengthening, relaxing, or addition of land use, environmental, or other government regulations. Changes in the socioeconomic fabric of the community, such as recessions, booming economies, changes in political climate, and demographic shifts, often

have repercussions on the community's sequence of mitigation priorities and the implementation of projects.

It should be noted that each participating community is responsible for the zoning requirements within that community. Each local community develops, maintains and enforces all zoning needs and requirements for that community.

5.4.2 Analyze findings and determine whether to revise planning process or mitigation strategy

The planning team should discuss what actions should be undertaken, reconsidered, or eliminated, to further the plan's goals. The community should be involved in reviewing the alternative mitigation actions that would result from these discussions. Some important questions to discuss with the planning team include:

Are the goals and objectives still applicable and has anything made them obsolete or irrelevant?

Review the findings of changes in the community, including changes that your mitigation initiatives have brought, to determine whether you have met your goals and if they remain consistent with current conditions. Add new goals when necessary.

Do the Plan's priorities correspond with the State's priorities?

Where applicable, make sure actions are consistent with any changes to state and local priorities.

Do existing actions need to be reprioritized?

Actions or projects may need to be reprioritized based on newly developed actions, changing community aspects and by learning what works and what does not work.

Are actions appropriate for available resources?

Before proceeding with actions, it is important to make sure that sufficient funding is available. Asking some of the following questions may help in researching what type of funding is available:

- ◆ Are past sources of funds still available?
- ◆ Are there new sources of funding that can be tapped?
- ◆ Are there new partnerships with nonprofit organizations or businesses that can be developed?
- ◆ What creative ways of implementing similar actions have other communities used?

5.4.3 Incorporate findings into the Plan

The planning team should then include the most recent findings about the community, the hazards and vulnerabilities, and the applicable original actions of the plan into the revised plan. Other areas of the plan will need to be updated including the description of the planning process to include the steps taken to revise the plan and how the public was involved. Additionally, the implementation strategy will need to identify who will be responsible for the new or revised actions, the time frame, and funding sources. Finally, the revised plan will need to be reviewed by all the key stakeholders and again passed through a formal adoption process.

5.5 INCORPORATING THE PLAN INTO COMMUNITY PLANNING MECHANISMS

Macomb County currently utilizes a number of plans and documents in its comprehensive planning. One aspect of the Hazard Mitigation Plan is that it is designed to fit in with existing planning procedures and policies and work concurrently with them. The planning mechanisms that Macomb County currently utilizes includes:

- Federal Response Plan
- Michigan Emergency Management Plan
- Macomb County Emergency Operations Plan (EOP)
- Macomb County Continuity of Operations Plan (COOP)
- Individual Community Emergency Operations Plan (Each community within the County has an EOP)
- SARA Title III “302” Site Response Plans for 130 facilities within Macomb County
- Macomb County Fire Mutual Aid Pact
- Macomb County Hazardous Material Mutual Aid Agreement
- Macomb County/Community Cost Recovery Ordinance

A truly effective HMP will be assimilated into the existing County/Local planning structures without disrupting the established procedures. According to the “State and Local Mitigation Planning How-To Guide (FEMA 386-4)”, integrating the hazard mitigation plan and the county’s existing plans can achieve a number of beneficial results. The primary benefit is that they both influence the location, type, and characteristics of physical growth, specifically buildings and infrastructure. The planning uses regulatory mechanisms (zoning, development ordinances, etc.) for implementing goals and objectives. Additionally, the comprehensive planning process is an established activity that is already familiar to the public, and it usually generates a great deal of interest and public participation.

5.6 CONTINUED PUBLIC PARTICIPATION

Throughout the initial plan development, the most current version of the plan has been made available on the county’s web site. Each publication of the plan, every time it is revised, was posted on the Internet. Articles were also be published in the local newspapers to notify the public of the plan’s revision and the need for community input. At least annually, Macomb County Emergency Management will ensure that an article is published on hazard mitigation through the local newspapers to focus attention on hazard mitigation planning within Macomb County. Should the need arise, a public forum or presentation will be conducted to address any questions or concerns the public may have regarding the plan’s modification.

6 Documentation

The following section includes all the information and documents pertinent to the adoption of the plan. The working draft of the plan, once considered complete, was sent to both the various county departments. Copies were also sent to the adjacent communities and counties of Macomb County and independent agencies, which play a major role in hazard planning. Please refer to Appendix A, which includes a copy of the invitation letter, and a list of the adjacent communities and agencies asked to review and comment on the draft plan. Upon completion of the reviews and after receiving the comments from both parties, final changes were made to the plan. The plan was then sent to the Michigan State Police, Emergency Management & Homeland Security Division for a thorough review. Once the State is satisfied with the plan they will then submit that plan to FEMA for their review. Once the FEMA and State review approves the 2020-2025 Plan, the Plan will then be sent to all of the governing authorities of the county's local jurisdictions and to the Macomb County Board of Commissioners for adoption. All accompanying adoption documentation by Macomb County and the individual communities will be submitted to the MSP-EMHS Division and FEMA and registered on the next page.

6.1 ADOPTION BY JURISDICTION

Jurisdiction	Adopting Authority	2020-2025 Plan Date of Adoption
Macomb County	Macomb County Board of Commissioners	9/24/2020
Armada Township	Armada Township Board of Trustees	8/12/20
Village of Armada	Armada Village Council	6/22/20
Bruce Township	Bruce Township Board of Trustees	7/15/20
City of Center Line	Center Line City Council	7/6/20
Chesterfield Township	Chesterfield Township Board of Trustees	9/22/20
Clinton Township	Clinton Township Bd. of Trustees	7/2/20
City of Eastpointe	Eastpointe City Council	6/16/20
City of Fraser	Fraser City Council	8/13/20
Harrison Township	Harrison Township Board of Trustees	6/22/20
Lenox Township	Lenox Township Board of Trustees	6/18/20
Macomb Township	Macomb Township Board of Trustees	7/22/20
Mount Clemens, City of	Mt. Clemens City Council	6/15/20
City of New Baltimore	New Baltimore City Council	6/29/20
Village of New Haven	New Haven Village Council	7/14/20
Ray Township	Ray Township Board of Trustees	7/21/20
City of Richmond	Richmond City Council	7/20/20
Richmond Township	Richmond Township Board of Trustees	6/10/20
Village of Romeo	Romeo Village Council	6/15/20
City of Roseville	Roseville City Council	7/14/20
Shelby Township	Shelby Township Board of Trustees	6/17/20
City of St. Clair Shores	St. Clair Shores City Council	7/20/20
City of Sterling Heights	Sterling Heights City Council	3/16/21
City of Utica	Utica City Council	8/11/20
City of Warren	Warren City Council	6/23/20
Washington Township	Washington Township Board of Trustees	6/17/20

7 Appendices

This appendix is intended to supplement the hazard mitigation plan. The information contained in this section was gathered from a variety of sources. They included the previous 2010-2015 Hazard Mitigation Plan, the Michigan State Police Emergency Management Division PUB 103 (Dec. 2001), numerous hazard related web sites, as well as maps and tables created from historical and Geographical Information Systems data, SEMCOG and Macomb County resources. This information is considered the most recent and up-to-date data available.

A - PRESS RELEASES AND ARTICLES

The first step taken to obtain public involvement was to notify the local newspapers about the plan and the forthcoming Town Hall meetings to introduce the Plan to the residents and businesses of Macomb County for their comments. A press release was sent to all of the local newspapers that service the Macomb County area. The press release contained general information about the hazard mitigation plan, the Town Hall meeting dates and time, and information regarding the web page on the county's web site. The following documents are the press releases regarding the hazard mitigation plan found in those newspapers.

January 28, 2019

MACOMB COUNTY SEEKS PUBLIC INPUT IN UPDATING HAZARD MITIGATION PLAN

Officials with Macomb County Emergency Management and representatives from each of the county's 25 local jurisdictions have jointly announced that an update to the Macomb County Hazard Mitigation Plan is underway. The plan identifies natural and human-caused hazards that pose a threat to the community while highlighting solutions that reduce vulnerabilities. It must be updated every five years and is a critical component in securing federal disaster relief funding.

Public input is vital for an effective plan. "Our residents are a vital source of information regarding the communities in which they live," said Brandon Lewis, director of Emergency Management and Communications for Macomb County. "It is important that our residents have a voice in helping us prepare for the hazards that are most likely to impact the county and its communities."

In order to introduce the plan and to solicit community input, county Emergency Management staff will be hosting two town hall meetings, which are open to the public. Residents and business owners will have the opportunity to discuss the hazards facing their communities. The meetings will be held as follows:

Utica City Hall - Council Chambers
7550 Auburn, Utica, MI
February 6, 2019 @ 7 p.m.

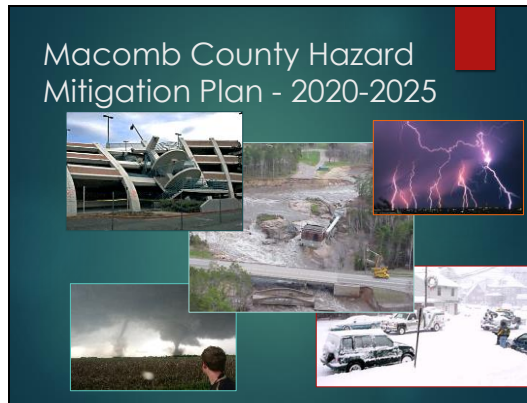
Roseville City Hall - Council Chambers
29777 Gratiot, Roseville, MI
February 7, 2019 @ 7 p.m.

For additional information, please contact Brandon Lewis, director of the Department of Emergency Management and Communications, at (586)469-6327.

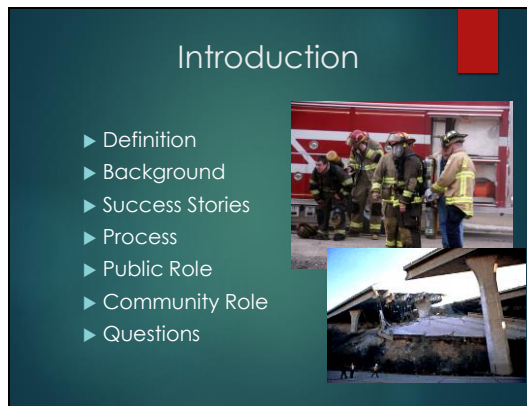
B - PRESENTATION

A presentation was prepared for the Town Hall meetings. The presentation provided information regarding the definition of the Plan, its background, the county's hazard history, success stories, the process involved in preparing the plan, the public's role, and the community's role. The presentation was given twice in 2019, the first on February 6, 2019 at the Utica City Hall, 7550 Auburn, Utica and again on February 7, 2019 at the Roseville City Hall, 29777 Gratiot, Roseville. A copy of the presentation has been included in this section.

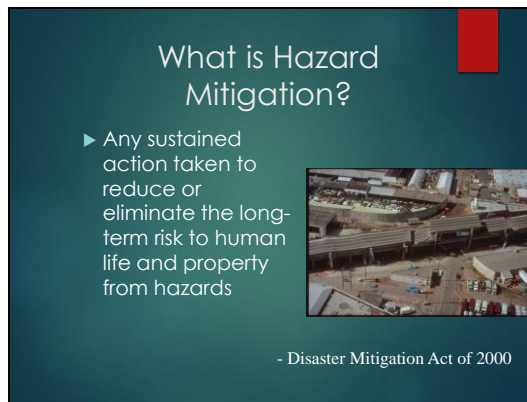
Slide 1



Slide 2

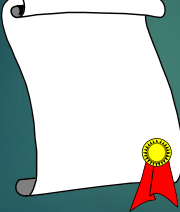


Slide 3



Slide 4

Hazard Mitigation Act Background



- ▶ Historical focus on response & recovery
- ▶ Congress wanted focus changed
 - ▶ Prevention
 - ▶ Disaster Resistance
- ▶ Enter DMA 2000
 - ▶ Mitigation Plan required
 - ▶ Economic analysis
 - ▶ All hazards

Slide 5

Success Stories

- ▶ Patnick Street Project-Macomb Township
Four houses and two empty lots acquired.
Flooding problems annually.
Land is now part of the flood plain for the Clinton River
- ▶ Outdoor Warning Sirens

Slide 6

Why implement Hazard Mitigation?


- ▶ Saves lives
- ▶ Protects property
- ▶ Preserves economy
- ▶ Prevents disruption of essential services & maintain quality of life
- ▶ Qualify for federal funding

Every \$1 spent on mitigation saves \$2 in losses!

Slide 7

Federal Funding

- ▶ Provides 75% of dollars for mitigation projects
- ▶ Opportunity for federal funding occurs at the beginning of each year and following every Presidential Declaration.



Slide 8

The Planning Approach

- ▶ Identify hazards and risks
- ▶ Determine your vulnerability
- ▶ Define goals & objectives to be achieved



Slide 9

The Planning Approach

- ▶ Identify alternative solutions
- ▶ Select feasible mitigation strategies
- ▶ Prepare a Draft Plan
- ▶ Prepare a Final Plan



Slide 10

Who is involved?

- ▶ Village, Township, City, County, State & Federal Officials
- ▶ Fire & Police Departments
- ▶ Emergency Management Departments
- ▶ Public

Slide 11

Some Potential Hazards




- ▶ Flooding
- ▶ Fire Hazards
- ▶ Hazardous Materials
- ▶ Extreme Weather
 - ▶ Tornadoes
 - ▶ Thunder/Lightning Storms
- ▶ Infrastructure Failures

Slide 12

Recent Hazards - Drought



- ▶ Countywide - July 2001
- ▶ \$150 M crop damages
- ▶ 11th driest month on record
- ▶ affected 16 nearby counties



- National Climatic Data Center Storm Events Webpage

Slide 13

Recent Hazards - Tornado





- ▶ Countywide – August, 2010
- ▶ \$275,000 property damage
- ▶ 85 mph winds
- ▶ 45,000 customers in Macomb County lost power

- National Climatic Data Center Storm Events Webpage

Slide 14

Recent Hazards - Infrastructure Failure

Blackout 2



- ▶ Northeast US - 8/4/03
- ▶ Problems arose over a 60 minute timeframe
- ▶ Major outages occurred in a span of roughly 5 minutes
- ▶ 2.3 million customers in southeast MI without power

Slide 15

Recent Hazards - Flooding

Nichols Street, Utica

ClintonRiver Road

- ▶ Multiple Counties – 8/11/2014-8/13/2014
 - ▶ 3 counties declared disaster areas
 - ▶ \$230 million in Federal Aid
 - ▶ 122,000 Macomb Residents impacted

Slide 16

Vulnerability Factors

- ▶ Characterized by:
 - ▶ Critical facilities
 - ▶ Vulnerable populations
 - ▶ Economic elements
 - ▶ Special consideration areas
 - ▶ Historic, cultural, and natural resource areas

Slide 17

Hazard Evaluation

- ▶ Likelihood of Occurrence
- ▶ The Significance of Impact
- ▶ Frequency of Occurrence
- ▶ Potential Size of Affected Area
- ▶ Impact of Affected Area

Slide 18

Solving the Problem



- ▶ Modify the Hazard
- ▶ Segregating the Hazard
- ▶ Preventing or Limiting Development
- ▶ Altering Design Construction
- ▶ Early Warning and Public Education

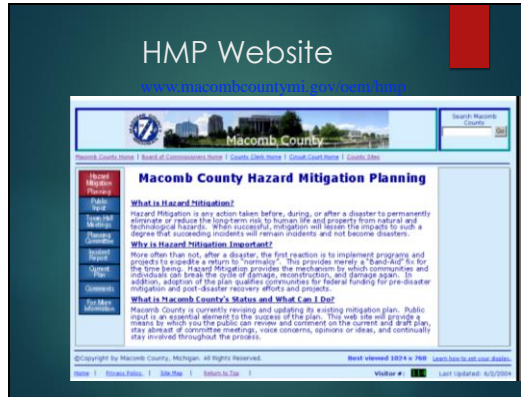


Slide 19

What is Public's Role?

- ▶ Need resident's perspective
- ▶ Get involved
- ▶ Identify hazards that concern you most
- ▶ Review plan online
- ▶ Suggest solutions
- ▶ Support community leaders efforts

Slide 20



Slide 21

What is Community's Role?

- ▶ Complete a Hazard Analysis
 - ▶ Detailed information
 - ▶ Identify community-unique hazards
 - ▶ Identify hazard mitigation projects
- ▶ Participate if we ask for your help
- ▶ Review draft Plans & provide input
- ▶ Adopt the Plan quickly

Slide 22

What Does it All Mean?

- ▶ Focus is on Prevention
- ▶ Protects Lives and Property
- ▶ Depends on public/community participation
- ▶ We need your input!

Slide 23

Contact Information

Macomb County Emergency Management & Communications
117 S. Groesbeck
Mt. Clemens, MI 48043
586-469-5270

peter.locke@macombgov.org

C - HAZARD MITIGATION PLAN WORKING GROUP

The following is the Hazard Mitigation Plan Work Group that worked on the 2020-2025 update of the plan and completed the community survey. The next group labeled LEPC or Local Emergency Planning Committee was the group that reviewed the Hazard Mitigation Plan before it was turned into the State of Michigan for review.

Participating Agency or Jurisdiction	Name	Title	Returned Survey	Attended Meeting 10/04/2018
Washington Township	Daniel Last	EM Liaison	X	X
Bruce-Romeo Fire Department	David Witgen	Fire Chief	X	X
Clinton Township	Paul Brouwer	EM Coordinator	X	X
Harrison Township Fire Department	Mike Lopez	Fire Chief	X	X
Mount Clemens Fire Department	Gregg Shipman	Captain	X	X
Shelby Township Fire Department	Duane Staten	Fire Marshall	X	X
Romeo Police Department	Dan Sokolnicki	Police Chief	X	X
Utica Fire Department	Randy Plante	Asst. Fire Chief	X	X
Sterling Heights Police Department	Ken Pappas	Captain	X	X
Chesterfield Township Fire Department	Peter Schoenherr	Inspector	X	X
Lenox Township /Richmond Township Department of Public Safety	Jeff White	Director of Public Safety	X	X
New Have Fire Department	Robert Brazee	Fire Chief	X	X
Eastpointe Fire Department	Larry Folkerts	Deputy Fire Chief	X	X
New Baltimore Fire Department	Jeff Stellman	Fire Chief	X	X
Roseville Fire Department	Mike Holland	Fire Chief	X	X
Armada Township Fire Department	Dan Reynolds	Fire Chief	X	X
Armada Township Fire Department	Kevin Kanehl	Fire Marshall	X	X
Warren Police Department	Chris Livingston	EM Coordinator	X	X

Macomb County

Hazard Mitigation Plan

2020-2025

Armada Village Police Department	Mike Patrick	Police Chief	X	X
City of Richmond	Jon Moore	City Manager	X	X
Macomb Township Fire Department	Bob Phillips	Fire Chief	X	X
Macomb County Emergency Management	Chris Hobbs	Emergency Management Aide	X	X
Macomb County Emergency Management	Peter Locke	Emergency Management Aide	X	X
Chesterfield Township Fire Department	Richard Schroeder	Captain	X	X
City of St. Clair Shores	Jamey Piper	Fire Chief	X	X
City of Fraser Department of Public Safety	Mike Pettyes	Director of Public Safety	X	X

Macomb County Local Emergency Planning Committee members that were present at the August 6, 2019 meeting received a copy of the Hazard Mitigation Plan for review.

Member Name	Organization/Department	8/6/2019
Anderson, Bruce	McLaren Hospital	E
Anderson, Scott	Selfridge ANG EM	P
Bodnar-Brazil, Melissa (Chair)	St. Clair Shores Fire Dept.	E
Brouwer, Paul	Clinton Township EM	P
Case, Michael	Art Van	P
Cox, Michael	Selfridge ANG EM	E
Des Madryl, Sam	St. Clair Shores Fire Dept.	P
DiMaria, James	Ray Township Fire Dept.	E
Felton, Joseph	Clinton Fire Dept.	E
Garwood, Ted	Warren Fire Dept.	E
Guity, Partow	Macomb County Health Dept.	P
Henion, Steven	Shelby Township Fire Dept.	E
Kuchenmeister, Keith	Citizen	P
Lewis, Brandon (EM Coord)	Macomb County EM	P
Livingston, Christopher	Warren EM	P
Locke, Peter M. (Sec./PIO)	Macomb County EM	P
Maier, Rodney	Axalta	P
Miltenberger, Jeff	Sunpro	E
Neumeyer, Doris (Vice Chair)	Beaumont Health	P
Piper, Jamey	St. Clair Shores Fire Dept.	E
Schmelzer, Robert	Washington Twp. Fire Dept.	P
Schubert, Charles	Center Line D. P. S.	P
Shipway, Brian	Henry Ford Macomb Hospital	P
Signorello, Matthew	Shelby Twp. Fire Dept.	E

Macomb County

Hazard Mitigation Plan

2020-2025

Slongo, Anthony	Henry Ford Macomb Hospital	P
Stankiewicz, Robert	Romeo/Bruce Fire Dept	E
Staten, Duane	Shelby Twp. Fire Dept.	E
Tarquinio, Christopher	Selfridge ANG EM	P
Werner, Brian	Shelby Twp. Fire Dept	E
Wolber, Victoria	Macomb County Exec's Office	P

Roll Call P: Present, A-Absent, E-Excused, NM Not a member at this time

D - COMMUNITY SURVEY

A survey packet was sent to each city, village, or township CEO following the initial kick off meeting with the local jurisdiction's liaisons. This survey was intended to gain a profile of each community within Macomb County and how the hazards related to them. The survey packet along with the letter of introduction which was sent to each community leader is present in this appendix. Also included in this appendix is a list of the community leaders names and titles and the community they represent who was sent the survey packet. The list also includes additional officials who participated in the completion of the survey. The packet had multiple forms that were required for the completion of this plan update. They included Risk and Vulnerability community assessments, updated project reports, zoning issues, both current and proposed, NFIP current mapping and other related issues, and siren placements. The next table tracked those communities that completed the forms and turned them in to Macomb County Emergency Management for consideration.

Hazard Mitigation Plan – 2020-2025

Jurisdiction	Risk	Vuln.	Projects	Zoning	NFIP	Sirens
Macomb County	X	X	X	X	X	X
Armada Township	X	X	X	X	X	X
Armada Village	X	X	X	X	X	X
Bruce Township	X	X	X	X	X	X
Center Line	X	X	X	X	X	X
Chesterfield Township	X	X	X	X	X	X
Clinton Township	X	X	X	X	X	X
Eastpointe	X	X	X	X	X	X
Fraser	X	X	X	X	X	X
Harrison Township	X	X	X	X	X	X
Lenox Township	X	X	X	X	X	X
Macomb Township	X	X	X	X	X	X
Mount Clemens	X	X	X	X	X	X
New Baltimore	X	X	X	X	X	X
New Haven Village	X	X	X	X	X	X
Ray Township	X	X	X	X	X	X
Richmond	X	X	X	X	X	X
Richmond Township	X	X	X	X	X	X
Romeo Village	X	X	X	X	X	X
Roseville	X	X	X	X	X	X
St. Clair Shores	X	X	X	X	X	X
Shelby Township	X	X	X	X	X	X
Sterling Heights	X	X	X	X	X	X
Utica	X	X	X	X	X	X
Warren	X	X	X	X	X	X
Washington Township	X	X	X	X	X	X

All requested data sets were turned into Macomb County Emergency Management on November 5, 2018



Mark A. Hackel
County Executive

EMERGENCY MANAGEMENT & COMMUNICATIONS

117 South Groesbeck Highway ♦ Mount Clemens, Michigan 48043

Phone: 586.469.5270; Fax: 586.469.6439

www.oemc.macombgov.org



Victoria Wolber, PEM
Director

Brandon Lewis, PEM
Emergency Program Manager

October 4, 2018

[Prefix][First_Name][Last_Name]
[Title]
[Representing]
[Address]
[City][State][Zip_Code]

Dear [Prefix][Last_Name]

The Macomb County Office of Emergency Management is updating the current *Macomb County Hazard Mitigation Plan 2015-2020* to meet the requirements of the Disaster Mitigation Act of 2000 and to incorporate comments received from the Federal Emergency Management Agency (FEMA) and the Michigan State Police Emergency Management/Homeland Security Division.

In 2014, your community assisted with the updating of this plan and subsequently adopted that plan to allow your community to be eligible for Federal mitigation and recovery grants. Under Federal guidelines, the Plan must be reviewed, updated and officially adopted by ordinance every five years. As we did previously, our office is taking the lead to review and revise our current plan. This plan will continue to be a multi-jurisdictional "all hazards" plan that will address the needs of the County and each individual city, township and village. Once the Plan has been drafted, coordinated, and finalized, each community's city council or governing body will need to formally approve and adopt the plan as their own.

Our office will need to work with our local city, township, and village officials to gather the information necessary for the completion of this immense task. We ask that you authorize your department officials to set aside the time necessary to address the needs of this project, when contacted by our office. As is our practice, all subsequent communications regarding this project will be directed to our Emergency Management Liaison for your community. The timeline for completion and submission of the Plan for review to the State and FEMA is May 1, 2019. Once approval of the new plan has been granted by both the State and FEMA we will notify you that the plan is ready for your community's formal adoption of the Plan.

Please contact me if you have any questions or concerns regarding this project.

Sincerely,

Victoria Wolber, Director
Macomb County
Emergency Management & Communications

Macomb County Hazard Mitigation Plan

Community Survey

Please complete the following 3 page survey to help provide us with information necessary to update the Macomb County Hazard Mitigation Plan for 2020 - 2025. The survey results must be mailed to me at:

Macomb County Office of Emergency Management
Hazard Mitigation Planning Office
117 S. Groesbeck
Mount Clemens, MI 48043

Or by emailing the completed forms to me at: peter.locke@macombgov.org.

These forms must be completed and turned into me no later than November 5, 2018.

Community Name:

Person completing this survey:

Community Profile

Using the next page, identify all critical facilities and/or infrastructure that are essential to the community and to the maintaining of the communities "Quality of life". Also, identify any facilities or infrastructure that house or support high concentrations of population.

Critical Facilities and Infrastructure

Facilities

Identify facility by name and address and if necessary to explain building function – use of that facility (nursing home, water pumping station, etc.)

Category	Name	Address	Population
Hospitals			
Medical Clinics			
Nursing Homes/Assisted Living			

Additional Facilities & Infrastructure

Use this table to identify any additional Facilities or Infrastructure that you may have that was not listed on the previous table.

Category	Name	Address	Population
Water Treatment Facility			
Waste Water Treatment Facility			

Hazard Ranking

Use this table to identify any community unique hazards/threats that were not included in the previous Hazard List for the County. Describe in detail why this hazard is unique to your community and what kind of impact the hazard has.

Hazard	Uniqueness	Area Affected	Impact

Rate each identified "Unique" hazard 1 – denoting a minor threat and 5-denoting a major threat

Hazard	Hazard Aspect	Rating
	Probability of Occurrence	1 2 3 4 5
	Population Affected	1 2 3 4 5
	Area Affected	1 2 3 4 5
	Potential for casualties/injuries	1 2 3 4 5
	Potential for property damage	1 2 3 4 5
	Potential for economic disruption	1 2 3 4 5
	Corollary effects	1 2 3 4 5

Hazard/Risk

Using your knowledge of the community and historical facts, complete following the two page table. Enter numbers, 0-5 to denote community's Risk in each box. 0-denotes lowest threat; 5-denotes highest threat.

Box 1 Hazard Type	Box 2 Probability of Occurrence	Box 3 Population Affected	Box 4 Area Affected	Box 5 Potential for Casualties	Box 6 Potential for Property Damage	Box 7 Potential for Economic Disruption	Box 8 Corollary Effects
-----------------------------	---	-------------------------------------	----------------------------	--	---	---	-----------------------------------

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6	Box 7	Box 8
Civil Disturbances							
Drought							
Earthquake							
Energy Emergency							
Extreme Temperature							
Structural Fire							
Wildfire							
Dam Failure							
Riverine Flooding							
Shoreline Flooding							
Haz Mat -Fixed Site							
Haz Mat -Transport							
Infrastructure Failure							
Nuclear Attack							
Nuclear Power Plant Accident							
Oil/Gas Well Accident							
Terrorism /Sabotage							
Subsidence							
Hail							
Lightening							
Severe Winds							
Tornado							
Ice/Sleet Storm							
Snow Storm							
Transportation Accidents							
Public Health Emergency							
Pipeline Accident							

COMMUNITY SURVEY RESULTS
RISK ASSESSMENT BY HAZARD

HAZARD TYPE	MACOMB COUNTY COMMUNITY RANKINGS - TOTALED
SEVERE WINDS	
ACTIVE SHOOTER	
CYBER ATTACK	
SNOWSTORMS	
ICE & SLEET STORMS	
TORNADOES	
TRANSPORTATION-HAZ MAT	
FIXED SITE-HAZ MAT	
RIVERINE FLOODING	
LIGHTNING	
STRUCTURAL FIRES	
INFRASTRUCTURE FAILURES	
ENERGY EMERGENCIES	
HAIL STORMS	
TRANSPORTATION ACCIDENTS	
TERRORISM/SABOTAGE/WMD	
SHORELINE FLOODING	
PUBLIC HEALTH EMERGENCIES	
EXTREME TEMPERATURES	
PIPELINE ACCIDENTS	
CIVIL DISTURBANCES	
WILDFIRE	
OIL & GAS WELL ACCIDENTS	
DROUGHT	
NUCLEAR ATTACK	
SUBSIDENCE	
EARTHQUAKES	
DAM FAILURE	
NUCLEAR POWER PLANT ACCIDENTS	

COMMUNITY SURVEY RESULTS
VULNERABILITY ASSESSMENT BY HAZARD

HAZARD TYPE	MACOMB COUNTY COMMUNITY RANKINGS - TOTALED
ACTIVE SHOOTER	
CYBER ATTACK	
TORNADO	
SEVERE WINDS	
ICE & SLEET STORMS	
SNOW STORMS	
TRANSPORTATION-HAZ MAT	
ENERGY EMERGENCIES	
INFRASTRUCTURE FAILURE	
STRUCTURAL FIRES	
HAIL STORMS	
LIGHTNING	
PUBLIC HEALTH EMERGENCIES	
TRANSPORTATION ACCIDENTS	
TERRORISM/SABOTAGE/WMD	
FIXED SITE-HAZ MAT	
NUCLEAR ATTACK	
CIVIL DISTURBANCES	
RIVERINE FLOODING	
EXTREME TEMPERATURES	
DROUGHT	
PIPELINE ACCIDENTS	
EARTHQUAKES	
WILDFIRES	
OIL & GAS WELL ACCIDENTS	
SHORELINE FLOODING	
SUBSIDENCE	
NUCLEAR POWER PLANT ACCIDENTS	
DAM FAILURE	

E - MEETING MINUTES

Several meetings were held throughout the course of the planning process. During these meetings, topics such as schedules, hazard identification, public outreach methods, regular updates, mitigation measures, and other related topics. This section of the appendix includes the meeting minutes from those meetings as well as the agendas.

Hazard Mitigation Plan Kick-Off Meeting Agenda

Date: October 4, 2018
Time: 10:00 AM
Location: Macomb Intermediate School District Building
44001 Garfield
Clinton Township, MI 48038 – Superior Room (1st Floor)

Review Scope of Project

Each Community Emergency Management Liaison and County Department Representative will receive a Planning Project folder which will contain the many forms and instructions that are required to be completed as Phase One of the Macomb County Hazard Mitigation Plan 2020-2025 Evaluation and Upgrade Project. All forms must be completed no later than November 5, 2018.

Update and Coordination Process/Tasks

The County will manufacture all of the forms and reports, compile all information, host all meetings and town hall presentations, prepare the web site for public review and comment and support the local jurisdictions with any and all guidance necessary to complete this project. Hopefully we can complete some forms here today.

Schedule

The planning process will address all issues pertaining to the review and update of the current Hazard Mitigation Plan. A draft work plan schedule will be developed for both open meetings and one-on-one meetings as needed.

Press Releases

Macomb County will prepare press releases, a web site and conduct the public meetings. Macomb County will handle any telephone calls from the public regarding the hazard mitigation plan and public input. Information provided by the public will be documented and utilized in the plan where necessary. The press releases will be submitted to the following news sources for publication: The Macomb Daily, The Voice, The Detroit News and The Detroit Free Press.

Public Meetings

Two public hearings in the county will be conducted. Dates are: Utica City Hall, 2/6/19 @ 7 PM; and Roseville City Hall, 2/7/19 @ 7 PM. The material to be presented at these meetings will be coordinated with the MSP-EMHSD for a regulation compliance review. The reason for the two town hall meetings is that for the past eight meetings conducted, only twelve residents total showed up for those meetings.

Web Site

A web site has already been built and is maintained by the County's IT Department. Once the updated plan is ready, the old plan will be removed from that site, replaced by

the new draft version. As before, two forms will be included in this site. One form will allow the public to comment on the plan and another will allow for the public to document hazards they had experienced in the county. Both forms will be submitted electronically and the information compiled in a database format. The web site address is www.macombcountymi.gov/OEM/hmp.

Community Letter

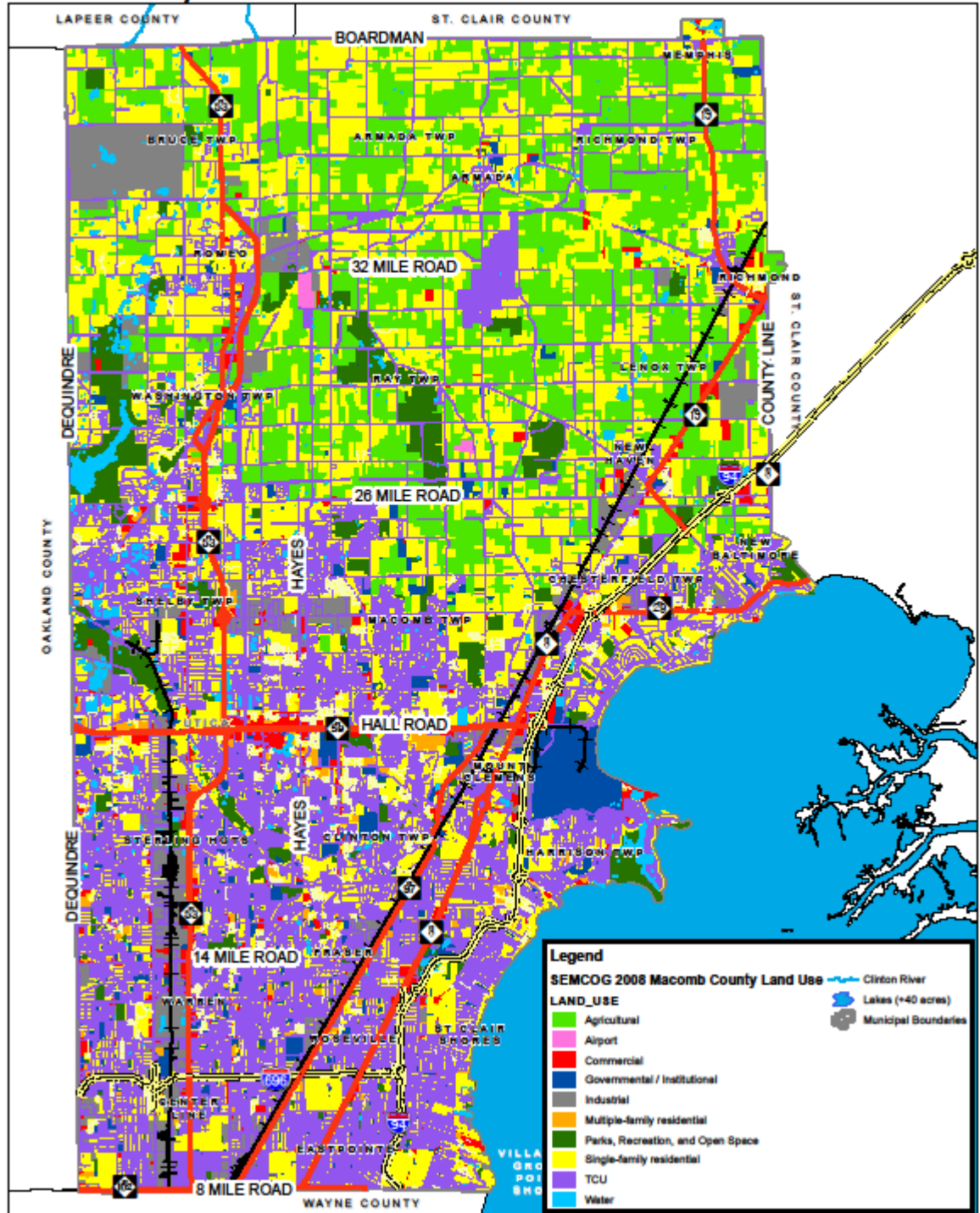
A letter will be sent to your Chief Elected Official which will serve two purposes. It will outline the purpose of the Hazard Mitigation Plan review project and each community's role in participating in the Plan. The letter will also indicate the need for the community as a whole to be involved in this process and will ask the CEO for full compliance and participation.

- We are starting two months later than usual and we have a new staff at FEMA who is charged with the review and approval of our plan. We need to stay on track to ensure the plan is ready to be submitted no later than April of 2019.
- The November 5th deadline for form completion is simply to ensure that I have enough time to review your submissions, update the plan and use the data you will be sending me to our Planning Department so they have time to create all of the new maps. This in itself will take a few months.
- If at any time you need me to come out to your place to help with the work of completing these projects, call me.

F - LAND USE

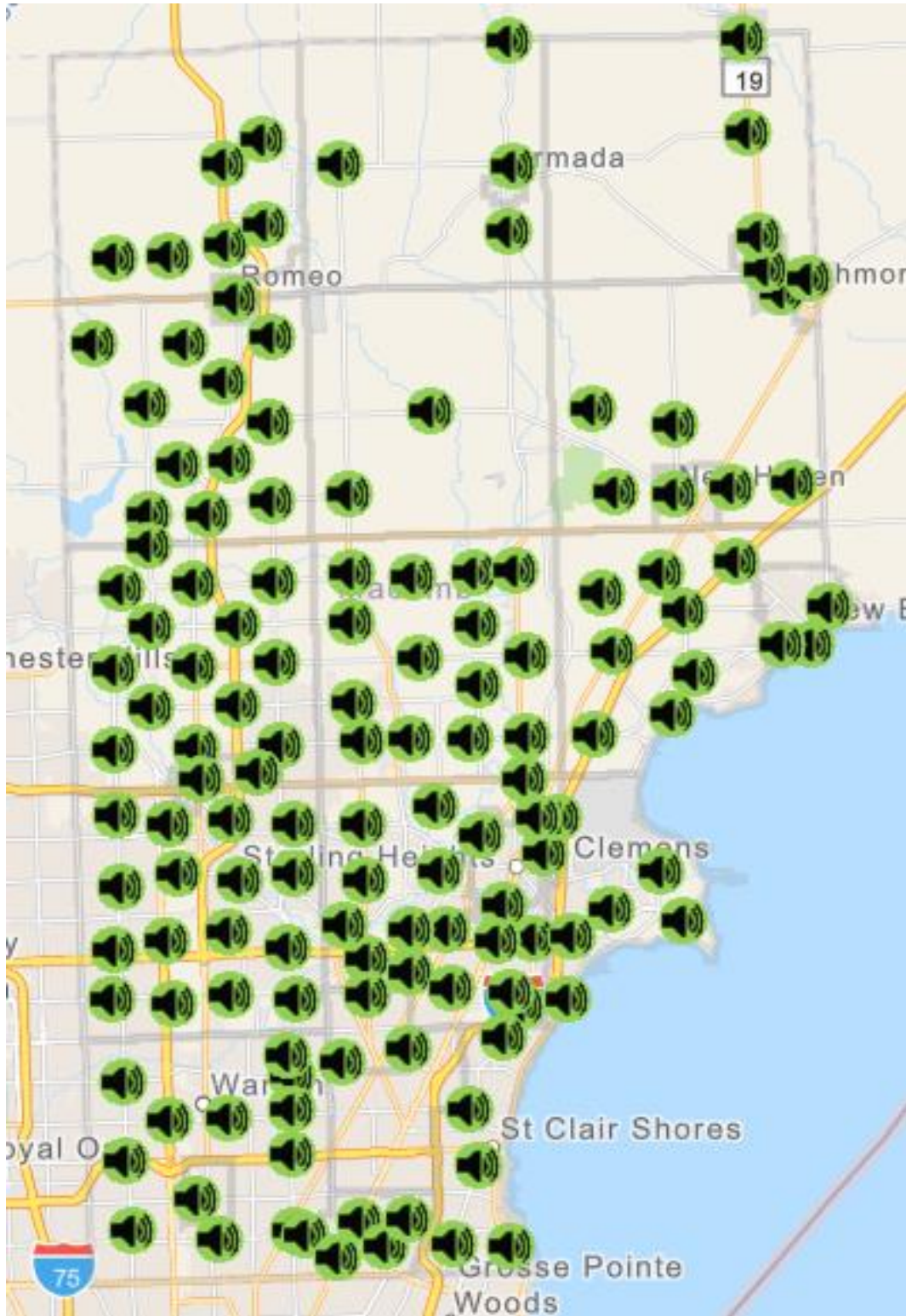
The following map was created with the most recent data (Nov., 2013) provided by the Macomb County Planning Department. This map shows a breakdown of the areas within the County which have been developed. The different types of land use on this map include commercial and office, industrial, extractive and barren, institutional, multiple and single family residential, transportation and utility, and under development or losing housing.

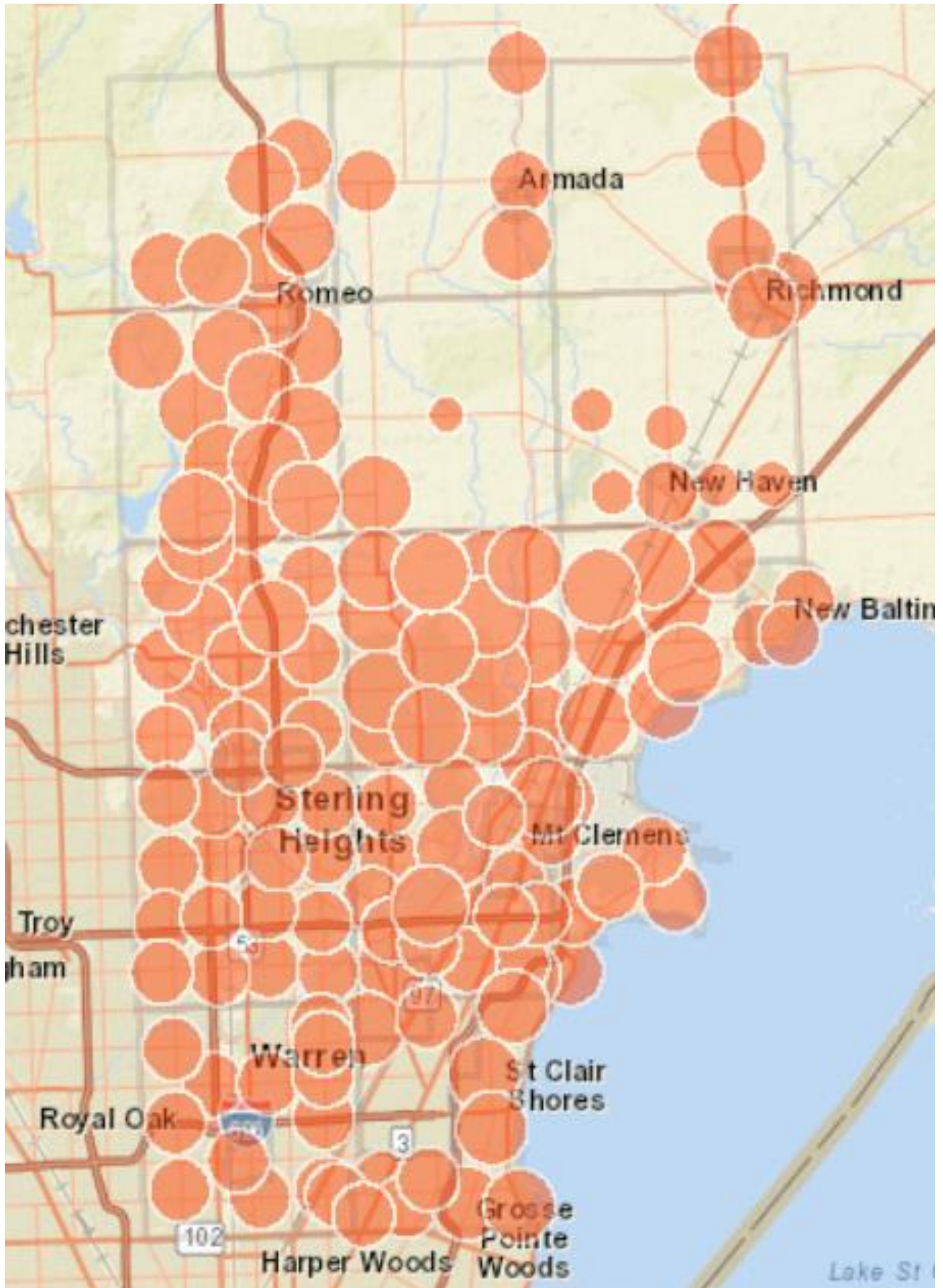
Macomb County - Land Use



G - WARNING SIREN COVERAGE

The following section of the appendix includes a 2019 countywide map of early warning siren locations. Most of the developed areas in the County have complete coverage. Following the map is a second map that identifies the area coverage based on the siren's radius of range. This map can be used to determine which areas need to be upgraded to ensure all residents are within range of an early alert siren.

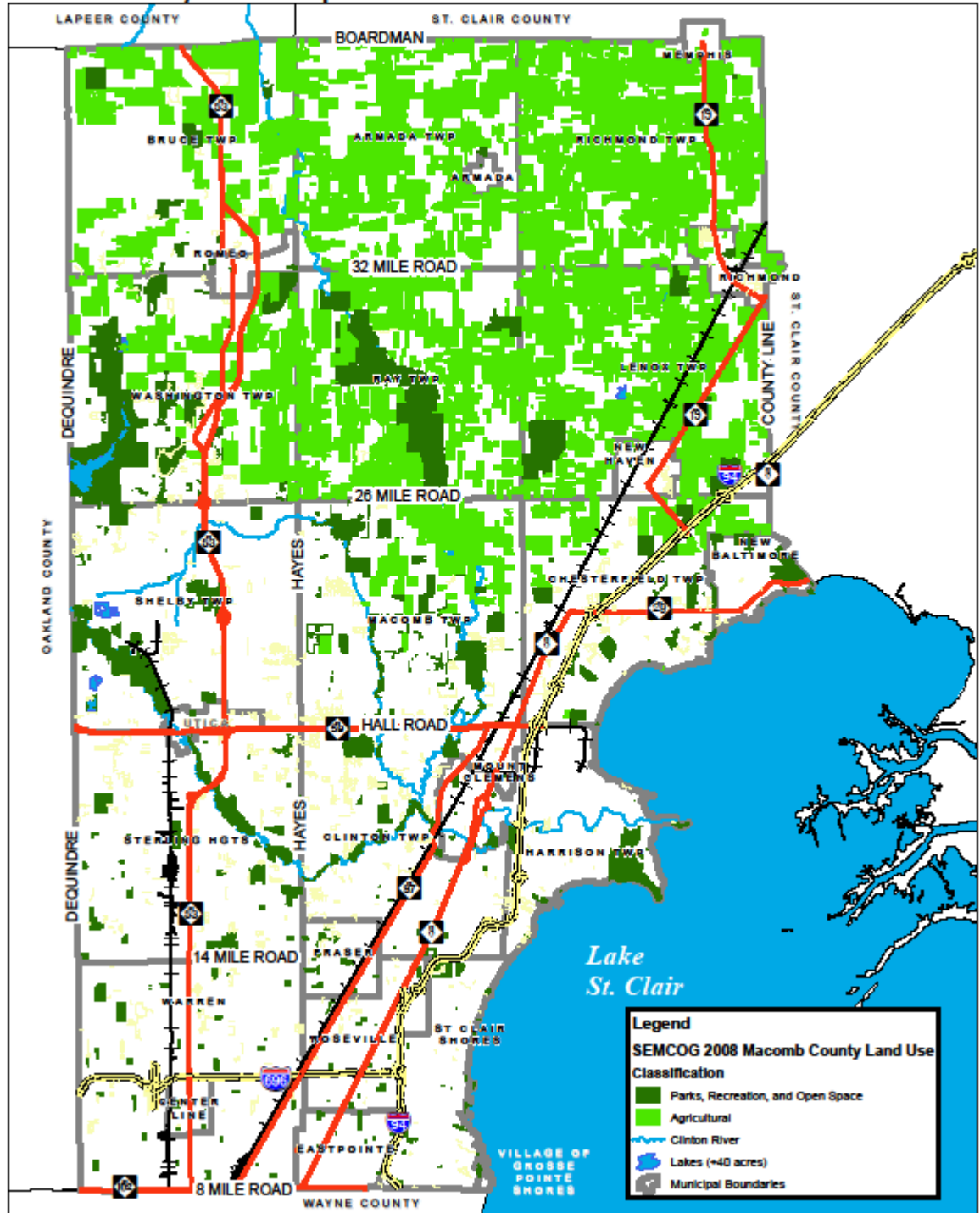




H - UNDEVELOPED LAND

The following map was created with the most recent data (Nov., 2013) provided by the Macomb County Planning Department. This map shows a breakdown of cultivated, grassland, and shrub areas, cultural outdoor recreational, and cemetery areas, wooded and wetland areas, and water areas.

Macomb County - Undeveloped Land



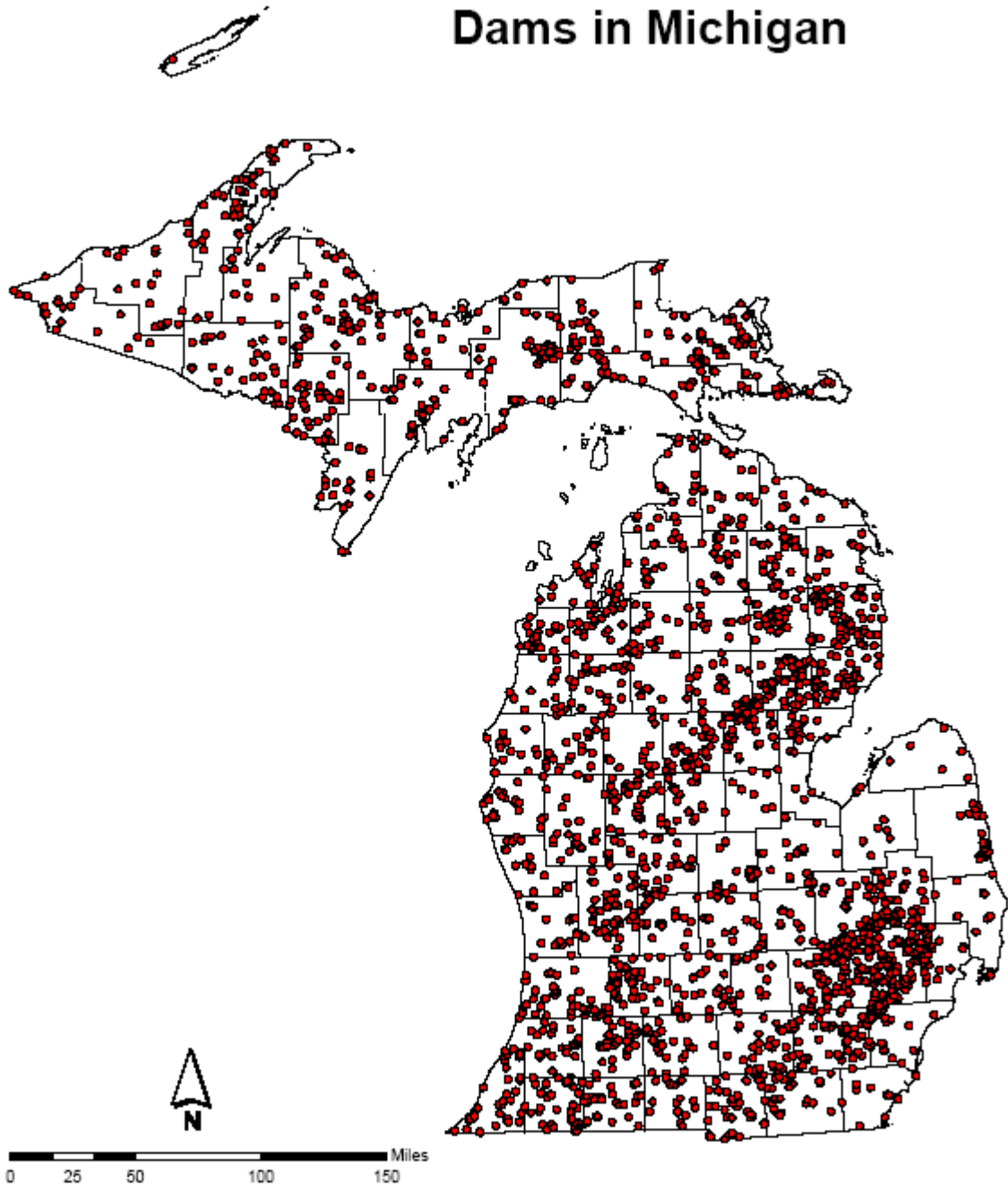
I - COUNTY RANKING SUMMARY AND INDIVIDUAL COMMUNITY RANKING TABLES

The following tables are included as backup to the Top 10 Hazards and supporting Hazard Analysis Rankings tables shown in Section 2.2. These tables display the rankings for all of the hazards across all of the communities within Macomb County. Each hazard was assigned a score of between 1 and 28 with 1 as the worst (highest) score on the community surveys. The Survey Results are listed on the following pages.

J - DAM LOCATIONS

This map was generated using the Michigan Department of Natural Resources and Environment web site. It should be noted that these dams are mainly earth berms and weirs. None of the dams shown are large retaining type structures.

Dams in Michigan

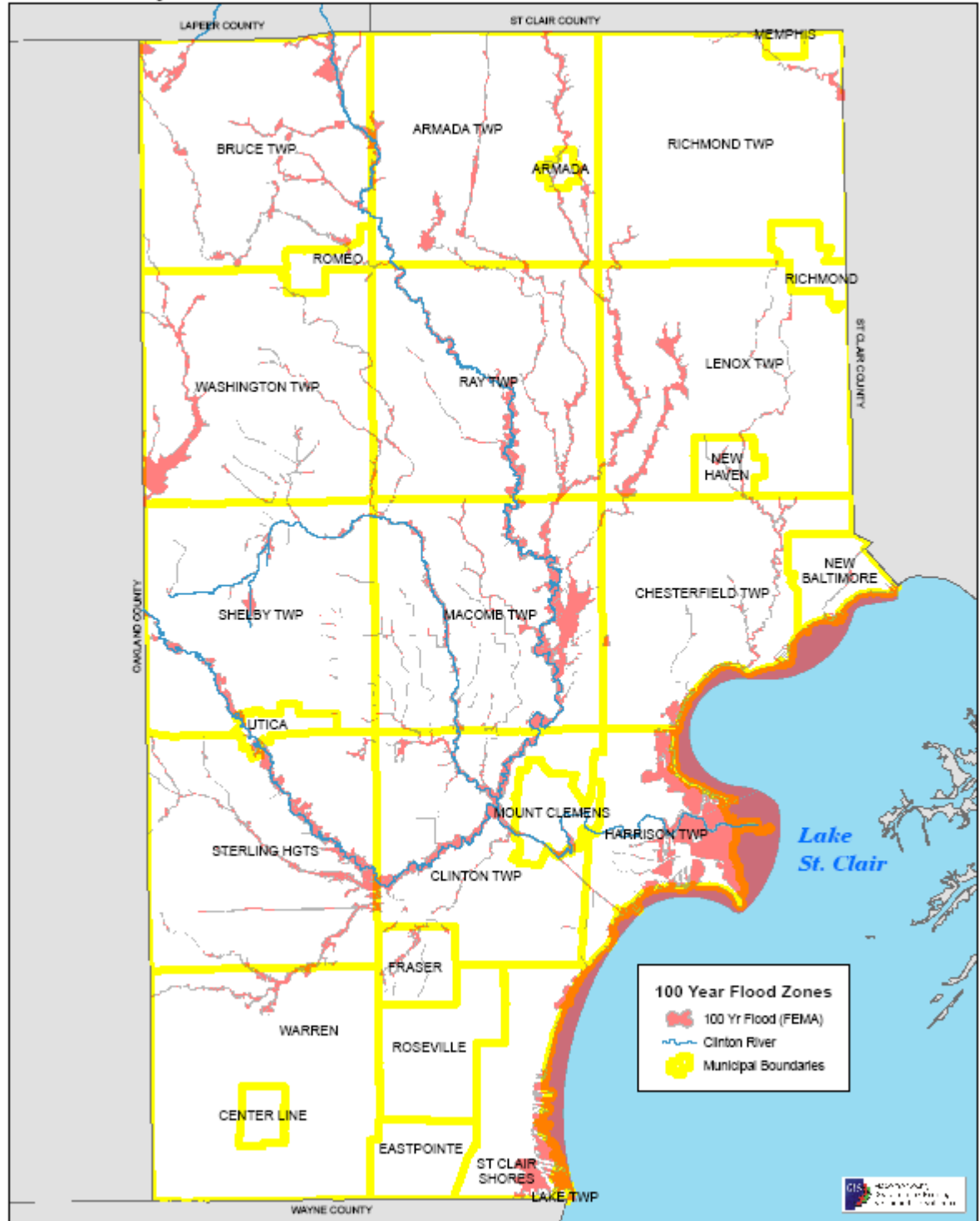


Michigan Department of Natural Resources
Institute for Fisheries Research 10-27-2003

K - “100-YEAR FLOOD” ZONES

The following map was created using data obtained (Nov., 2013) from the Macomb County Planning Department. The map shows the County’s municipal boundaries, road structure, and the flood zones within the County based on a 100-year flood (or 1% chance) event. The data displayed in this map shows the flood zones and development as of the year 2000, the most current information available from FEMA. Areas displayed include both river flooding and shoreline flooding areas.

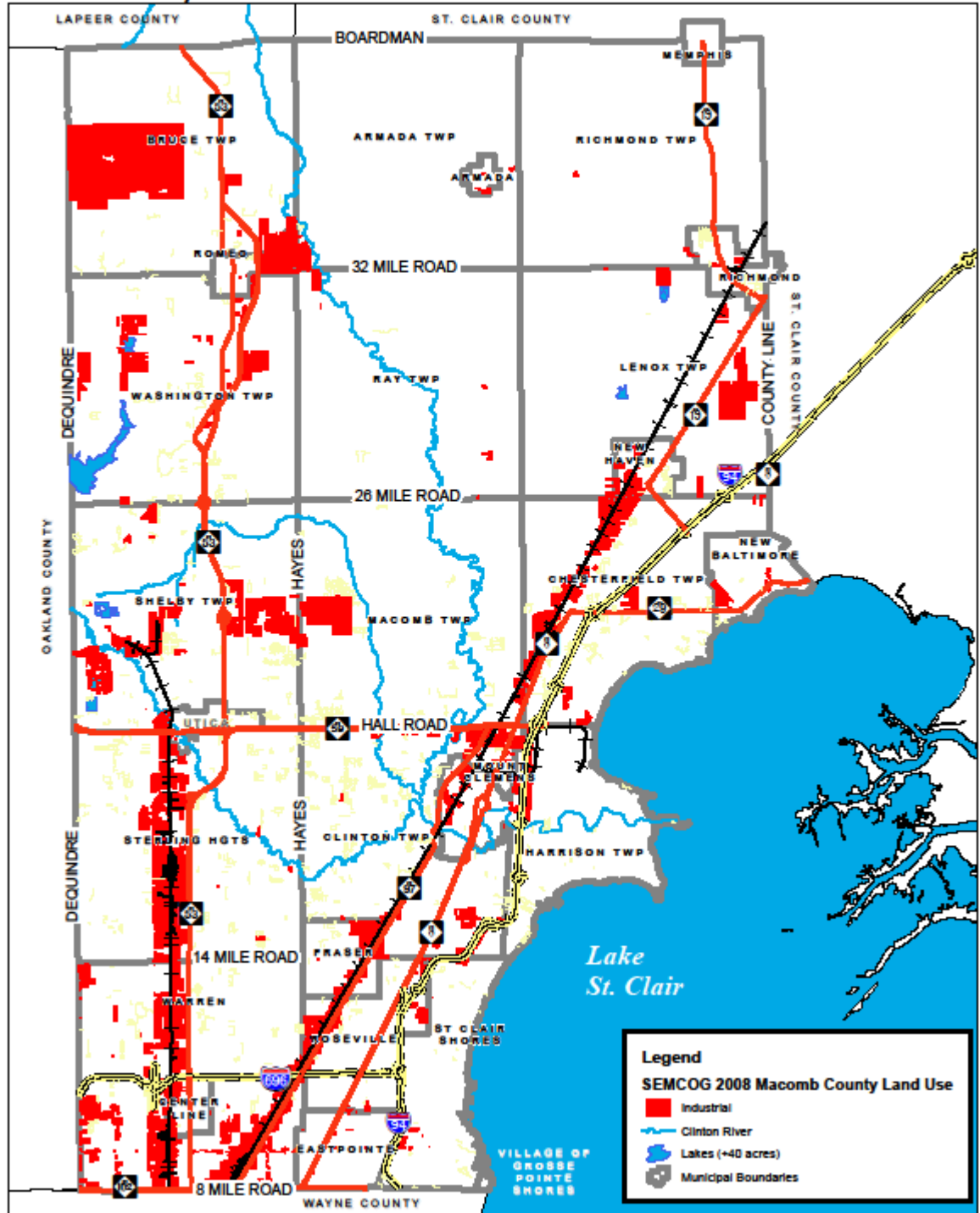
Macomb County - FEMA 100 Year Flood Zones



L - INDUSTRIAL ZONING AREAS

The following map shows the areas of the County zoned as “Industrial” areas. Industrial areas are of a large concern, mainly due to their potential to contain hazardous materials. Most industrial zones in Macomb County are located along certain corridors. The potential exists at these sites for a hazardous material incident at a fixed site, or in the transporting of materials. This map can be used to track the locations of Sara Title III sites within the County.

Macomb County - Industrial Zoned Areas



M - HAZARDOUS MATERIALS TRANSPORTED THROUGH THE COUNTY

One of the primary means of transporting hazardous materials through the County is via the rail line. Canadian National Railroad (CNR) carries a number of hazardous materials through and to sites within the County. A list of known hazardous materials carried by CNR has been included in this section. The list contains information such as, material description, class, and the United Nations (UN) or North American (NA) hazardous material designation numbers. By keeping track of the materials that frequently travel through the County, preparatory measures can be made for each material in case an event occurs.

**Hazardous Materials Transported Through Macomb County
Via Canadian National Railroad**

Description	Class	UN/NA Number
Acetone	3	UN1090
Acrylonitrile, Inhibited	3	UN1093
Alc Bev	3	UN3065
<i>Ammonia, Anhydrous, Liquefied/Sol.</i>	2.4	UN1005
Ammonium Nitrate Fertilizers, NOS	5.1	UN2072
Ammonium Nitrate	5.1	UN1942
Butadienes, Inhibited	2.1	UN1010
Butadienes, Inhibited,	2.1	UN1010
Butanols	3	UN1120
Butyraldehyde	3	UN1129
Carbon Dioxide, Refrigerated Liquid	2.2	UN2187
<i>Chlorine</i>	2.3	UN1017
Denatured Alcohol	3	UN1987
Dicyclopentadiene	3	UN2048
Dimethylamine, Anhydrous	2.1	UN1032
Dimethylformamide	8	UN2051
Elevated Temperature Liquid, NOS	9	UN3257
Ethanol or Ethanol Solutions	3	UN1170
Ethanol/Solutions	3	UN1170
Ethyl Acetate	3	UN1173
Ethylene Glycol	9	NA3082
<i>Ethylene Oxide</i>	2.1	UN1040
ETM, LQD, Flam	3	UN3256
Ferric Chloride Solution	8	UN2582
Ferric Sulfate Solution	8	UN1760
Ferrous Chloride, Solution	8	UN1760
Hydrochloric Acid or Solution	8	UN1789
<i>Hydrogen Fluoride, Anhydrous</i>	8	UN1052
Hydrogen Peroxide or Aque Sol.	5.1	UN2015

Description	Class	UN/NA Number
Isoprene & Pentene	3	UN1993
Kerosene	3	UN1223
Liquefied Petroleum Gas (Butane),	2.1	UN1075
LPG (Butane)	2.1	UN1075
LPG (Propane)	2.1	UN1075
LPG (Propane/Propylene)	2.1	UN1075
LPG (Propylene) Not Odorized	2.1	UN1075
LPG (Propylene)	2.1	UN1075
LPG	2.1	UN1075
Maleic Anhydride	8	UN2215
Methylnaphthalenes,	9	UN2308
N,N-Dimethylformamide	3	UN2265
Naphtha	3	UN2553
Pet Dist, NOS	3	UN1268
Pet Dist, NOS	3	UN1268
Phenol, Molten	6.1	UN2312
Phosphoric Acid	8	UN1805
Phosphoric, Acid	4.2	UN1805
Phosphorus, White/Yellow,	4.2	UN1381
POISONOUS Liquids, NOS	6.1	UN2810
Propylene Oxide	3	UN1280
Sodium Chlorate	5.1	UN1495
<i>Sodium Cyanide</i>	6.1	UN1689
Sodium Dithionite	4.2	UN1384
Sodium Hydroxide, Solution,	8	UN1824
Sodium Phosphate, Dibasic	9	UN3077
Styrene Monomer, Inhibited	3	UN2055
Sulfur, Molten	9	UN2448
<i>Sulphur Dioxide</i>	2.3	UN1079
Sulphur, Molten,	4.1	UN2448
Sulphuric Acid	8	UN1830
<i>Sulphuric Acid, Fuming</i>	8	UN1831
Sulphuric Acid, Spent,	8	UN1832

Description	Class	UN/NA Number
Tripropylene	3	UN2057
Vinyl Acetate, Inhibited	3	UN1301
Waste Corrosive Liquids, NOS	8	UN1760
Waste Sulphur Acid, Spent	8	UN1832
White Asbestos	9.1	UN2590
Xylenes,	3	UN1307

N - POTENTIAL NUCLEAR TARGET SITES

During the Cold War, many sites within Macomb County, the State of Michigan, and the United States were considered potential targets for adversaries with nuclear weapon capability. The following pages in this section include a list of those potential target sites and also a map of sites, both covering the entire State of Michigan. It is important to acknowledge sites not only in a historical context but for future planning and consideration of critical infrastructure within Macomb County and throughout the State as well.

Nuclear weapons have serious after-effects as well. A weapon's explosive capability may be limited to a few miles. However, the radioactive material released into the air can be carried for hundreds, if not thousands of miles. This can have serious effects on people even if they are far away. Knowing these potential sites can help planners determine proper evacuation procedures and locate shelters in safe areas.

Michigan**Primary:**

Selfridge Air National Guard Base (Harrison Township)

Secondary:

Detroit Metropolitan Area (area within a line connecting Pontiac, Ann Arbor, and Monroe east to the State line), Sawyer AFB (De-Commissioned, Gwinn), Kincheloe AFB (De-Commissioned, Sault Ste. Marie), Wurtsmith AFB (De-Commissioned, Oscoda).

Tertiary:

Alpena, Bat City, Battle Creek, Benton Harbor, Escanaba, Sault Ste. Marie, Midland, Saginaw, Muskegon, Flint, Grand Rapids, Port Huron, St. Clair, Lansing, Kalamazoo, Jackson.

Potential Nuclear Attack Target Areas in Michigan

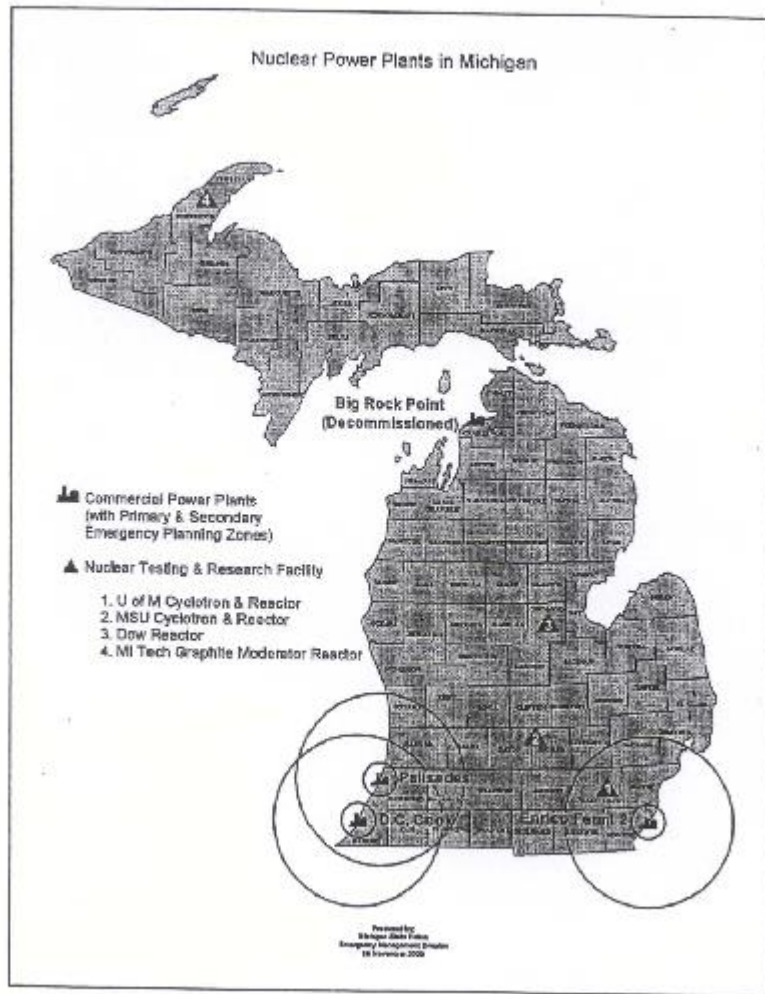
Source: *Nuclear Attack Planning Base 1990 (NAPB-90)*, Federal Emergency Management Agency

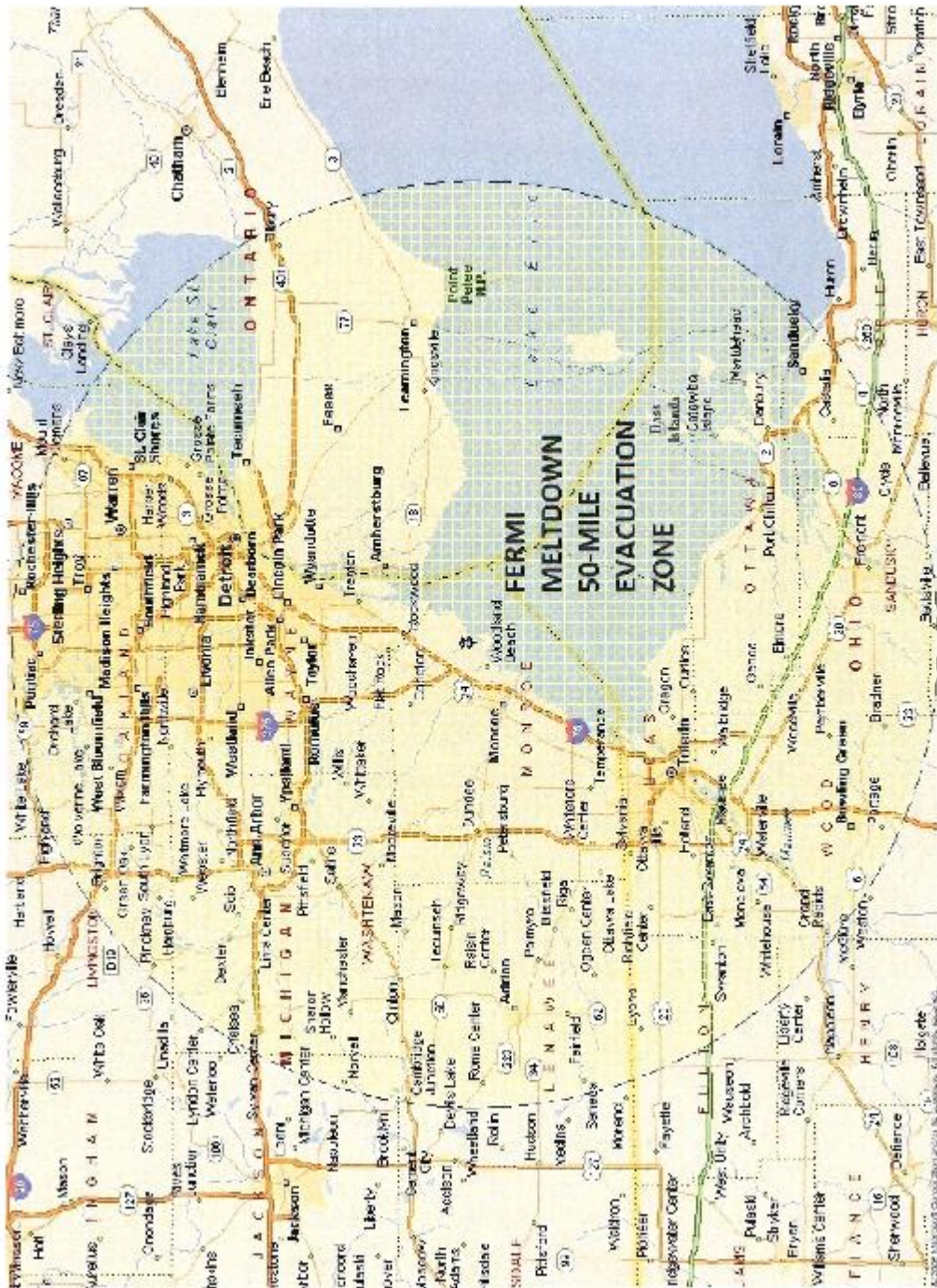


O - NUCLEAR POWER PLANT LOCATIONS

Just as knowing potential nuclear attack sites is important, so is knowing where nuclear power plants and testing and research facilities are. The following pages include a map of power plants and testing and research facilities throughout the state. This section also contains a listing of power reactor units with the plant name, reactor type, location, ownership, and the Nuclear Regulatory Commission (NRC) region. An incident at a nuclear facility can have very similar effects to a nuclear attack. Winds can carry radioactive material hundreds of miles. Also included in this section is a fact sheet regarding the decommissioning of nuclear power plants (with some located in Michigan including Fermi I in Monroe County), and a list of test and research reactors (some located in Michigan).

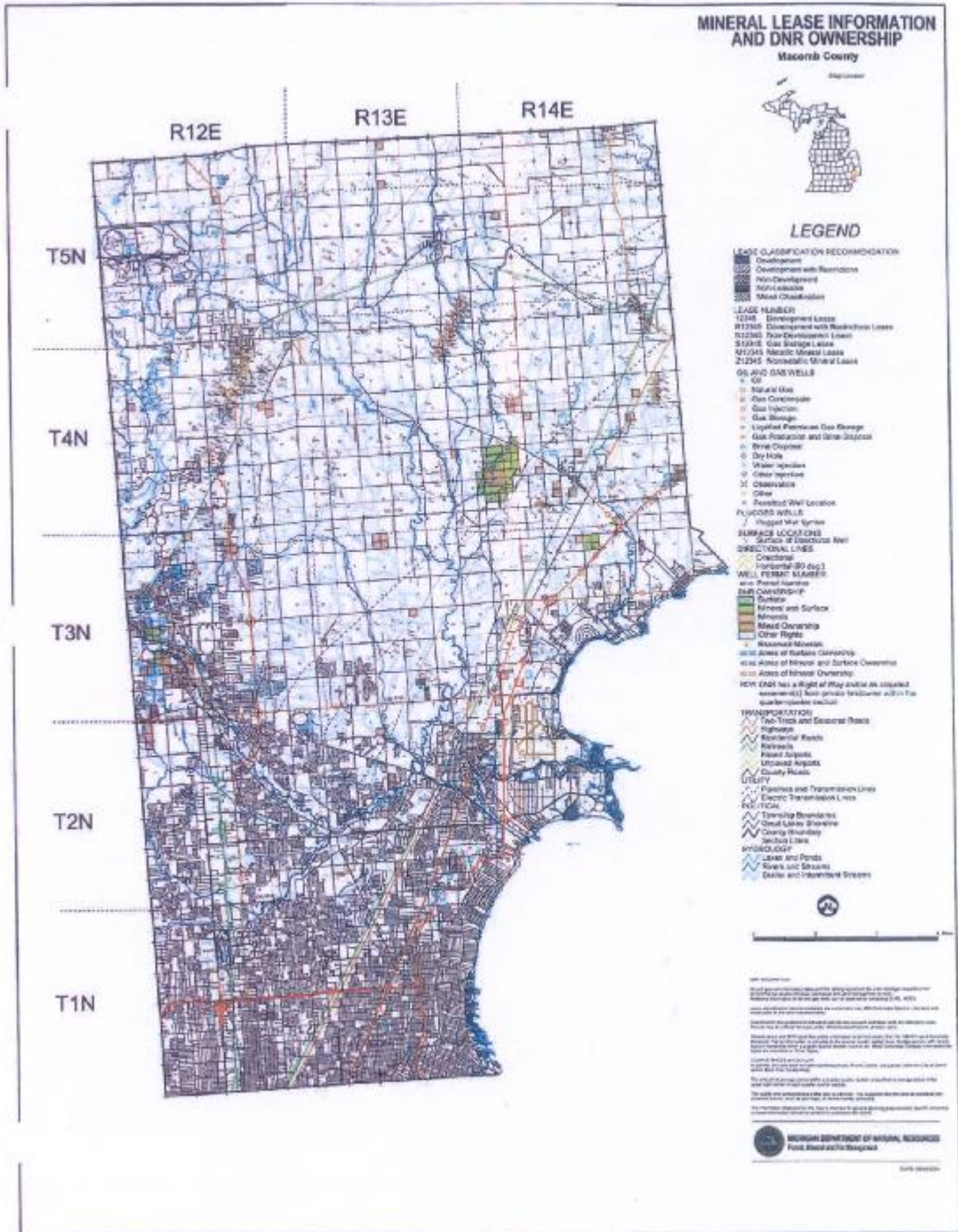
Nuclear Power Plants in Michigan





P - OIL AND GAS WELLS

The following map was obtained (Nov., 2013) from the Michigan Department of Natural Resources and Environment (DNR&E) web site. The map, entitled "Mineral Lease Information and DNR Ownership", shows information such as, lease classification, oil and gas well location, directional lines, and other associated information. Tracking where wells are located and the types of wells they are can help in identifying proper procedures should an incident occur.



Q - OIL & GAS PIPELINES

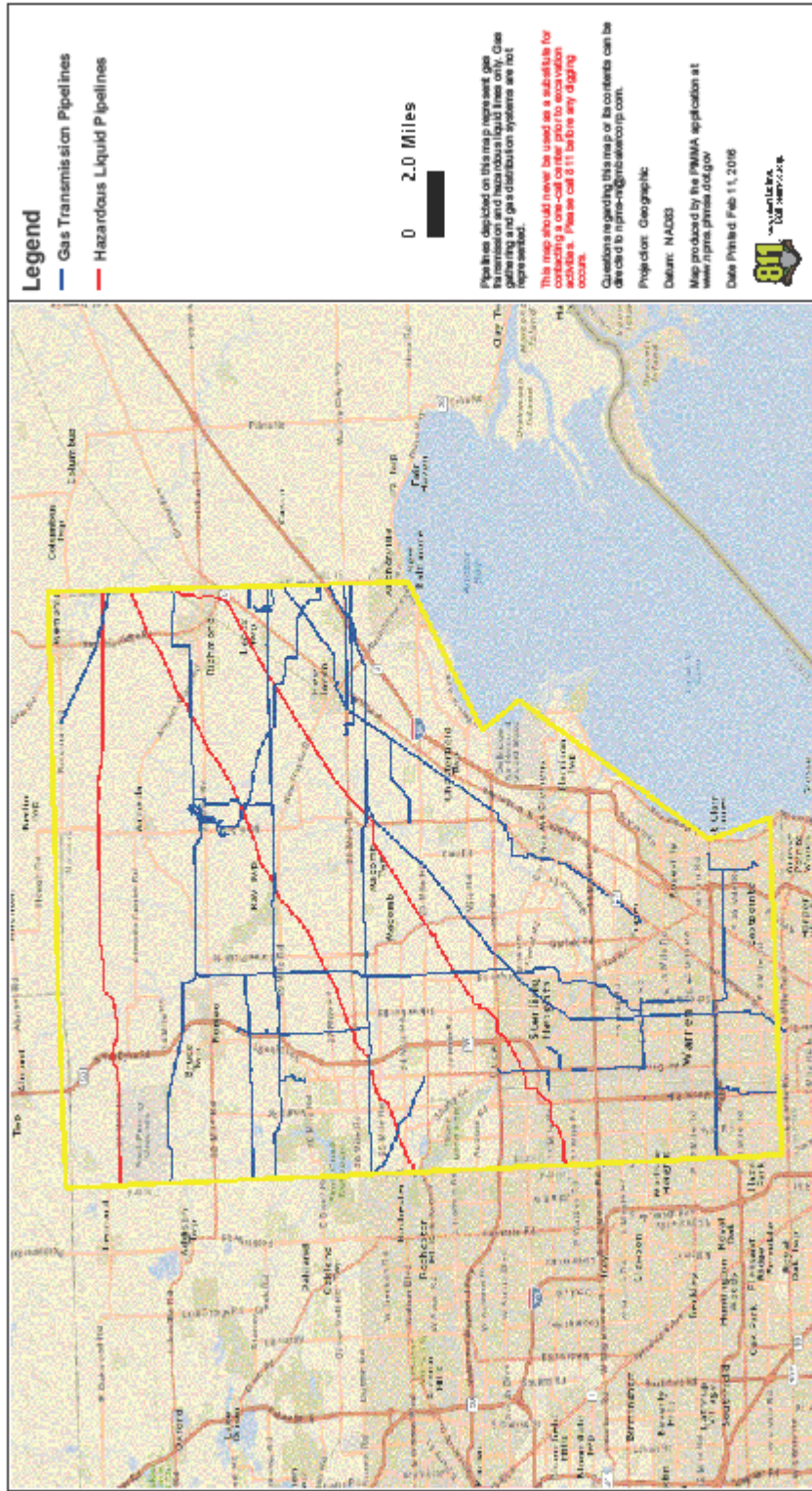
The following map was obtained (Nov., 2013) from the Michigan Public Services Commission of the Department of Labor and Economic Growth. This map, located on the State of Michigan's official web site, shows the major petroleum pipelines traversing the lower peninsula of Michigan. Macomb County has an 8-inch Sun pipeline running through the center of it. There are no other pipelines indicated.

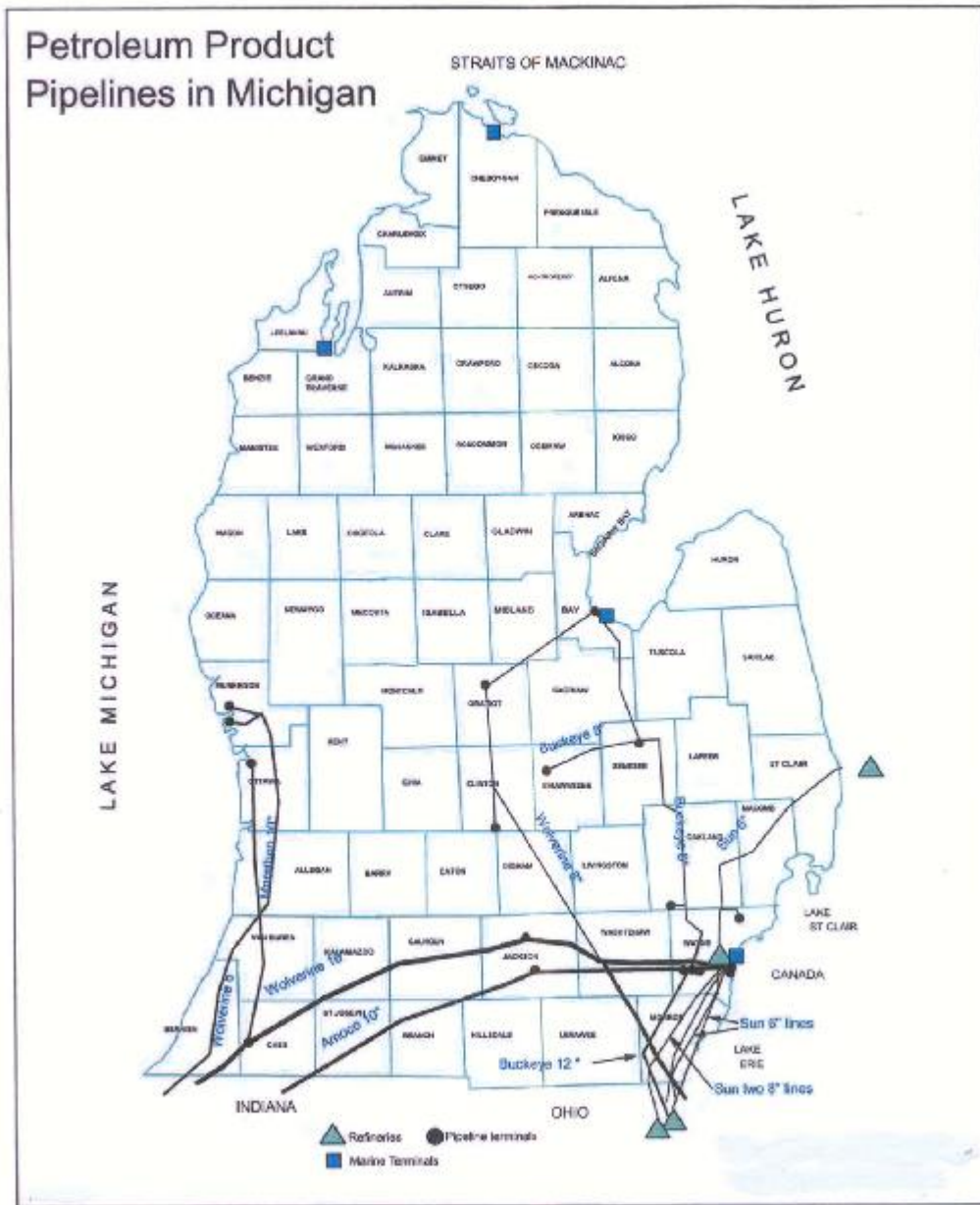
The second map shows the major gas pipelines and storage fields located throughout the State of Michigan. Macomb County has a number of gas companies with pipelines running within its borders. Some of these companies include DTE, Consumers Energy, and Vector. Documenting the types of lines and their ownership can greatly help in identifying potential problematic areas for future development.

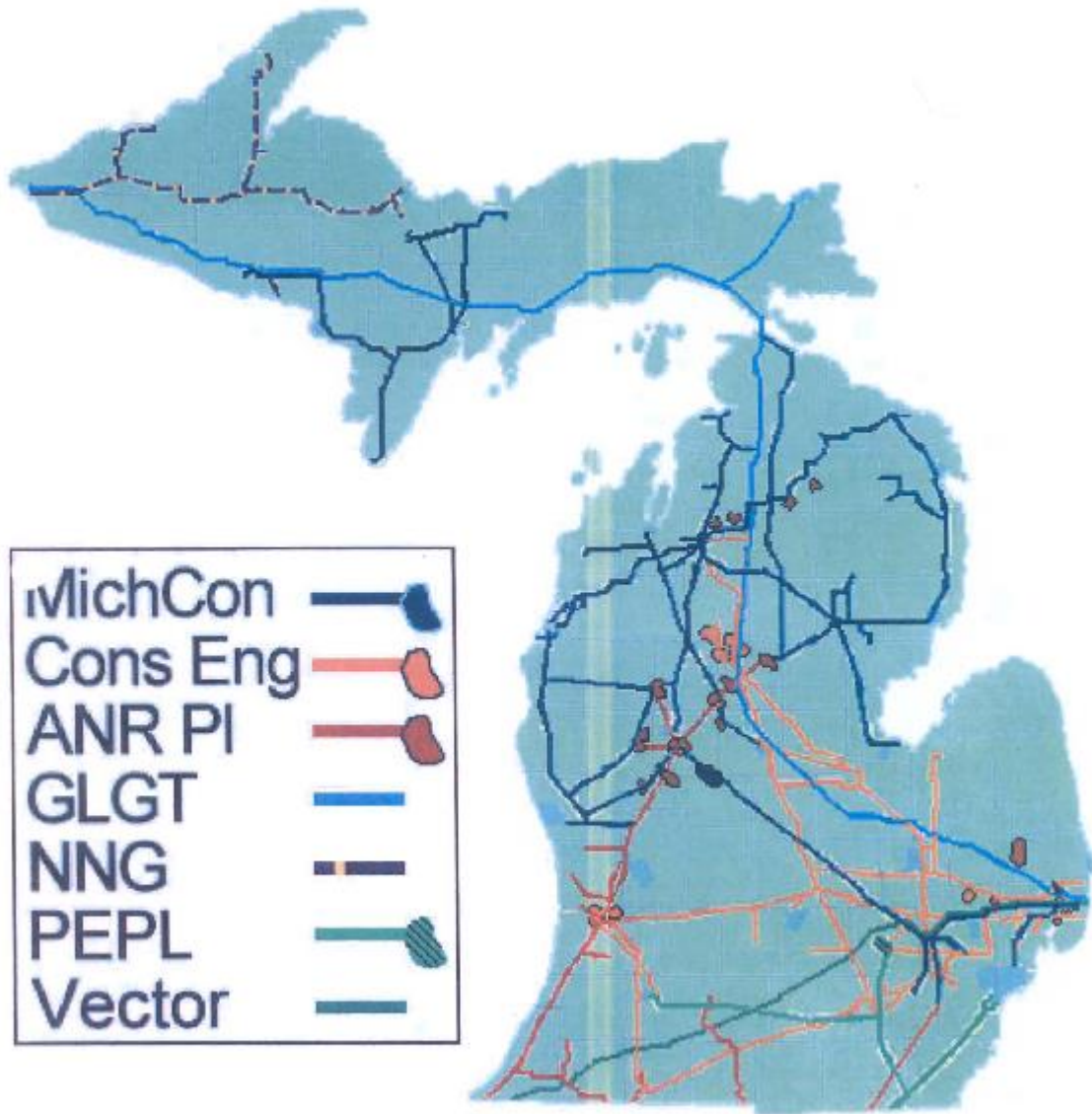
FOR OFFICIAL USE ONLY

NATIONAL PIPELINE MAPPING SYSTEM

Pipeline and Hazardous Materials Safety Administrator





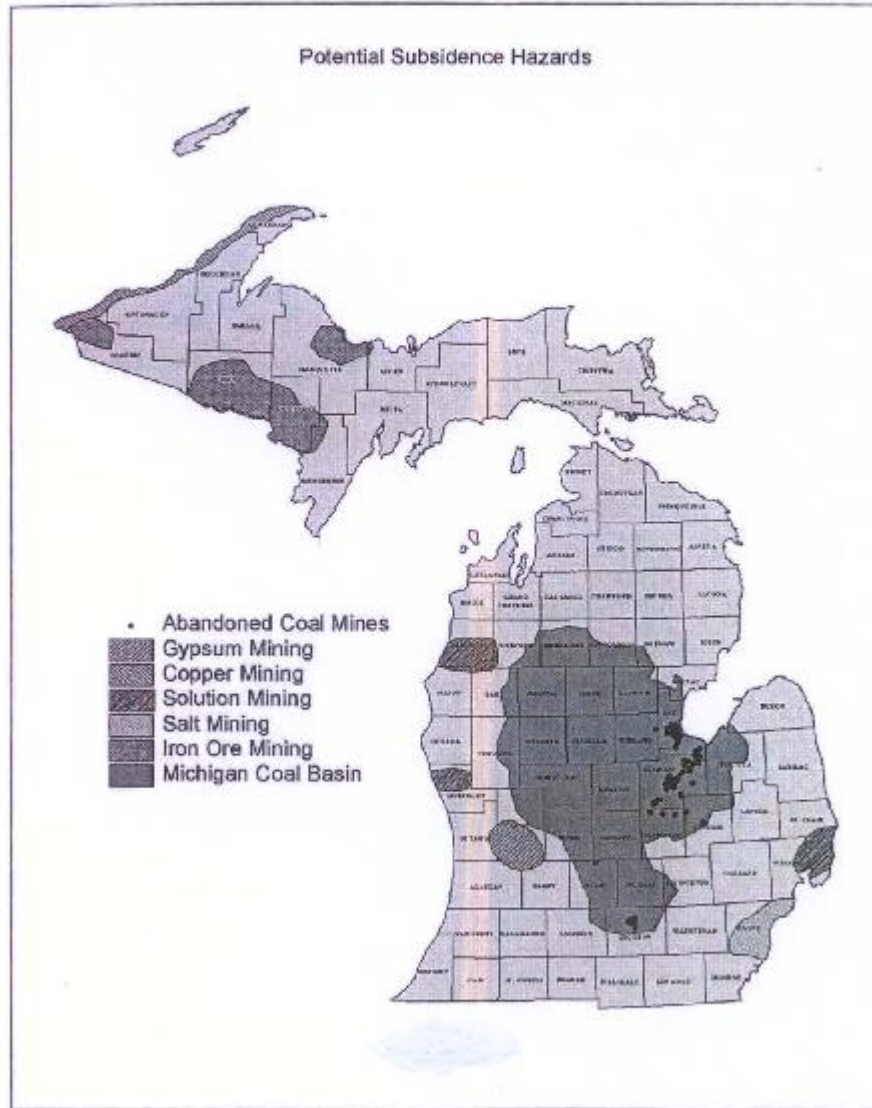


R - SUBSIDENCE

Although subsidence can occur for a number of reasons, one of the primary causes is from mining. Macomb County does not have any major mining regions. However, the following map from the MSP EMD PUB-103, which shows the potential mining hazard areas within the state, has been included. Macomb County does have some regions where solution mining could have taken place or where deposits may be located. It is not certain whether or not these mining areas exist. Nevertheless, this map has been included to document potential problem areas.

Potential Subsidence Hazards in Michigan

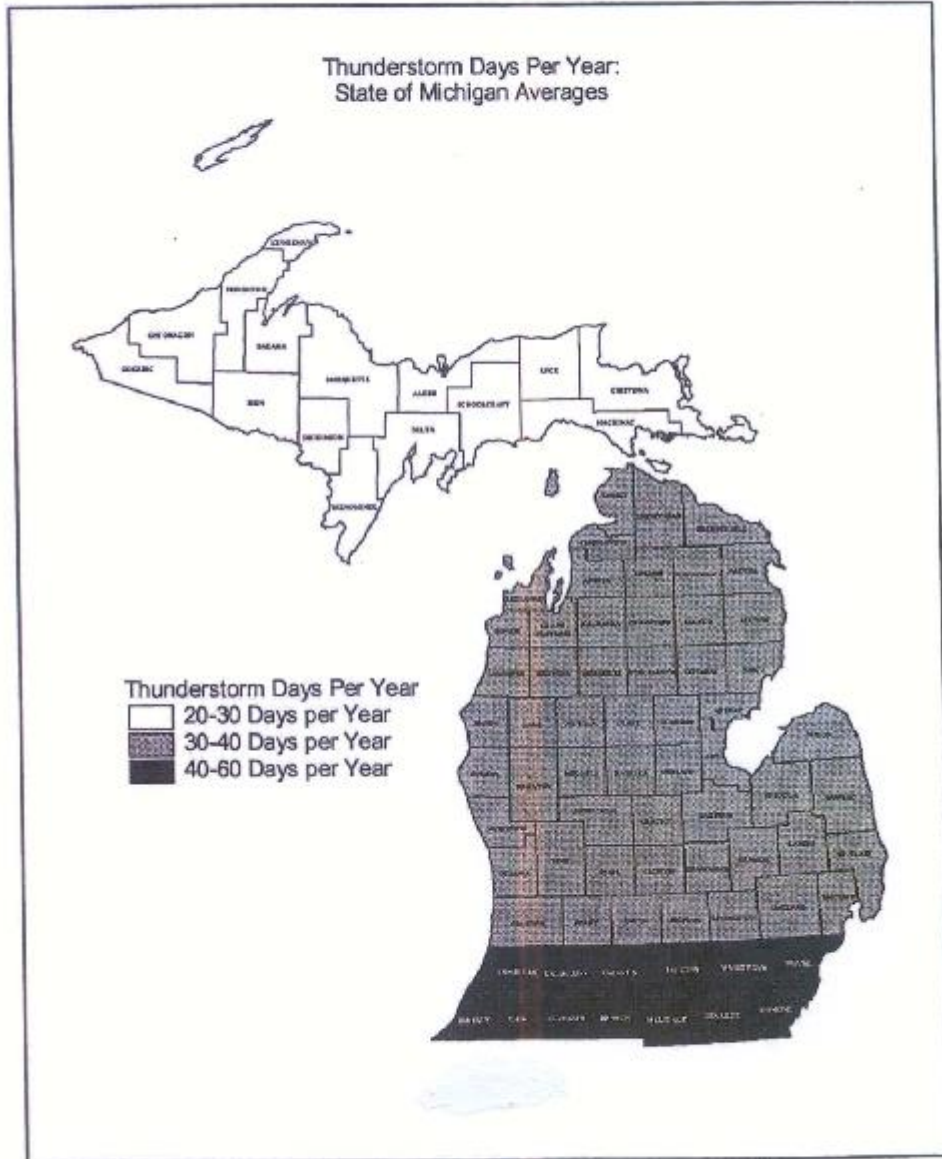
Source: Michigan Department of Environmental Quality, Geological Survey Division



S - THUNDERSTORM DAYS

The following map, which was obtained from the Michigan State Police EMD PUB-103 shows the average thunderstorm days per year for all counties throughout the State of Michigan. Macomb County falls within the 30-40 thunderstorm days per year range. It should be noted that this map simply displays averages and that actual storms can vary significantly and cross over into other areas. Just to the south of Macomb County and on its southernmost border, is the range of 40-60 thunderstorm days per year. The potential exist for Macomb County to experience a number of violent storms throughout the year, especially in the spring and summer months.

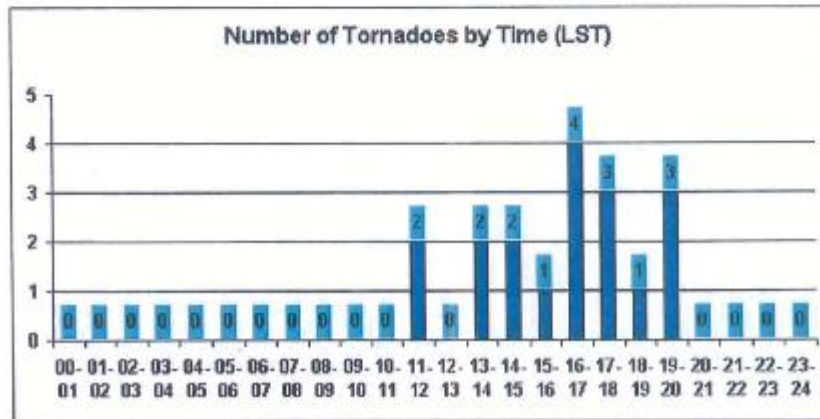
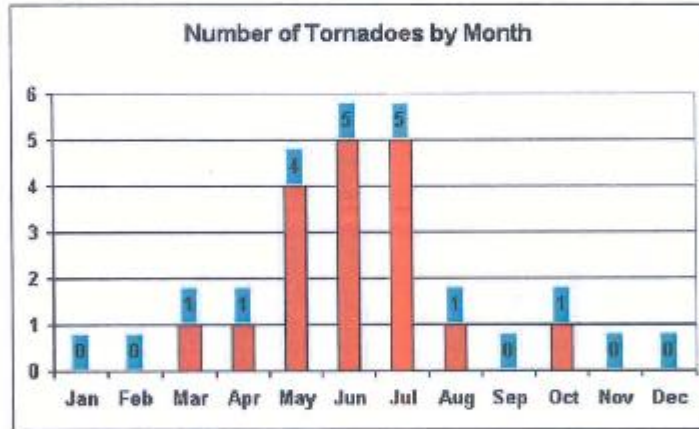
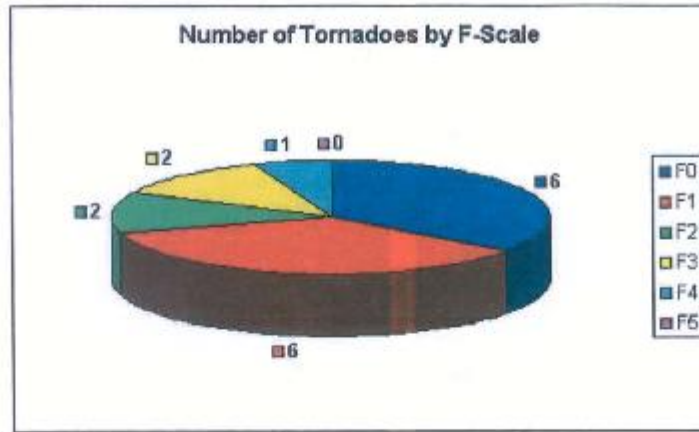
Source: National Weather Service, White Lake, Michigan



T - TORNADO ACTIVITY

The following data was obtained from the National Oceanic and Atmospheric Administration (NOAA). The information show indicates tornado activity within Macomb County. The first table shows the total number of tornadoes by F-Scale to touch down in the County since 1964. The second graph shows the months in which these tornadoes typically occurred. The third graph shows the typical times in which they have occurred. By documenting this type of historic information and utilizing it to create trend data, future tornado incidents are more easily predicted and better measures for preparedness can be implemented.

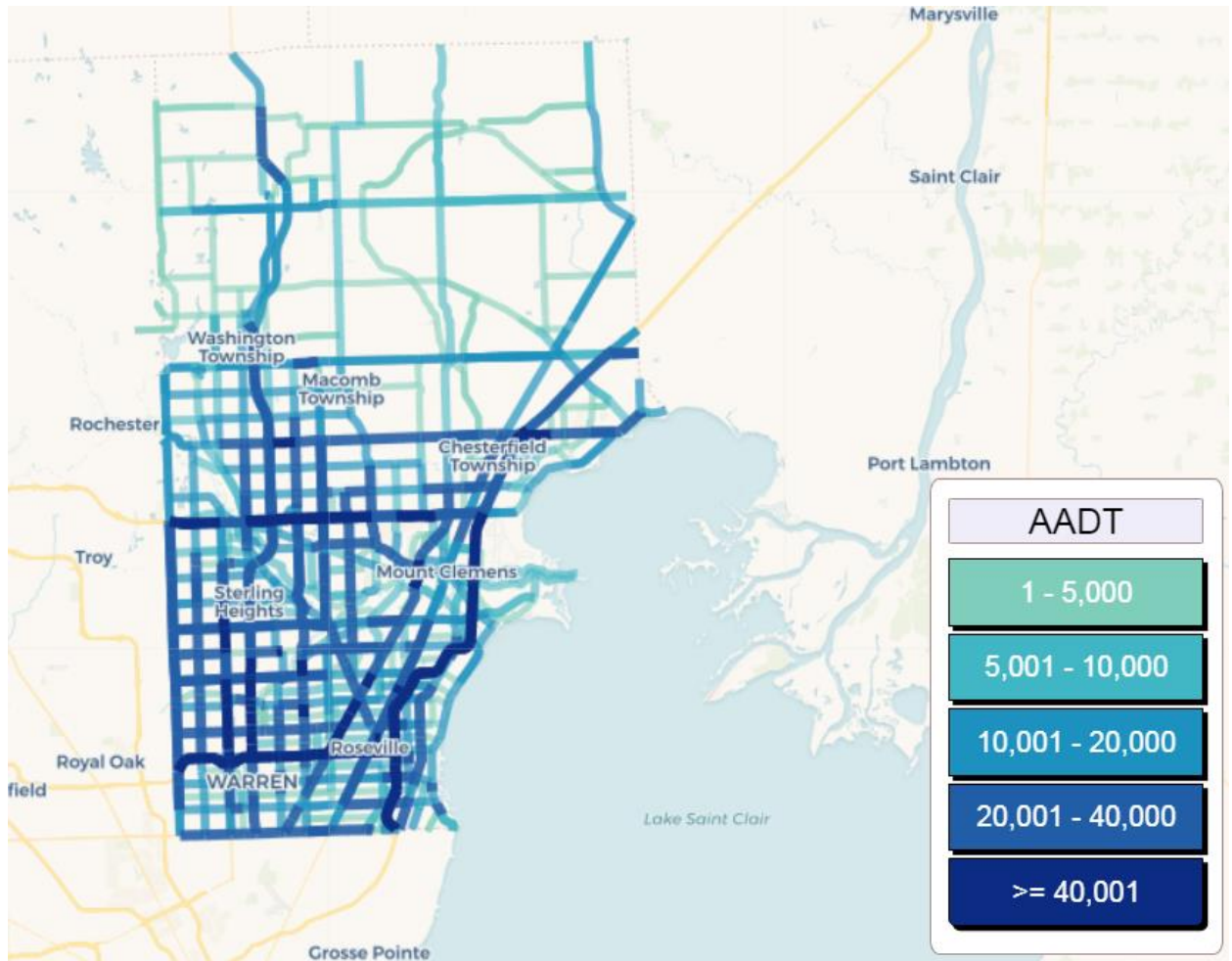
Macomb County Historical Tornado Statistics



<http://www.orh.noaa.gov/otx/?page=macler>

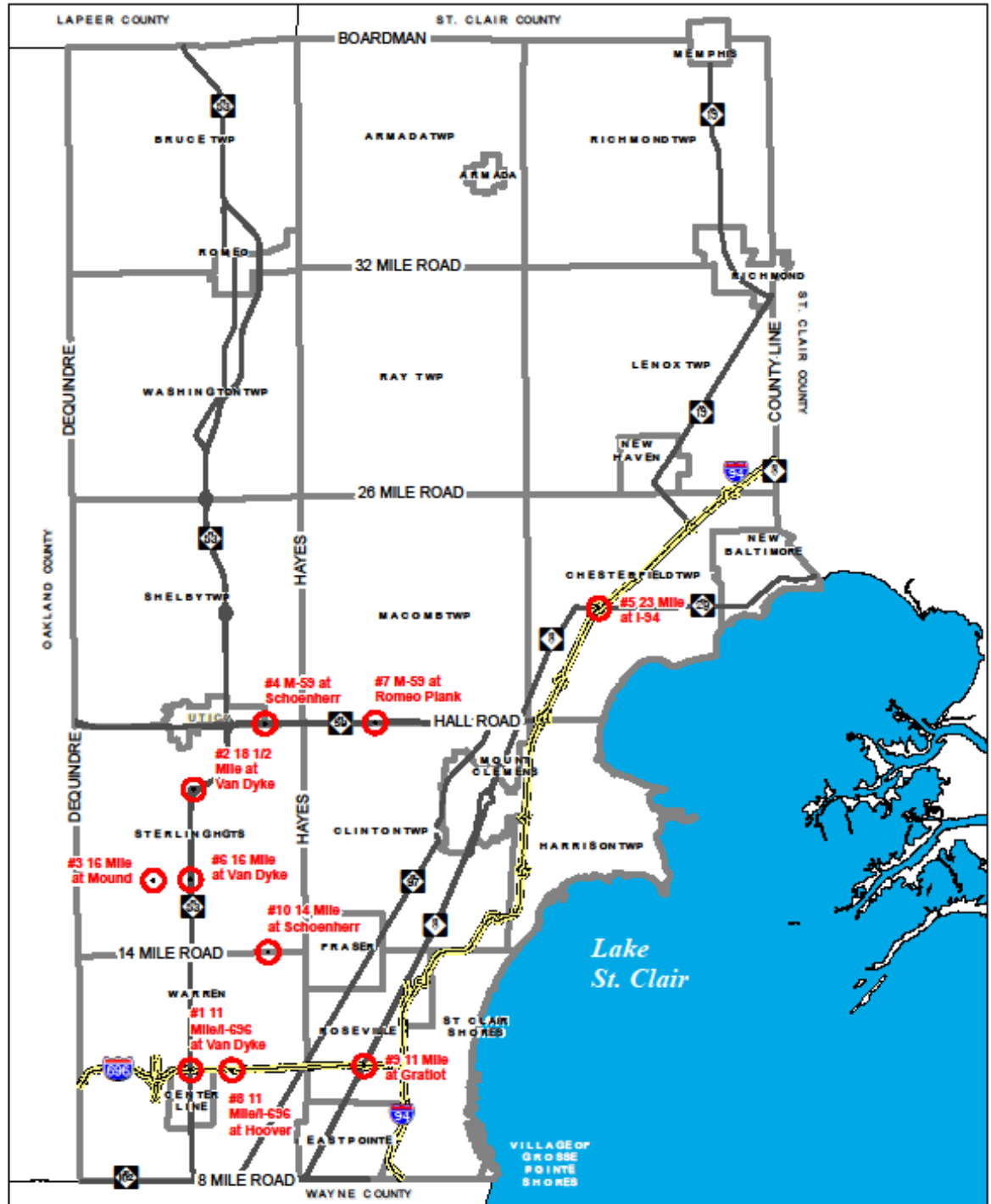
U - TRAFFIC FLOW DENSITIES

The following maps have been included to show typical daily traffic flows. This data, obtained from the South East Michigan Council of Governments (SEMCOG) web site shows densities on major roadways in Macomb County. The two traffic density maps depict average daily traffic flows as of 2019. Typically a larger traffic flow usually means more accidents. By identifying the heavily traveled roads within the County, measures to alleviate the density, or action to manage the flow can be developed.



V - TRAFFIC ACCIDENTS

The following map shows the top ten crash intersections within Macomb County as of the data recorded from traffic accident information from 2018. The colored chips in the map represent the location, based on ranking (refer to 2.3.25). Once the high risk areas have been isolated, measures can be investigated and implemented to reduce loss of life, injuries, and minimize property damage.



W - CRITICAL FACILITIES

The map included in this section of the appendix lists each jurisdiction's critical facilities. These facilities include police stations, fire stations, hospitals, schools, and local government buildings. This map shows the facilities in relation to the 100-year flood plain. Flooding was the only hazard in Macomb County that had distinguishable boundaries. The map can also be used for other mitigation purposes.

Macomb County - Critical Facilities in Relation to 100 - Year Flood Plain

