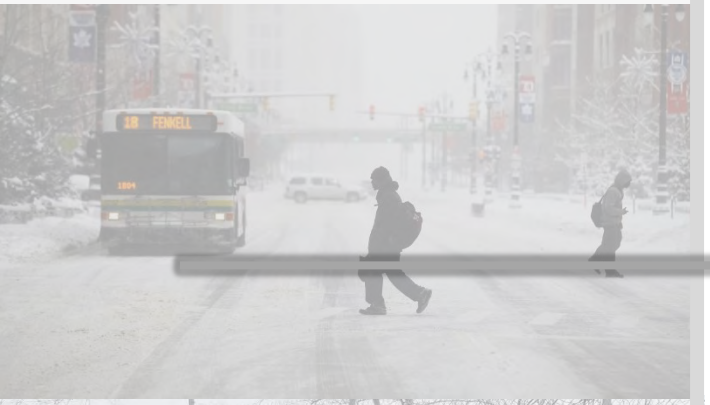
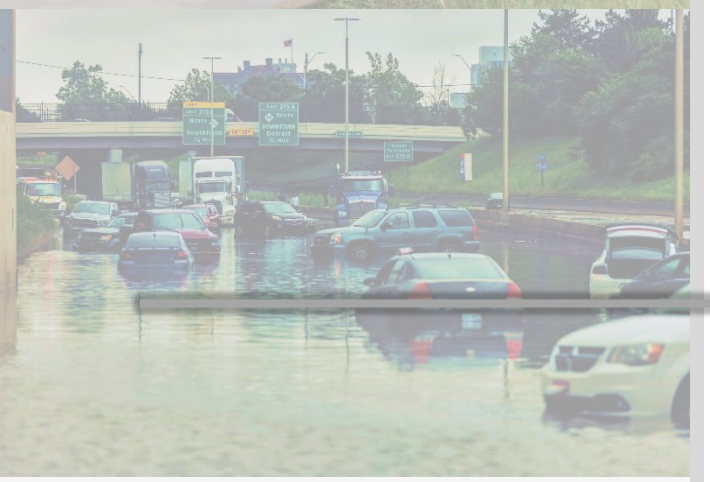




CITY OF DETROIT

HAZARD MITIGATION PLAN

2022
Update

DETROIT OFFICE OF HOMELAND SECURITY & EMERGENCY MANAGEMENT

Contents

SECTION 1. INTRODUCTION AND COMMUNITY PROFILE

Located in southeastern Michigan, Detroit is the largest city in Michigan, and the 26th largest city in the United States in 2020. Founded in 1701, the city was named the Ville d'Etroit or "City of the Straight" because of its position on the Detroit River. The Detroit River separates the City of Detroit from the City of Windsor, Ontario and serves as an international boundary between the United States and Canada.

In 2013, the City of Detroit was the largest city to declare municipal bankruptcy. Since the economic downturn of 2008 and 2013 bankruptcy, the Detroit metro area's economy has climbed above the 2005 peak Gross Domestic Product of $232.55B to $237.09B in 2019 (values provided in 2012 dollars[1]). Michael Duggan was elected mayor in 2013 and re-elected to second and third terms in November 2017 and November 2021. This election provides an opportunity to continue the successful planning and growth of the city in a post-pandemic society.

Detroit, Michigan, is subject to hazards that threaten life and health, and have caused extensive property damage. Between 2016 and 2019, the City averaged 2,875 structural fires a year, resulting in 199 civilian deaths, and hundreds of millions in property damage. Due to extensive community engagement and mitigation efforts, the average number of structure fires annually in Detroit has declined. According to the Detroit Fire Department's Fire Investigation Division, there were 4,741 structure fires in Detroit in 2014, compared with 2,478 in 2019. While recent statistics reveal an average of six structures per day.[2] These trends reflect a significant decline in fires but also demonstrate that more work needs to be done. Over the past several years, the City endured power outages, winter storms, and floods. The most recent flood event and presidentially declared disaster occurred in June 2021. To better understand these hazards and their impacts on people and property, and to identify ways to reduce those impacts, the City's Office of Homeland Security & Emergency Management and the Detroit Hazard Mitigation Plan Steering Committee undertook this five-year update to the Hazard Mitigation Plan.

Hazard mitigation does not mean that all hazards are stopped or prevented. It does not suggest complete elimination of the damage or disruption caused by such incidents. Natural forces are powerful, and most natural hazards are well beyond our ability to control. According to the Federal Emergency Management Agency (FEMA), hazard mitigation includes any sustained action taken to reduce or eliminate long-term risk to life and property from future disasters.[3] Every community, including Detroit, faces different hazards and has different interests and resources to bring to bear to address its problems. As there are many ways to deal with natural hazards and many agencies that can help, there is no one solution to managing or mitigating their effects.

[1] https://www.statista.com/statistics/183873/gdp-of-the-detroit-metro-area/ (retrieved on July 19, 2021_
[2] Detroit blazes see huge decline, fire officials say (detroitnews.com)
[3] Hazard Mitigation Assistance Grants | FEMA.gov

Planning is one of the best ways to correct these shortcomings and produce a program of activities that will best mitigate the impacts of natural hazards. A well-prepared plan will identify possible corrective measures and mitigation activities to consider and implement, so that potential impacts are addressed by the most appropriate and efficient means. It can also ensure collaboration and coordination on other goals and activities. Planning also helps to prevent conflicts with overlapping projects and potentially reduce implementation costs.

A local hazard mitigation plan is a requirement for receiving certain types of federal mitigation funds. Section 104 of the Disaster Mitigation Act of 2000 (42 United States Code 5165) states that after November 1, 2003, local governments applying for pre-disaster mitigation funds must have an approved local mitigation plan. After November 1, 2004, a plan will also be needed for post-disaster mitigation funding under the Hazard Mitigation Grant Program. These requirements are described at 44 Code of Federal Regulations, Part 201. For these reasons, and to plot a course toward a more resilient City, this local mitigation plan will guide mitigation strategies, the best use of funding, and meet the prerequisite for obtaining such funds from FEMA.

Detroit's Hazard Mitigation Plan (HMP) identifies activities that can be undertaken by the public and private sectors to reduce safety and health hazards and the property damage caused by natural hazards. The HMP focuses on seven major natural hazards facing Detroit, including: Drought, Earthquakes, Extreme Summer Weather, Extreme Winter Weather, Flooding, Structural Fires, and Public Health Emergencies. While climate change is not a hazard unto itself, the HMP will also address adaptation and implications of climate change for the profiled hazards. Human-caused hazards are also addressed by this plan and include: Civil Disturbance, Hazardous Materials Releases, Infrastructure Failure – Energy Emergency, Nuclear Power Plant Accidents, Oil and Natural Gas Well Accidents, and Public Transportation Accidents. The HMP fulfills federal planning requirements and provides the City with a blueprint for reducing the impacts of these natural hazards on people and property. The HMP also addresses other hazards that have impacted Detroit in the past.

1-1. PLANNING APPROACH

This plan is the product of a rational process, in which the planning team reviewed alternatives and designed strategies that would work best for the City. The plan provides carefully considered directions to City government by studying the overall damage potential and ensuring that funds are well spent.

This HMP was last approved on April 5, 2015. The 2021 update was prepared by Integrated Solutions Consulting, a contractor hired by the City of Detroit, Office of Homeland Security & Emergency Management with guidance from the local Steering Committee. The Detroit Hazard Mitigation Plan Steering Committee has been reconstituted as the primary vehicle for updating the HMP. The Steering Committee, which includes representatives from City departments, met on a periodic schedule from

April through December 2021 and will continue to meet for planning maintenance and updates. A complete listing of the members of the Steering Committee who participated in this process is provided in **Appendix A**. The contractor and the Steering Committee followed a 10-step planning process, based on FEMA requirements. That process is summarized in the figure at right.

Step 1: Organize Resources
Step 2: Involve the Public (Continuous)
Step 3: Coordinate with Agencies and Organizations (Continuous)
Step 4: Assess the Hazards
Step 5: Evaluate the Problem
Step 6: Set Goals
Step 7: Review Mitigation Strategies
Step 8: Draft Action Plan
Step 9: Adopt the Plan
Step 10: Implement, Evaluate and Revise

1-1.1. Public Involvement

Step 2 of the planning process focused on obtaining input on the HMP from community members and businesses that have been impacted by natural hazards. Public meetings were held with members of the community, on October 4 and 5, 2021. Meeting details are provided in **Appendix B.** The public was also invited to participate in a community preparedness survey. The survey was advertised via local media, local government websites, and social media sites. Results and survey distribution details are provided in **Appendix B**. Finally, plan developers met with the Hazard Mitigation Plan Steering Committee and requested input related to hazards and mitigation strategies. Examples of these efforts are also provided in **Appendix B.**

1-1.2. Coordination

Existing plans and programs were reviewed during the planning process. This plan does not replace other planning efforts, such as the City's Master Plan, The Detroit Future City Strategic Framework Plan, Community Reinvestment Strategy, the City's Evacuation Plan, or plans developed by the Local Emergency Planning Committee (LEPC). This HMP complements those efforts and builds on their recommendations. During the planning process, plan developers coordinated with regional, state, and federal agencies and organizations. These organizations provided much of the information that was instrumental in developing the hazard analysis, vulnerability analysis, and mitigation strategies. These organizations include:

- Federal Emergency Management Agency
- National Drought Mitigation Center
- U.S. Geological Survey
- U.S. Army Corps of Engineers
- National Snow and Ice Data Center
- U.S. Fire Administration
- City of Detroit
- National Climatic Data Center
- Nuclear Regulatory Commission
- Emergency Management and Homeland Security Division, Michigan State Police
- SE Michigan Council of Governments
- Michigan Department of Environmental Quality
- Fire Marshal Division, Michigan Department of Labor and Economic Development
- National Transportation Safety Board
- Wayne Co. Office of Homeland Security and Emergency Mgmt.

The update of the plan sought to have input from surrounding jurisdictions. The Urban Area Security Initiative (UASI) consists of the six counties in Southeast Michigan. Those counties are Wayne, Oakland, Macomb, St Clair, Washtenaw, and Monroe. Two of the counties (Oakland and Macomb) have a contiguous border with Detroit. The regional planning committee for the UASI was asked to review the HMP and provide comments or recommendations.

1-1.3. Hazard Assessment and Problem Evaluation

Detroit Office of Homeland Security & Emergency Management (DHSEM) completed Steps 4 and 5 of the planning process from April through December 2021.The hazards reviewed were based on the State of Michigan's Hazard Analysis, prepared by the Emergency Management and Homeland Security Division of the Michigan State Police. Each hazard was rated based on the probability of future occurrence, potential impact, and the city's vulnerability. The most significant natural hazards that could impact Detroit are described in the table below.

Significant Natural Hazards						
Natural Hazard	Time of Potential Occurrence				Last Major Event	
	Spring	Summer	Fall	Winter	Year	Location
Energy Emergency	X	X	X	X	2021	City-Wide
Extreme Summer Weather	X	X			2020	City-Wide
Extreme Winter Weather			X	X	2021	City-Wide
Structural Fires	X	X	X	X	2021	City-Wide
Hazardous Materials Release	X	X	X	X	2019	SW Detroit
Public Health Emergency	X	X	X	X	2020	Nationwide
Floods	X	X	X	X	2021	City-Wide

The hazard data, as well as the Hazard Mitigation Plan Steering Committee's conclusions, are covered in Section 2 of the HMP. Section 2 provides an overall risk assessment of each natural hazard and its potential impact on the City.

1-1.4. Goals

The DHSEM conducted a goal setting exercise at its May 2021 meeting. The goals were then drafted. The results are discussed in Section 3.

1-1.5. Mitigation Strategies

The DHSEM considered a wide range of strategies for mitigating each of the natural hazards listed above. At a second meeting conducted in June 2021, the DHSEM reviewed the list of strategies for each hazard. These strategies are described in Section 4.

1-1.6. Action Plan

After reviewing many alternatives, the DHSEM retained an Action Plan that specifies recommended projects, who is responsible for implementing them, and when they anticipate the action will be completed. The action plan is included in Section 4. This HMP serves only to recommend mitigation strategies. Implementation of these

recommendations depend on the adoption of this Plan by the Detroit City Council. It also depends on funding availability and the cooperation and support of the departments designated as responsible for each action item.

1-2. COMMUNITY PROFILE

1-2.1. Historical Background

When founded in 1701 by Antoine de la Mothe Cadillac, Detroit served as a fur collection site and strategic stronghold for the French. In 1760 the British captured Detroit and much of the Northwest Territory from the French. Detroit remained under England's control until after the Revolutionary War. Detroit was incorporated as a city in 1815 and spent the decades leading up to the Civil War as the final U.S. stop on the Underground Railroad.

The City remained relatively small until the introduction of steam travel on the Great Lakes and the opening of the Erie Canal in the 1820's. These two events made it possible for more immigrants to enter Detroit and more exports to leave the city. During this era, Detroit became famous for its lumber, manufacturing, and railroad concerns, and eventually became known as a "World Class City."

Detroit eventually became the Motor City due to the influence of Henry Ford. In 1896, Ford built his first car in Detroit, and his idea of manufacturing automobiles on a moving assembly line put the world on wheels. During the early part of the 20th century, dozens of companies emerged in the area committed to the new industry.

Detroit's location along a major water artery, its proximity to Canada, and a highly developed transportation infrastructure made it easy for businesses to transport products locally and across the world. Internationally known for automobile

manufacturing and trade, Detroit ranks high in the production of machine tool accessories, metal fabricating, and plating.

Detroit is also recognized as a regional banking center and home to many of the nation's largest corporations. It has the largest foreign trade zone in the state, geographically and by virtue of the value of goods leaving the zone ($100-$250 million[4]). The City of Windsor, Ontario is only minutes away via a railroad tunnel, a vehicular tunnel, and the Ambassador Bridge. A second bridge, the Gordie Howe International Bridge is currently under construction and scheduled to open in 2024. Detroit's international port facilities provide storage, transportation, services and dockside foreign trade zones.

The City is at the hub of the metropolitan freeway network, and the railroads provide a link to the region and beyond. The City owns and operates its own general aviation airport and has freeway access to Detroit Metropolitan and Willow Run airports. Downtown Detroit has completed the rejuvenation of the expanded convention facility with 700,000 square feet of exhibition space and several new office buildings and residential towers. A network of skywalks and the People Mover, a centrally automated transportation system, connect many of the downtown office and high-rise buildings.

1-2.2. Geography and Climate

Detroit is located in southeastern Michigan on the northern banks of the Detroit River and south of Lake St. Clair. Detroit is 90 road miles from the state capital in Lansing, 283 miles from Chicago, and 169 miles from Cleveland. The land area of Detroit comprises 138.7 square miles and has an altitude of 581 feet, as measured at the Detroit River. The average high and low temperatures per month are provided in the chart below.

Month	High/Low (Fahrenheit)	High/Low (Celsius)
January	46.34/19.88	7.97/-6.73
February	41.21/14.08	5.12/-9.96
March	55.08/29.22	12.82/-1.54
April	58.69/32.89	14.83/0.49
May	78.25/38.14	25.69/3.41
June	79.29/57.25	26.27/14.03
July	83.71/71.42	28.73/21.89
August	83/66.88	28.33/19.38
September	74.38/50.75	23.54/10.42

[4] Annual Report of the Foreign-Trade Zones Board – 2019, Appendix D (https://www.trade.gov/sites/default/files/2020-11/AR-2019.pdf)

October	66.1/38.04	18.94/3.36
November	68.71/34.2	20.39/1.22
December	45.8/21.48	7.67/-5.84

Source: *Weather Underground*

The record high temperature of 105 (F) was recorded in Detroit in July 1934. The record low temperature of –21 (F) was recorded in 1984. Summer high temperatures in July are around 84 (F) winter lows in January averages at 19 (F), and the average annual snowfall is 33 inches.[5] The average wind velocity in the city is 10.2 miles per hour.[6]

1-2.3. Population and Employment Characteristics

According to the 2019 American Community Survey (ACS), Detroit has a population of 670,031, a decrease of 43,867 (-6.1%) from the 2010 Census.[7] According to the 2019 ACS, the City has 359,623 housing units, which is slightly lower than the 2010 estimate of 360,675.[8] Changes are due primarily to a continuing blight removal project. The loss in housing corresponds closely with Detroit's drop in population. The table below provides a socio-economic profile of the City, using ACS data and data from the Southeast Michigan Council of Governments.

Component	2010 Census	2019 ACS	2040 Forecast
Total Population	713,777	670,031	614,969
Households	269,478	263,688	255,638
Housing Units	349,213	362,947	N/A
Household Size	2.59	2.51	2.35
Population 65 and Older	81,925 (11%)	91,661 (13.6%)	115,756 (19%)
Population Under 18	190,347 (27%)	168,452 (25%)	137,676 (22%)
Persons in Poverty	258,295 (36%)	232,137 (35.0%)	N/A
Population under 65 with a disability	29,363 (11.4%)	103,250 (15.3%)	N/A
Owner Occupied Housing Units	137,730 (19%)	171,311 (47.2%)	N/A

Source: US Census Bureau, Quick Facts, Detroit City, Michigan, 2019 Population estimates

The largest private employers in the City of Detroit are described below:

Employer	# of Employees	Type of Employment
American Axle & Manufacturing	25,000	Automotive
Ilitch Holdings	23,000	Entertainment/Sports
General Motors	20,000	Automotive
Henry Ford Health System	17,000	Health Care

[5] Collected from https://www.bestplaces.net/climate/city/michigan/detroit, July 20, 2021
[6] Collected from https://www.currentresults.com/Weather/US/wind-speed-city-annual.php, July 20, 2021
[7] US Census Bureau, Total Population, American Community Survey, 1-Year Estimates Detailed Tables
[8] US Census Bureau, Selected Housing Characteristics American Community Survey, 1-Year Estimates Date Profiles

Rock Mortgage (Quicken Loans)	17,000	Finance
Marcus Hamburgers	15,700	Hotels, Restaurants, and Leisure
Detroit Receiving Hospital	12,000	Health Care
Blue Cross Blue Shield of Michigan	10,880	Nonprofit
DTE Energy	10,600	Electric Services
Ally Financial	8,200	Financial Services
Little Caesar	6,000	Restaurant
MSX International	3,668	Automotive
Chemical Bank	3,100	Finance
MGM Grand Casino	3,000	Casino
MotorCity Casino Hotel	2,750	Casino
Children's Hospital of Michigan	2,282	Health Care
Greektown Cassino	2,200	Casino
Hutzel Woman's Hospital	1,884	Health Care
Strategic Staffing Solutions	1,500	Employment Agency
Barbara Ann Karmanos Cancer Institute	1,347	Health Care
Smith Group	1,190	Architecture

Source: *20 Biggest Companies in Detroit, MI - Zippia*

1-3. LAND USE AND DEVELOPMENT

Hazard mitigation is greatly concerned with development. Planners seek to determine where people live, the buildings that they work in, and the infrastructure that serves them. The table below provides the breakdown of land use, comparing 2015 to 2020. As the table indicates, the largest percentage of land use is dedicated to green space. The next highest percentage of land use is single-family residential dwellings.

Land Use Type	2015 (Acres)	2020 (Acres)
Single Family Residential	26,240.8 (29.5%)	24,753.7 (27.8%)
Multi-Family Residential	3,514.8 (4%)	1,715.4 (2%)
Retail, Office, Hospitality, and Medical	3,514.8 (4%)	3,235,8 (3.6%)
Institutional	3,630.8 (4.1%)	3,305.8 (3.7%)
Industrial	5,078.3 (5.7%)	4,993.1 (5.6%)
Agricultural	10.3 (0%)	17.6 (0%)
Recreation, Open Space, and Cemetery	6,803.1 (7.6%)	5,847 (6.6%)
Green Space – vegetation, trees, fields, grasslands, turfgrass, soil, aggregate piles	40,102.5 (45%)	40,102.5 (45%)
Parking	800.8 (0.9%)	804.4 (0.9%)
Extractive	38.6 (0%)	38.1 (0%)
Water	407.7 (0.5%)	407.7 (0.5%)
Total Acres	89,090.3	89,090.3
Note: The 2015 and 2020 total acres are not exact, due to rounding errors and precision differences between 2015 and 2020 GIS layers.		

Source: *SEMCOG, Community Profile for Detroit*

The City has had a significant reduction in population which has also resulted in the reduction of occupied homes. Unoccupied properties became abandoned and blighted. The City has a blight removal process where structures are demolished. This has left wide areas of Detroit with open land and fewer homes that require City services. The City has had several development plans under different administrations. The Michigan Urban Farming Initiative and Peace Tree Parks, both 501(c)(3) organizations based in Detroit are examples of grass roots movements to utilize vacant lots and engage members of the community in sustainable agriculture. Other initiatives, such as Moore Park, are private land purchases used to create neighborhood parks. There is an aggressive plan for use of a land bank to sell and develop property usage.

Detroit's current Master Plan, Article 203, includes several policies aimed at addressing the large-scale problems inherent in the simultaneous aging of the housing stock, industrial buildings, and other facilities. Modernization, replacement, and reuse are all strategies appropriate ~~to~~ for Detroit's landscape.

Article 203 on Physical Development Goals, Policies, and Strategies address the following subjects:

- Redevelopment
- Housing Stock
- Retail Areas
- Industrial Areas
- Human Services Facilities
- Urban Design
- Historic Preservation
- Transportation
- Environmental Quality
- Rezoning

Article 203 also emphasizes the importance of building partnerships among individual property owners, businesses, and neighborhood groups to correct land use problems. For this reason, the Hazards Mitigation Plan will ensure that all these stakeholders will have a role to play in determining how hazards could impact the City's ability to address these areas. In addition, the Planning and Development Department will incorporate hazard mitigation considerations into all future planning, zoning, and development decisions.

1-4. CRITICAL FACILITIES

When natural disasters impact a community, some development is more important than others. These more important resources are considered critical facilities because damage to them can cause harm to large groups of people. Facilities may also be considered critical if damage to them can prevent the City from responding to the emergency, or if damage can result in secondary disasters, such as a release of a hazardous material from an industrial location.

The inventory of critical facilities is divided into the following categories:

- Public Assembly
- Utilities
- Government
- Schools
- Office Buildings
- Hotels
- Hazardous Materials Facilities
- Police and Fire Stations
- Industrial Facilities
- Commercial Facilities
- Hospitals

Section 2 (**Risk Assessment**) examines how each o category of Critical Facilities can be impacted by hazards. For some hazards, such as releases of hazardous materials, affected critical facilities can be easily identified. For other hazards, such as winter storms, the impact on critical facilities can only be broadly defined. But for all hazards and for all critical facilities, hazard mitigation methods can be identified. A listing of critical facilities is provided in **Appendix C**.

1-5. PUBLIC WARNING SYSTEM

The public warning system for Detroit is composed of sirens at 56 sites located throughout the city. Approximately 95% of the city is covered by this warning system. The locations and type of sirens are provided below.

Site #	Address	Location Description
1	18140 Joy Rd	Engine 55
2	Burt Rd., South of Lyndon	Engine 57
3	16825 Trinity	Engine 54
4	Prest St.	North of Fenkell
5	16543 Meyers	Engine 30
6	13939 Dexter	Across the street from Engine 40
7	19326 Livernois	Engine 51
8	12515 Grand River	Across the street from Eng. 49
9	6342 W. Chicago/6535 Livernois	Engine 34
10	Gilbert St.	South of Warren, West of Livernois
11	10325 Linwood	Engine 21
12	2275 W. Warren	Detroit Fire Training Academy
13	2200 Crane	Engine 26
14	5029 Manistique	Engine 52 Frankfort, N. of Warren
15	10800 Whittier	Engine 58
16	12985 Houston Whittier	Engine 50
17	17467 Mt. Elliot	Engine 47
18	35 Seven Mile @John R	Engine 44
19	3044 Grand Blvd.	Cadillac Place Bldg.
20	Lewerenz St.,	Between Fort St. & Fisher Fwy Service Dr.
21	Rex St.	Between State Fair & Tacoma St.
22	Orleans St.	South of Erskine
23	Porter St.	South of Brooklyn St.
24	Berg Rd.,	North of Cambridge
25	19330 Lindsay	Coffey School
26	Lesure St,	North of Pembroke, Vernor School
27	Capital Ave.	West of Greenfield; O'Shea Rec Ctr

28	Trinity St.	South of Joy Rd.
29	Southfield Service Dr.	North of Warren; Ruddiman School
30	8900 Cheyenne St.	North of Joy Rd; McFarlane School
31	Senator St.	West of Mullane
32	Clark St.	@ Vernor Ave.
33	2300 S. Fort St.	Engine 48
34	Fort St.	East of 14th St.
35	Fourth St.	South of ML King Dr.
36	Whipple St.	West of Van Dyke, north of Gratiot
37	Montclair	South of Warren Ave. DDOT Office Bldg.
38	Bluehill St.	N. of E. Warren; E. English Village H.S.
39	Ryan Rd.	South of Seven Mile Rd.
40	Lappin St.	South of E. Outer Dr.
41	Leander St.	East of Van Dyke
42	Burt Rd.	North of Plymouth Ave.
43	Beaverland	South of McNichols
44	Vaughan St.,	South of Seven Mile Rd.
45	Whitcomb St.	S. of W. Outer Dr.; Renaissance HS
46	Glastonbury St.	North of Grand River Ave.
47	Chicago	West of Woodward Ave.
48	Dearborn St.	West of Fort St.
49	Canfield St.	West of McDougall
50	Caniff St.	East of Conant St.
51	Clairpointe Ave.	East of Conner St.
52	Mt. Elliot, north of Lafayette	Engine 9
53	Belle Isle, Picnic Way	South of Central Ave.
54	Belle Isle, Oakway Trail	West of Lake Side Dr.
55	1340 Atwater, Rivard Place	Riverfront Conservancy
56	110 Mt. Elliott, Mt. Elliott Park	Riverfront Conservancy

1-6. PROGRESS OF MITIGATION ACTION ITEMS

The City of Detroit had 44 Action Items identified in the 2015 updated Hazard Mitigation Plan. Of the 44 items, 14 were completed and seven remain incomplete. The City has ongoing processes in place to complete 23 of the action items identified. Section 4 (**Action Items**) includes updates for each of the existing mitigation action items.

1-7. REFERENCES

1. *A Profile of Detroit*, Detroit Economic Growth Corporation, August 1999.
2. *Community Profile for Detroit*, Southeast Michigan Council of Governments, December 2014.
3. *Critical Facility Locations*, Detroit Office of Homeland Security and Emergency Management May 2021.
4. *FEMA Disaster Costs*, Federal Emergency Management Agency, May 2021.

5. *Michigan Hazard Mitigation Plan*, Michigan State Police, Emergency Management Division, April 2019.
6. *Natural Hazards Mitigation Plan*, Kane County, Illinois, September 2003.
7. *Risk and Vulnerability Assessment Tool*, NOAA Coastal Services Center, September 2021.
8. 2019 Census Demographic Profile, 2003 Master Plan Draft, Detroit Planning and Development Department.

SECTION 2. RISK ASSESSMENT

2-1. INTRODUCTION

From 2011 to 2020, the federal government declared 1,386 disasters in the United States, including severe weather emergencies and other types of natural disasters. Of those, nine were declared in Michigan. In 2021, there were 63 disasters in the country, one of them in Michigan. Disasters caused by natural hazards have become increasingly costly, not only for the disaster victims, but also for all taxpayers. For the 2005 to 2017 period FEMA spent a total of $81 billion, while 2017 set a new record of $129.5 billion, followed in 2018 with a total of $36.4 billion.

The costs of major disasters to Detroit and other Michigan communities go well beyond those damages that are directly sustained. Recovery from disasters requires resources to be diverted from other important public and private programs, and adversely impact the health, safety, and the livelihood of citizens across the state. The magnitude of these losses is most appropriately considered at the local rather than national level.

In support of local mitigation programs and to help address the rising costs associated with natural disasters, FEMA has encouraged the emergency management community to become more proactive in reducing the potential for losses before a disaster occurs. The first step in reducing the community's vulnerability to natural hazards is identifying the hazards that the community faces. Risk assessment involves identifying all the hazards that potentially threaten a community and analyzing them individually to determine the degree of risk that is posed. A comprehensive risk assessment determines the:

- Hazards that threaten the community
- Frequency of the hazards
- Severity of the situation
- Likely impact on the community
- Vulnerability of the community to the threat

The information identified in the risk assessment is used to develop mitigation plans and emergency response plans. During the development of this risk assessment, all events that could pose a threat to Detroit were analyzed and rated according to Likelihood of Occurrence, Potential for Causing Death; Population Impacted; Property and Economic Damage; and Local Response Capability. The table that follows identifies each of these hazard aspects, including a number from "0" to "5" that represents various levels of potential risk

2-1.1. Hazard Aspects

In determining and ranking the hazards, the following hazard aspects were used:

1. Likelihood of Occurrence	**2. Potential for Causing Death**
5 = Will occur within 1 year 4 = Will occur within 5 years 3 = Will occur within 10 years 2 = Will occur within 20 years 1 = Will occur within 100 years 0 = No data available	5 = More than 100/year 4 = 51 to 100/year 3 = 26 to 50/year 2 = 11 to 25/year 1 = 1 to 10/year 0 = No data available
3. Population Impacted	**4. Property and Economic Damage**
5 = 80% to 100% 4 = 60% to 80% 3 = 40% to 60% 2 = 20% to 40% 1 = 1% to 20% 0 = Under 1%	5 = More than $100 million/year 4 = 50 to 100 million/year 3 = 25 to 50 million/year 2 = 10 to 25 million/year 1 = 1 to 10 million/year 0 = Less than 1 million/year
5. Local Capability to Respond	
5 = No capability 4 = Minimum capability 3 = Some capability 2 = Good capability 1 = Excellent capability 0 = Fully capable	

Members of the Hazard Mitigation Plan Steering Committee selected these five criteria as being most critical in conducting a vulnerability assessment of the hazards that could impact the City. Plan developers used these five factors in assessing the risks to the City of 7 natural hazards and 9 human-caused hazards identified by members of the Steering Committee, based on information provided in the Hazard Mitigation Plan for the State of Michigan. Plan developers used information from a variety of sources to conduct a risk assessment of each type of hazard (see Risk Assessment Summary Table on the next page).

2-1.2. Risk Assessment Summary Table

This table provides a summary/aspect ratio of the risk assessment conducted for each of the natural and human-caused hazards listed below. Information based on the table was gathered from a variety of sources. The information listed in this table correlates directly with the Hazard Aspect table in Section 2-1.1. The values assigned were developed in conjunction with Steering Committee input as well as the qualitative and quantitative hazard risk assessments. The weighted aspect number value was utilized to develop the Hazard Assessment Rating Table in Section 2.1-4.

Hazard	Potential for Causing Death	Population Affected	Property and Economic Damage	Local Response Capability
Flooding	2	4	4	5
Infrastructure Failure – Energy Emergency	1	4	3	3
Structural Fires	4	2	3	4
Extreme Winter Weather	3	5	1	2
Extreme Summer Weather	2	2	2	2
Hazardous Materials Releases	4	2	2	3
Public Health Emergencies	3	2	1	2
Civil Disturbance	2	2	3	2
Public Transportation Accidents	3	2	1	3
Petroleum and Natural Gas Pipeline Accidents	2	3	2	2
Drought	2	2	0	2
Nuclear Power Plant Accidents	1	2	3	2
Oil/Natural Gas Well Accidents	0	1	3	2
Earthquake	1	1	1	2

Sources: *National Centers for Environmental Information; State of Michigan Hazard Mitigation Plan; City of Detroit, Planning Department; City of Detroit, Fire Department; City of Detroit, Department of Homeland Security and Emergency Management; City of Detroit Health Department ; City of Detroit, Department of Transportation; Detroit News; Michigan Department of Community Health; National Transportation Safety Board; Detroit Free Press, The Detroit Almanac; City of Detroit, Law Department,; and FEMA, National Flood Insurance Program*

2-1.3. Hazard Aspect Weighting

In an exercise conducted at its May 2021 meeting, members of the Steering Committee selected hazard aspects and weighting factors for each of the hazard aspects selected. Plan developers in conjunction with the Steering Committee members reviewed the existing ranking criteria and worked to update the information based on each of the ranking categories and updated the hazard rankings accordingly. Steering Committee members selected among the following: Likelihood of Occurrence, Physical Damage, Size of Area Affected, Population Affected, Economic Damage, Potential for Causing Death, Duration of the Threat, Local Response Capability, and Availability of Warning Systems.

After Steering Committee members reviewed the hazard rankings and the Hazard Vulnerability and Risk Assessment (HVIRA) was conducted for each hazard, the hazards ranking list was developed and subsequently listed in order of rank within HVIRA. The ranking criteria included: Size of Area Affected, Duration of the Threat, and Availability of Warning Systems.

Plan developers then rounded each percentage listed above and combined percentages for Physical and Economic Damage to arrive at the 5 weighting factors provided below.

Hazard Aspect	Weight
Likelihood of Occurrence	25%
Potential for Causing Death	25%
Population Impacted	20%
Physical and Economic Damage	20%
Local Response Capability	10%
Total	100%

2-1.4. Hazard Assessment Rating Table

Using these weighting factors and information from the Risk Assessment Summary Table, plan developers created a Hazard Assessment Rating Table for each of the hazards designated by the Steering Committee. Each hazard is assigned a number based on the information in the Risk Assessment Summary Table. That number is multiplied by the weighted Hazard Aspect to provide a Hazard Assessment Rating for that specific aspect. The total represents the sum of the five weighted Hazard Aspects.

Hazard	Likelihood of Occurrence (25%)	Potential for Causing Death (25%)	Population Impacted (20%)	Physical and Economic Damage (20%)	Local Response Capability (10%)	Total	2015 Rank	2021 Rank
Civil Disturbance	2 (.50)	2 (.50)	2 (.50)	3 (.60)	2 (.20)	2.30	5	8
Drought	2 (.50)	2 (.50)	2 (.40)	0 (.0)	2 (.20)	1.70	11	11
Earthquake	1 (.25)	1 (0.25)	1 (.20)	1 (0.20)	2 (.20)	1.1	10	14
Infrastructure Failure	5 (1.25)	1 (0.25)	4 (.80)	3 (.60)	3 (.30)	3.20	3	2
Extreme Summer Weather	4 (1)	2 (.50)	2 (.50)	2 (.40)	2 (.20)	2.60	6	5
Extreme Winter Weather	4 (1)	3 (.75)	5 (1)	1 (.20)	2 (.20)	3.15	1	4
Structural Fires	3 (.75)	4 (1)	2 (.40)	3 (.60)	4 (.40)	3.15	2	3
Flooding	3 (.75)	2 (.50)	4 (.80)	4 (.80)	5 (.50)	3.35	6	1
Hazmat Releases	2 (.50)	4 (1)	2 (.40)	2 (.40)	3 (.30)	2.60	7	6
Nuclear Power Plant Accident	1 (.25)	1 (.25)	2 (.40)	3 (0.60)	2 (.20)	1.70	9	12
Oil/Natural Gas Well Accident	1 (.25)	0 (.0)	1 (.20)	3 (.60)	2 (.20)	1.25	9	13
Pipeline Accident	1	2	3	2	2	1.75	12	10

Hazard	Likelihood of Occurrence (25%)	Potential for Causing Death (25%)	Population Impacted (20%)	Physical and Economic Damage (20%)	Local Response Capability (10%)	Total	2015 Rank	2021 Rank
	(.25)	(.50)	(.60)	40)	(.20)			
Public Health Emergency	4 (1)	3 (.75)	2 (.40)	1 (.20)	2 (20)	2.55	4	7
Public Transportation Accident	2 (.50)	3 (.75)	2 (.40)	1 (.20)	3 (.30)	2.15	8	9

Based on this Rating Table, plan developers prioritized these hazards by using the total for each hazard listed above. A complete description of each hazard, in rank order, is provided below.

2-2. FLOODING (#1)

Hazard Description

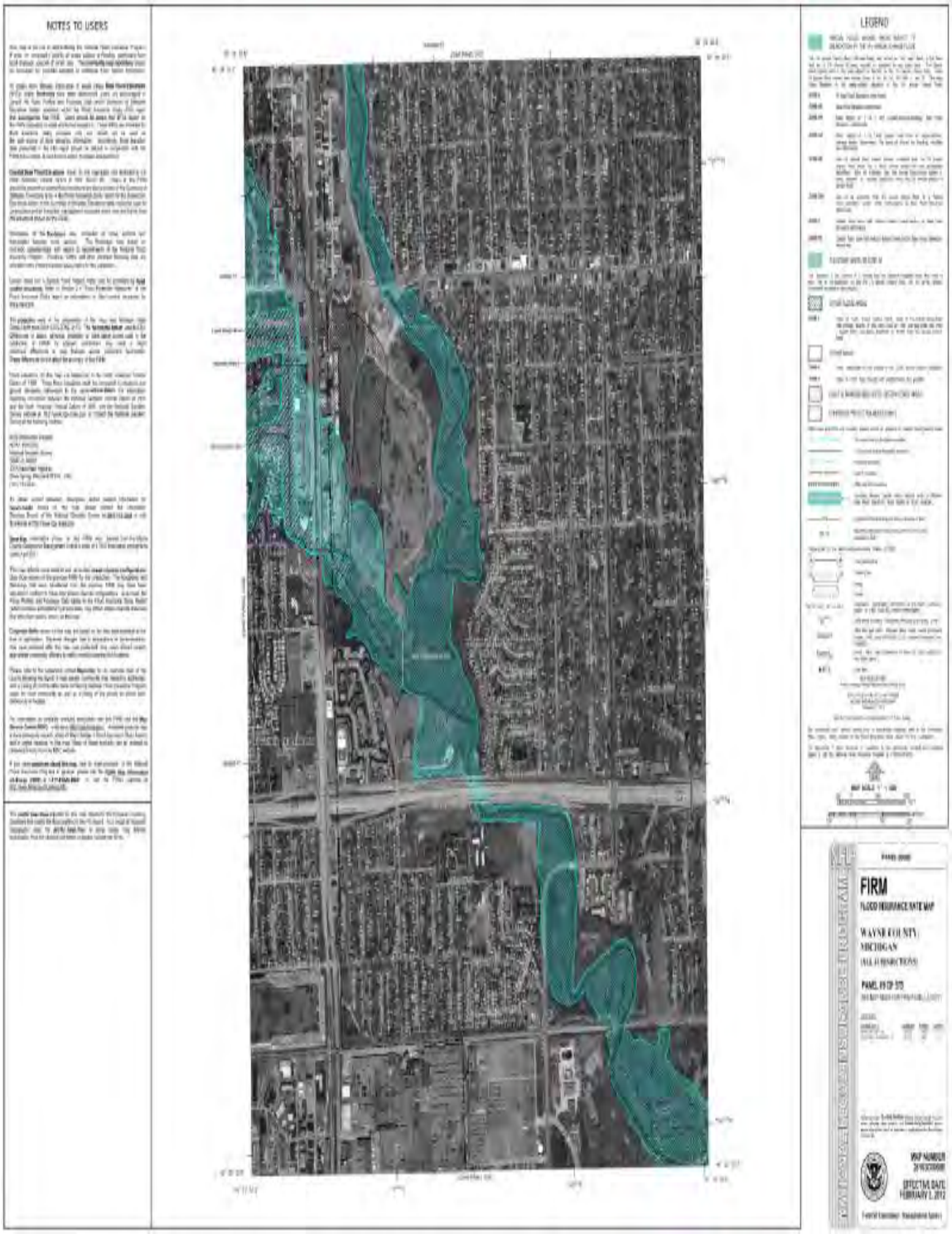
Flooding of land adjoining the normal course of a stream or river has been a natural occurrence since the beginning of time. If these floodplain areas were left in their natural state, floods would not cause significant damage. Development has increased the potential for serious flooding because rainfall that used to soak into the ground or take several days to reach a river or stream via a natural drainage basin now quickly runs off streets, parking lots, and rooftops, and through man-made channels and pipes. Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. People may be stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all.

Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials. In Detroit, flood prone areas are found along the Detroit River and along the Rouge River. See the Flood Insurance Rate Maps for these areas on pages 25-28. Land use maps including residential areas are located in Appendix C, this map indicates that residential properties would be the most impacted by Urban/Flash flooding.

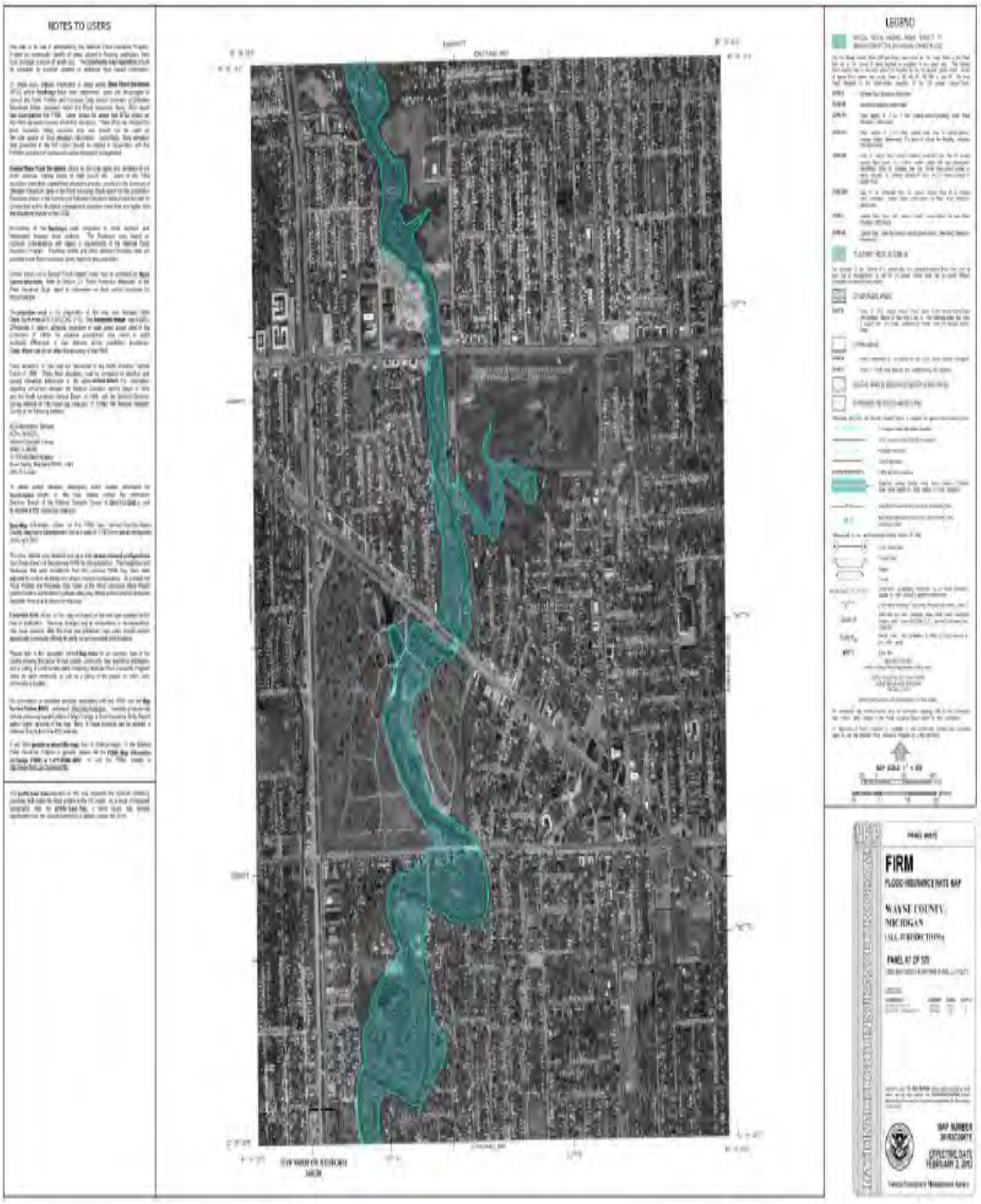
Based on historical data records, most major flooding events occur throughout the summer months. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding during the summer or fall, although these are normally localized and have more impact on watercourses with smaller drainage areas. Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations – areas that are often not in a floodplain. That type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disburse the water flow.

Urban/Flash Flooding also occurs due to combined storm and sanitary sewers that cannot handle the tremendous flow of water that often accompanies storm events. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

The following Flood Insurance Rate Maps depict areas that are prone to flooding within the city. A full map of the city is also included to identify the latest effective National Flood Hazard Layer data effective as of October 2021.

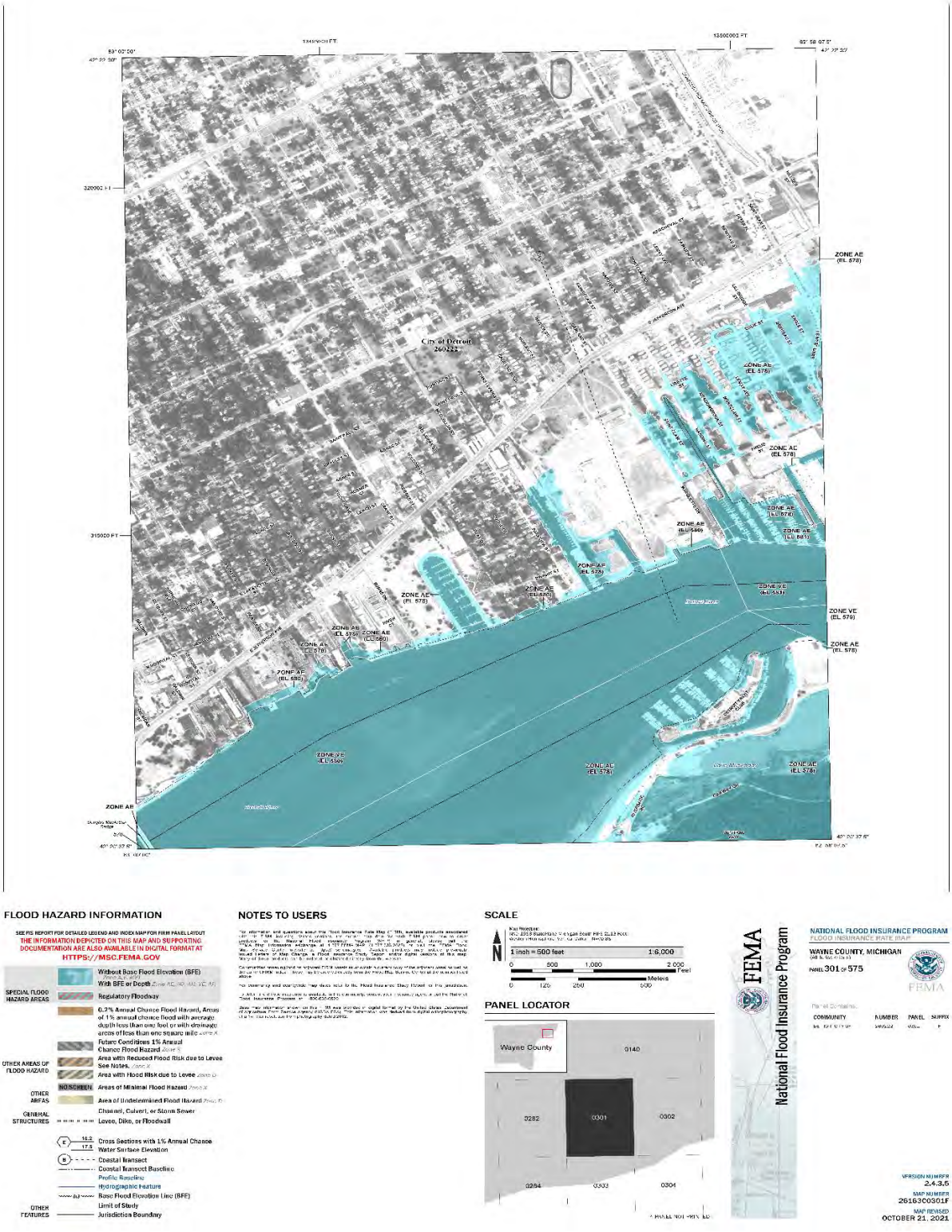


Source: Flood Insurance Rate Map, City of Detroit, Panel 69 of 575, FEMA



Source: Flood Insurance Rate Map, City of Detroit, Panel 67 of 575, FEMA

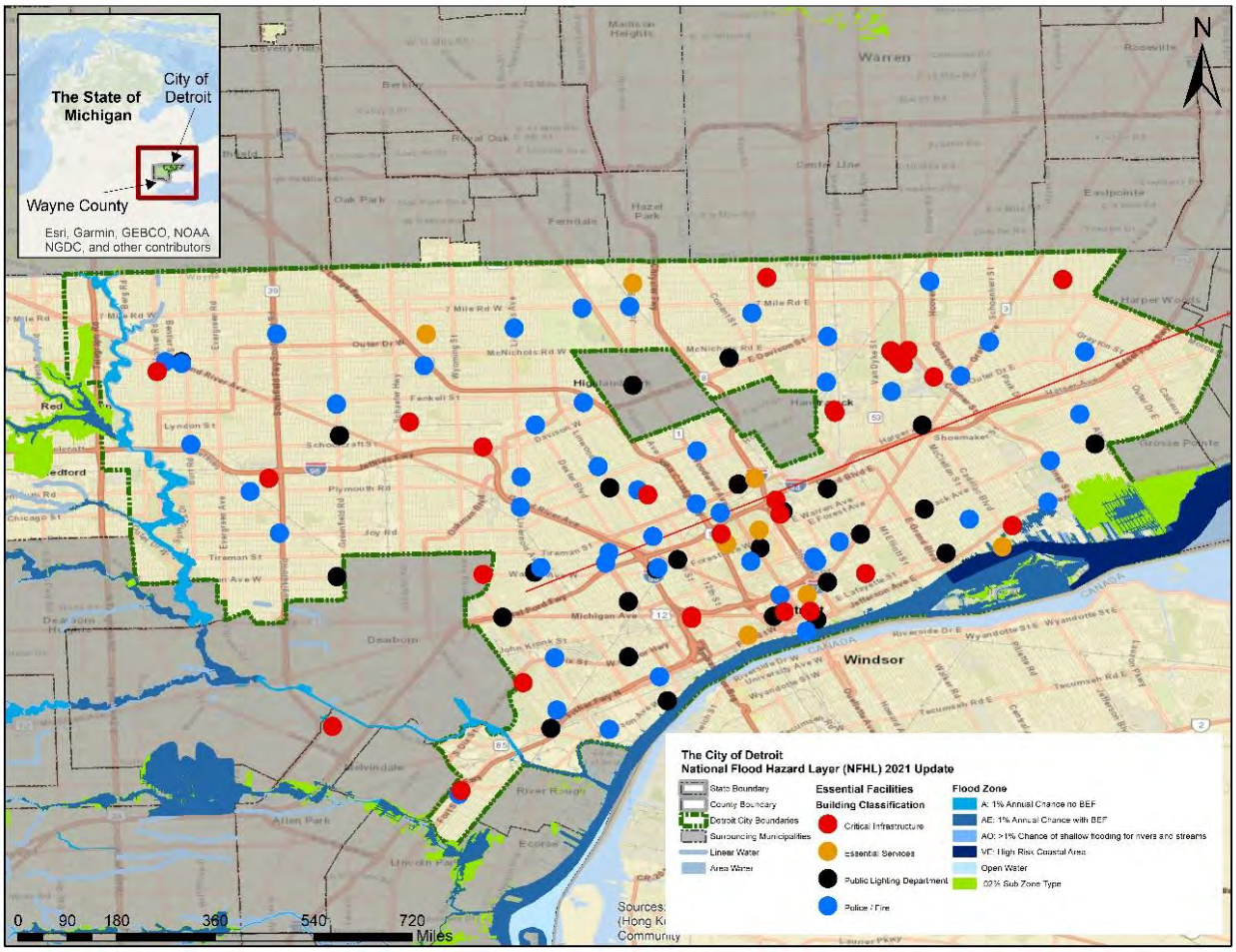
Source: Flood Insurance Rate Map, City of Detroit, Panel 301 of 575, FEMA Effect October 2021



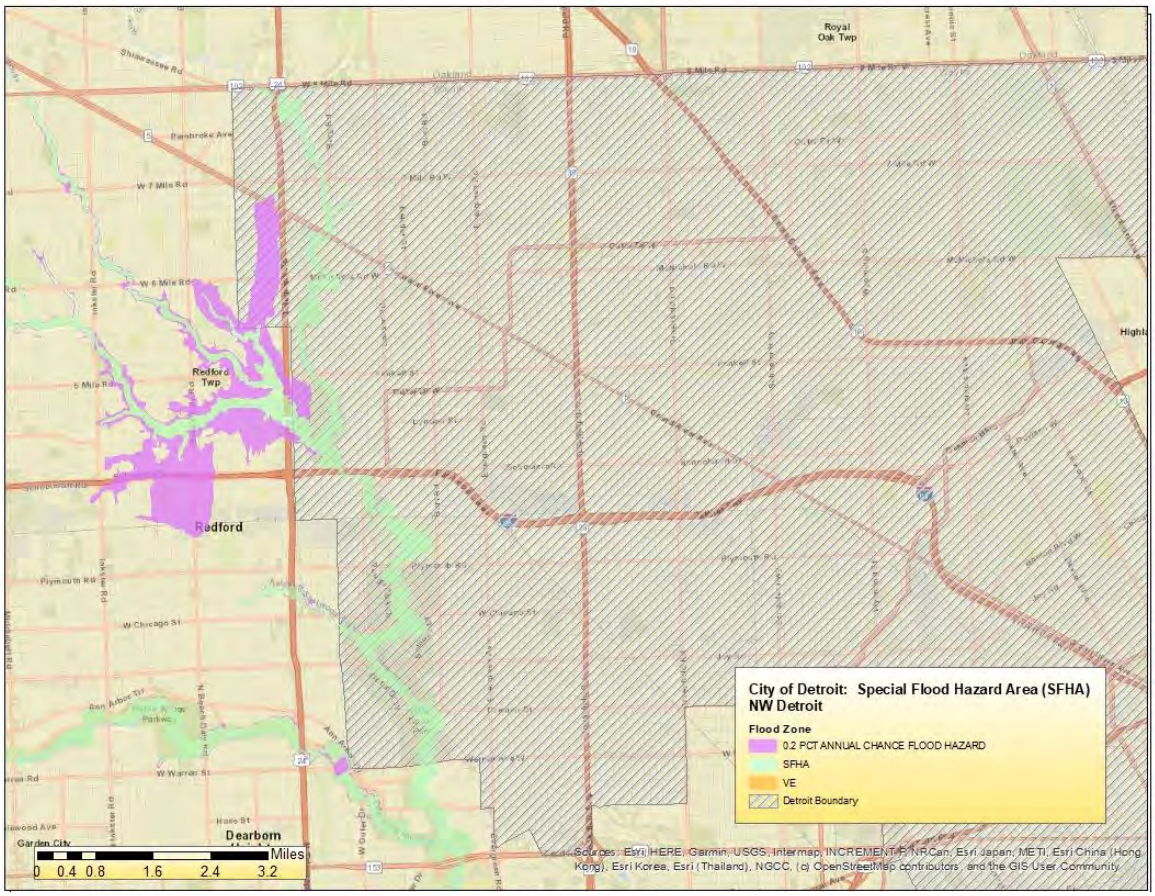
Source: Flood Insurance Rate Map, City of Detroit, Panel 302 of 575, FEMA

During the 2021 plan update process, new National Flood Hazard Layer data was made available via the FEMA Map Service Center. The below maps depict updated Special Flood Hazard Areas effective as of October 2021, including an image of the entire city with updated Special Flood Hazard Areas along with individual maps depicting areas in the NW, SE and SW portions of the city with identified Special Flood Hazard Areas.

Map: 2021 FEMA National Flood Hazard Area Layer (City of Detroit)

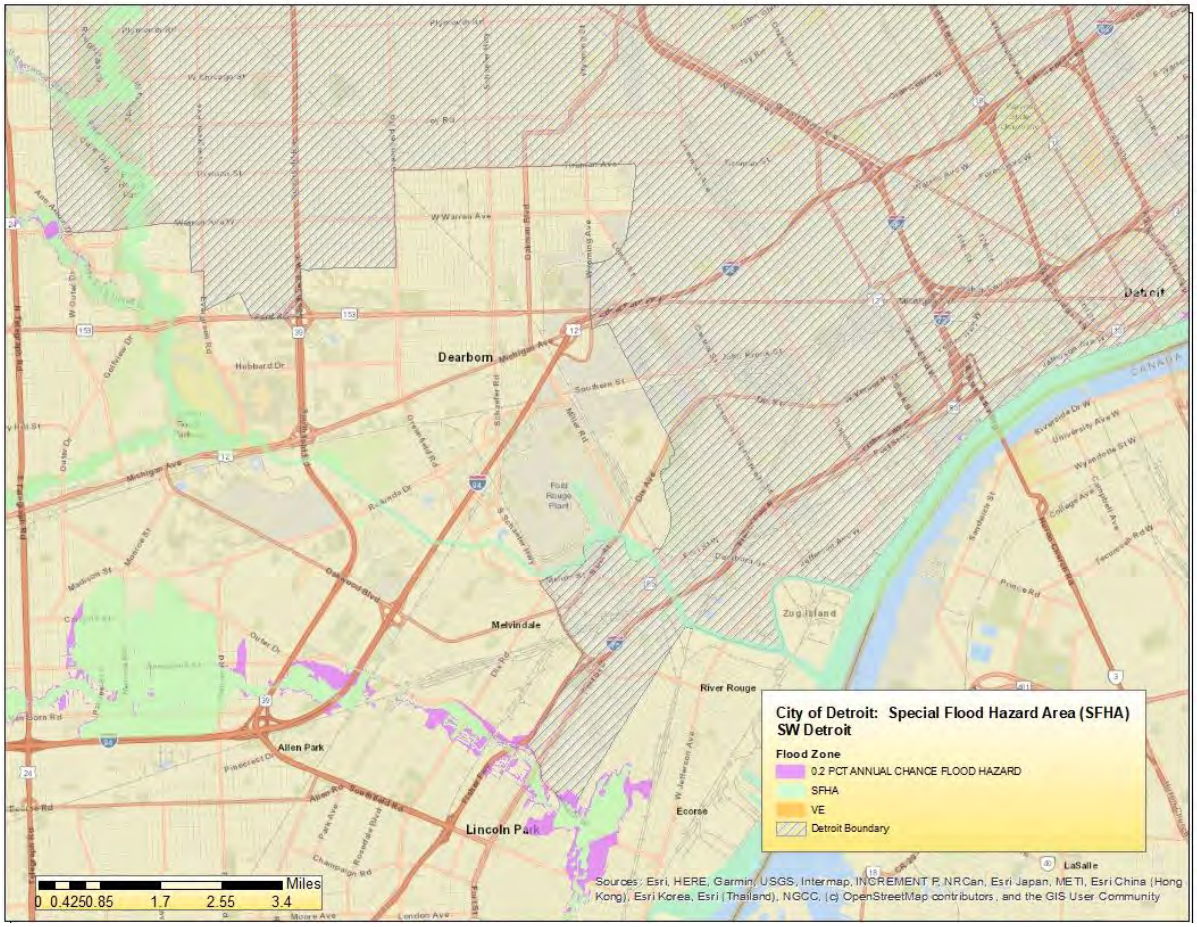


Map: 2021 FEMA National Flood Hazard Area Layer (NW Area City of Detroit)



Map: 2021 FEMA National Flood Hazard Area Layer (SE Area City of Detroit)

Map: 2021 FEMA National Flood Hazard Area Layer (SW Area City of Detroit)



Significant River Flooding Affecting Detroit

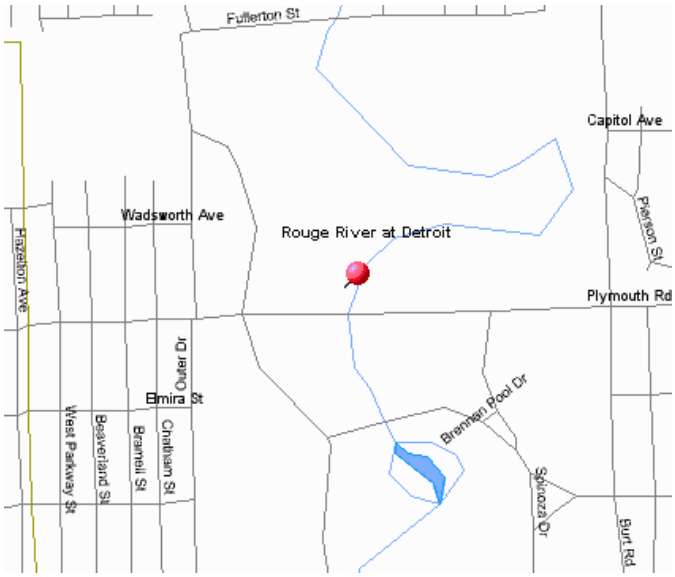
Since 1947, the Detroit area has experienced several flood disasters. These disasters have caused millions of dollars in damage to homes, businesses, personal property and agriculture in Southeast Michigan. The following table provides a listing of those floods in the Detroit area that resulted in a Presidential Major Disaster Declaration, a Governor's Disaster Declaration, or that caused significant damage.

Date	Location	Summary of Impacts
June 2021	Wayne County	After several weeks of moderate to severe drought conditions in Southeast Michigan, an active weather pattern brought widespread rainfall and flooding to Metro Detroit and surrounding areas during the weekend of June 25-27th. Low pressure tracking along a stalled stationary boundary interacted with a very moist subtropical air mass to produce widespread 3 to 5 inches of rainfall across Metro Detroit (localized 6 to 8 inches), resulting in numerous reports of

Date	Location	Summary of Impacts
		major flooding within the Detroit metro vicinity, especially Washtenaw and Wayne Counties. In addition to the heavy rain, an EF-2 tornado was observed near Port Austin in Huron County during this event just before 5 pm EST on June 26th. Numerous roads and highways became impassable due to flooding. Four to eight inches of rainfall was reported in several areas of Detroit, with Grosse Pointe Park reporting the highest total of 8.19 inches. Almost 15,000 homes suffered major flood damage, with close to 6000 homes experiencing minor flood damage across the northern part of county.
May 2019	Wayne County	Heavy rain with thunderstorms produced 2 to 4 inches of rain in about a 4 hour window across the I-94 corridor. This amount of rain in a short period caused flash flooding across parts of Wayne County, including Detroit with the Dearborn Heights area being hardest hit. About 5000 homes experienced basement flooding, with 1000 homes or so suffering major flood damage. Several road closures occurred or were rendered impassable as many cars were stalled out in the high water over the roadways. The excessive rainfall also caused flooding across Ecorse Creek and Rouge River. Ecorse Creek in Dearborn Heights peaked at 9.77 feet during the early morning hours of May 1st. The Lower Rouge River at Dearborn peaked just above 10.5 feet around noon on May 1st.
August 2018	Wayne County	After an abnormally dry July across lower Michigan, a low pressure system lifted up from the Ohio Valley and moved through extreme southeastern Michigan and brought some much needed rainfall. Showers on the afternoon and evening of July 31 and became heavier into the nighttime hours. As the center of the low pressure interacted with the marine layer over western Lake Erie shortly after midnight, a brief tornado formed over Wayne County despite relatively weak winds aloft. Heavy rain bands and thunderstorm activity resulted in rainfall totals near 4 inches in several locations while many more areas around the Metro Detroit area received 1-3 inches, prompting a Flash Flood Warning for the urban areas as most of the rainfall occurred over a period of 3 hours or less. A couple feet of water were reported over roadways in Dearborn Heights and Taylor during the early morning hours.
August 2016	Detroit Metro	Widespread rainfall of 2 to 3 inches from the evening of August 15th to the early morning of August 16th led to some flooding in urban areas of Detroit Metro Area and Midland.
July 2016	Wayne County	Two to three inches of rain fell from the evening of July 7 to the early morning hours of July 8, leading to Flooding across parts of Macomb and Wayne Counties. Detroit City Airport ended up reporting 2.99 inches. Numerous streets and

Date	Location	Summary of Impacts
		freeways were closed due to flooding. Some flooding of homes and basements also occurred.
August 2014	Wayne County	A historic rainfall event unfolded over Southeast Michigan on Monday, August 11, leading to major flooding and road closures. This event was caused by a strengthening low pressure system moving over the area, focusing the tropical moisture which came up from the south. The hardest hit areas included Metro Detroit and surrounding communities, along with Flint and the Saginaw Valley areas. Wayne, Southern Oakland and Macomb counties saw the worst of the flooding as 4 to 6 inches of rain fell over a 4 hour period. Around 75,000 homes and businesses suffered damage, with over 3000 suffering major damage. There was also damage to the roads and bridges, along with the city sewer pumps which were overwhelmed by the torrential rainfall. Total estimated dollar loss from the Detroit Metro area was 1.8 billion dollars. Farther north, across parts of Saginaw, Bay, and Genesee counties, flooding was not nearly as bad, but flooded roads with 2 to 3 feet of water were reported.
July 2010	Wayne County	A tropical air mass and a frontal boundary lifted into southeast Michigan, which produced severe storms south of Eight Mile Road. Two and half to three inches of rain fell in 2 hours, resulting in flooding. Six to eight inches of water was reported on some side streets, making them impassable.
May 2004	Southeast Michigan	A stationary front brought severe thunderstorms and heavy rains that spread over Southeast Michigan. Much of the rainfall occurred in saturated areas that had experienced well-above average precipitation for the month of May. In fact, May 2004 will go on record as the wettest May in Detroit history. Over a 36-hour period, 2 to 6 inches of rain fell across SE Michigan. Flooding resulted in sewer system overflows, backyard flooding, and the submerging of many roadways.
September 2000	Wayne and Oakland Counties	A Presidential Major Disaster Declaration was granted to Wayne and Oakland Counties for urban flooding and sewer backups caused by intense rainfall on September 10 and 11, 2000.
July 2000	Detroit	Thunderstorms developed in the heat of the day along Lake Michigan and evolved into a squall line that crossed southeast Michigan in the late afternoon of July 28. The storms moved slowly and thus dumped heavy rain on the area. Urban flooding was widespread in Detroit, with many freeways closed, and some industrial facilities flooded. The rain continued for 4 days and created flooding throughout metropolitan Detroit.
February 1998	Southeast Michigan	A strong low-pressure system moved from Arkansas to the eastern Great Lakes on February 17. Rainfall totals for three days were commonly over 2 inches with the heaviest rain in

Date	Location	Summary of Impacts
		Detroit on February 17. Detroit Metro Airport recorded 2.81 inches of rain in three days. Hundreds of basements and many streets were flooded throughout the Detroit area. Damage from the storm for Wayne County totaled $1.1 million.
July 1997	Wayne and Macomb Counties	On July 2, 1997 a series of intense thunderstorms struck central and southeast Michigan, causing extensive wind damage. A Presidential Major Disaster Declaration was granted for five counties, primarily for the wind-related damage. However, the heavy rainfall produced by these storms caused flooding in Wayne and Macomb counties. Flood-related damage to the public water and sewer systems in those two counties totaled nearly $300,000. It should be noted that these flooding problems occurred at the same time the two counties were also faced with flooding problems associated with high water levels on the Great Lakes.
April 4-11, 1947	Central and Eastern Lower Michigan	The flood of April 4-11, 1947 was caused by a combination of snow and rainfall that began in late March of that year. Two frontal systems in early April dumped several inches of rain in many localities across central and eastern Lower Michigan. The areas primarily affected by the April, 1947 flood included the Clinton, Detroit, Grand, Kalamazoo, Saginaw and St. Clair Rivers, and the River Rouge.



The National Oceanic and Atmospheric Administration (NOAA) keeps track of the crest history of various rivers in Michigan and throughout the United States. In particular, the Advanced Hydrologic Prediction Service of NOAA provides a listing of dates when the Rouge River crested above its flood stage, which is 15 feet at a designated point in Detroit. This listing, provided below, does not indicate the amount of damage that occurred, but it does provide an indication of the potential for harm. The top 10 crests are provided in descending order for the Rogue River in Detroit.

Date	Crest Feet
06/26/1968	21.40 feet
05/26/2011	20.23 feet
10/01/1981	19.92 feet
06/26/2021	18.94 feet
06/22/1989	17.72 feet
01/12/2020	17.56 feet
05/13/2018	17.54 feet
08/12/2014	17.51 feet
08/06/1998	17.36 feet
02/21/2018	17.24 feet

Source: National Weather Service Advanced Hydrologic Prediction Service

Impact and Analysis

The National Flood Insurance Program (NFIP) was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the 100-year floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood-proofed (the flood-proofing must be certified by a registered professional engineer or architect); and 3) require anchoring of manufactured homes in flood-prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed. In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the

purchase of flood insurance as a condition of any federally regulated, supervised, or insured loan on any construction or building within the 100-year floodplain.

The City of Detroit entered the NFIP on July 26, 1974 with an initial Flood Insurance Rate Map (FIRM) identified on July 2, 2981. The current effective map date is October 21, 2021. The City has also joined the Community Rating System (CRS) on October 1, 2017 and maintains a Class 8 rating.

According to NFIP, there are 403 policies in force in Detroit. These policies provide insurance worth $82,121,200 as of 2021. The NFIP Repetitive Loss/Severe Repetitive Loss data provided indicates a total of 64 RL/SRL properties with a net total claim of $1,437,151.30. Of the 64 properties identified, all are listed as Repetitive Loss properties according to the NFIP; none are listed as Severe Repetitive Loss properties. There are 57 single family residential structures, two 2-4 family residential structures, four non-residential and one listed as other residential. The National Center for Environmental Information (NCEI) estimates total property losses for a 15-year period to be $169,600,000 for an average loss of $11.3 million per year. These figures would suggest that adequate coverage is provided to those who would be most impacted by river flooding in Detroit. According to NOAA, the River Rouge crested above flood stage in Detroit on 41 occasions between 1968 and 2021. When combined with other flooding events recorded through NCEI records, such as heavy rain or snow melt, the city has experienced 2.96 flooding events per year since 1978. The table below provides expected impacts at various flood stages of the Rouge River. The largest impacts would be experienced by jurisdictions outside the City of Detroit.

River Crest	Impact
14 feet	The river reaches its banks.
15 feet	Flooding begins in some park areas, the Rouge Municipal Golf Course, and a few homes. Most flood damage occurs on the Upper Rouge River with minor flooding occurring on the main branch.
18 feet	Flooding begins on Fenkell Avenue, Middlebelt Road, several side streets and residential areas in Redford Township and Livonia.
21 feet	Fenkell Avenue floods to a depth of 3 feet and some businesses along Fenkell, where it crosses the Upper Rouge, flood. Evacuation of several residents is likely with many basements flooding in Livonia.

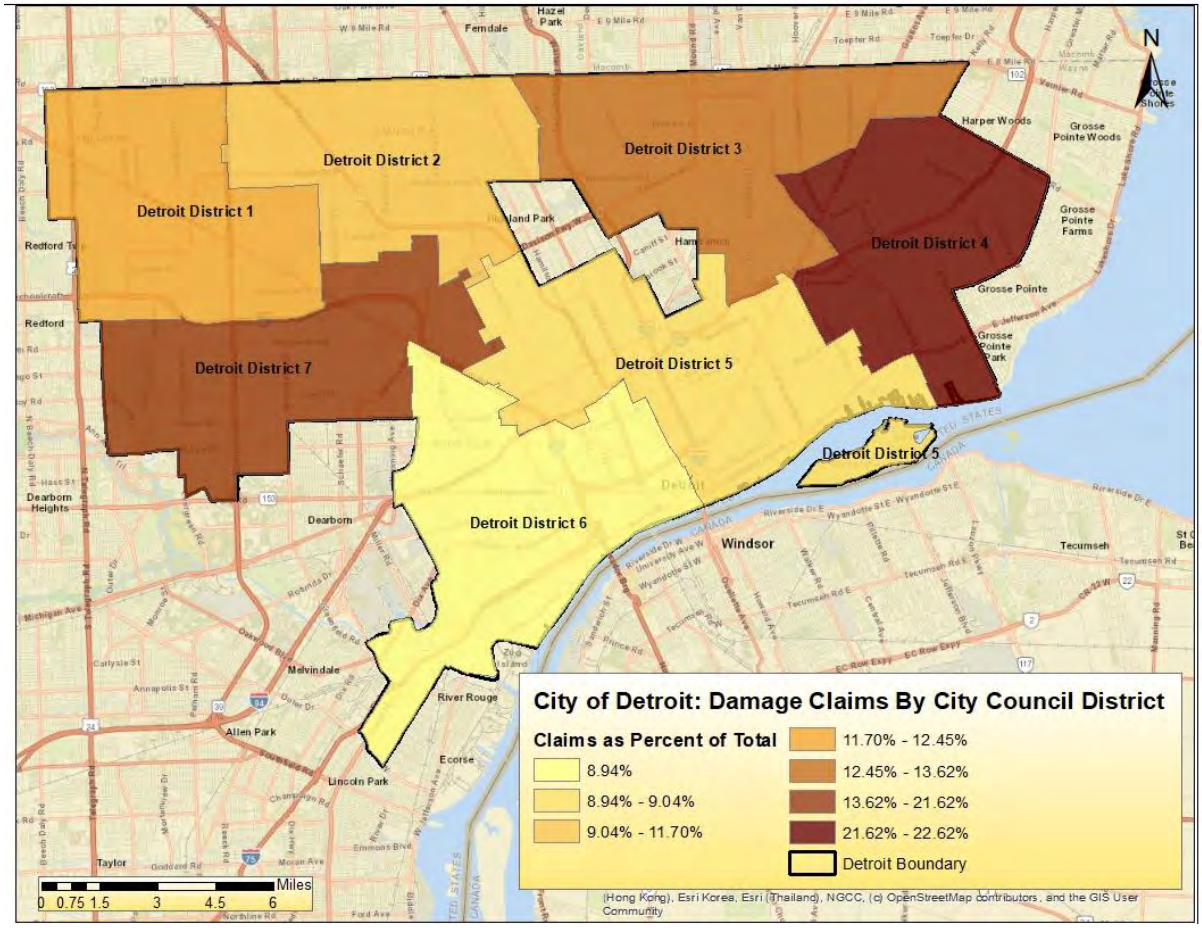
Source: National Weather Service, Advanced Hydrologic Prediction Service

Since the Great Lakes experienced record high lake levels in 1985-86, 1997-98, and again in 2017-19, it is not surprising that seven of the ten communities showing the highest amount of flood insurance payouts occurred on the Great Lakes and connecting waterways. It should also be noted that the major river flooding events that have occurred since 1978 have largely occurred in the more rural areas, which typically have lower flood damage potential. However, mitigation strategies for the city must include recommendations for protecting residents and businesses from flooding that can be expected to occur in the future. To this end, the Planning and Development Department, will ensure that hazard mitigation considerations regarding flooding will be incorporated into land use planning, zoning, and development decisions.

It is widely known that controlling floodplain development is the key to reducing flood-related damages. Although there are state and local programs to regulate new development or substantial improvements in flood prone areas, floodplain development in many communities continues to increase, resulting in corresponding increases in potential future flood-related damages. The opportunity to mitigate flood hazards rests primarily with local government, since it controls the regulation or direction of land development. Proper land use management and strict enforcement of building codes can make communities safer from flood hazards and help reduce the high costs of flood losses.

In addition to the Special Flood Hazard Areas within the City of Detroit, Urban/Flash flooding events have caused significant damage events throughout residential communities within the city, much of this damage can be attributed to sewage backflow issues as opposed to threshold flooding. On June 25 and 26, 2021 the City of Detroit received localized amounts of 6-8 inches of rainfall, which led to major flooding throughout the city. Property damages in excess of $139 Million dollars were reported through the NCEI. The City of Detroit was included in the Major Presidential Disaster Declaration (DR-4607). At the time of the plan update, 65,394 individual assistance applications were approved by FEMA, resulting in a total of $179,287,723.14 individual and household program dollars being approved. This number is subject to increase as additional applications are approved. The total numbers for FEMA public assistance were not available at the time of the plan update, the numbers will be included in the next plan update. The following map, depicting Individual damage claims by City Council District, identifies a total of 66,384 total applications for assistance. Based on claims as a percent of the total the areas within City Council Districts 4 and 7 represent approximately 48% of the total damage applications filed. These figures indicate that the residential properties within these areas are among the most vulnerable to such flooding events.

Map: Individual Damage Claims by City Council District, 2021 Flood

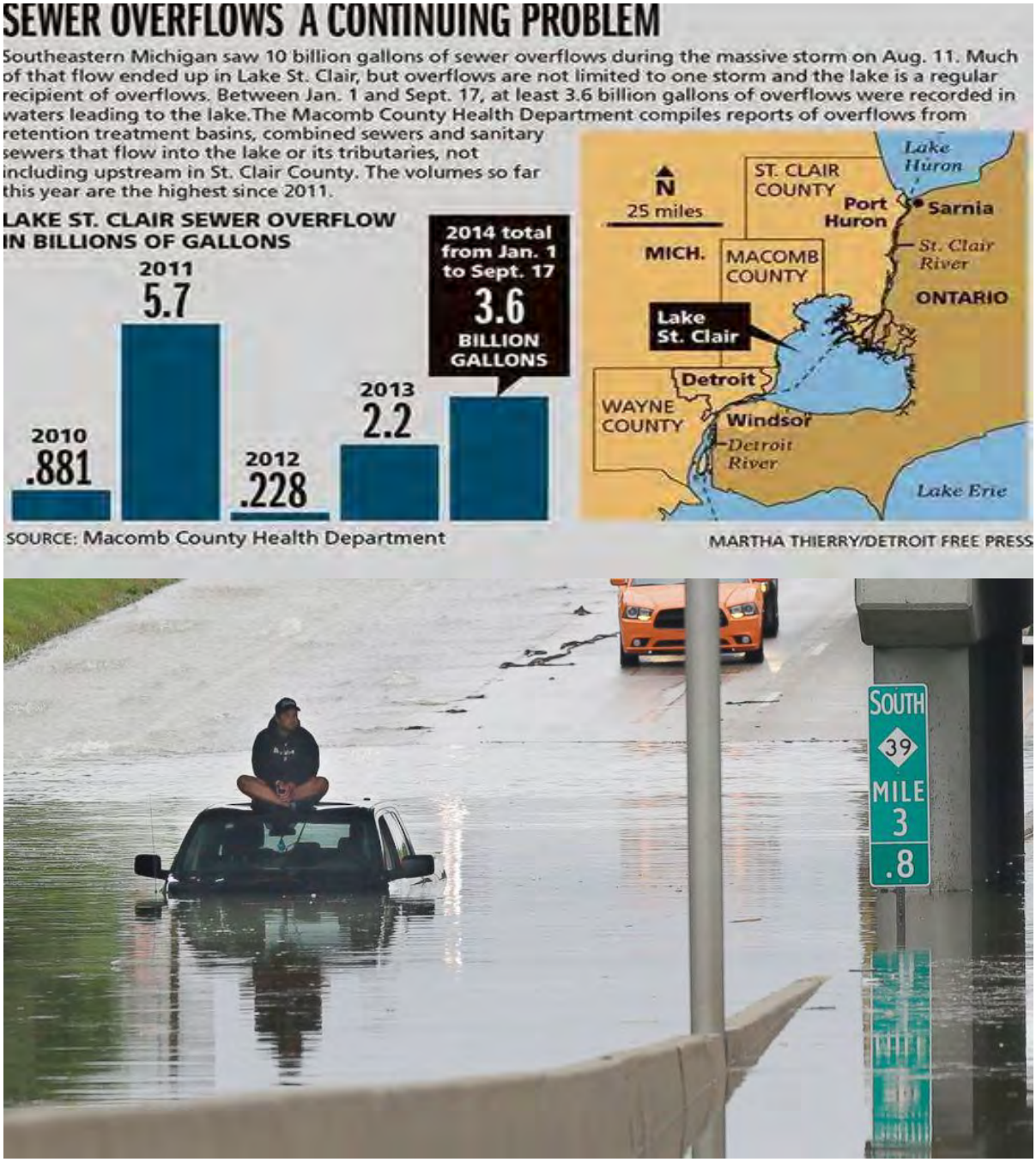


Source: Weather.gov Detroit Flooding 6/26/2021

On August 11, 2014, the City of Detroit had an unusually extreme amount of rainfall that created flood conditions in the Metropolitan Detroit area. The National Weather Service say that the total of 4.57 inches of rain that fell for the day is the second-heaviest calendar-day rainfall on record in Detroit, after the 4.74-inch rainfall of July 31, 1925. The flooding closed major freeways, hospitals, businesses, schools and government offices. This storm has been categorized by some weather experts as a 100-year type of event. Almost 10 billion gallons of sewer overflows poured into southeast Michigan's waters in the historic August flooding, according to a Free Press review of data from the Michigan Department of Environmental, Great Lakes and Energy.

The FEMA HAZUS-MH modeling application was utilized to analyze vulnerability and impacts throughout the City of Detroit. The below table provides results associated with the 100-year flood model for occupancy type. Full HAZUS reports for 100-year and 500-year analyses are provided in **Appendix D.**

Building Exposure by Occupancy Type for the Study Region		
Occupancy	Exposure ($1000)	Percent of Total
Residential	63,594,745	71.8%
Commercial	15,218,643	17.2%
Industrial	5,187,531	5.9%
Agricultural	86,893	0.1%
Religion	2,397,463	2.7%
Government	442,951	0.5%
Education	1,618,219	1.8%
Total	**88,546,445**	**100%**



Source: Associated Press Detroit Flooding 8122014

During the flooding event there was significant basement sewer backups for residents in the Detroit Metropolitan area. There was increased basement backup in areas contiguous to the freeway system. This was later found to be because the pump stations on the freeways were failing at an alarming rate. As of a result of the basement backups there was a tremendous amount of debris that was set out at the curbside.

Debris from basement sewage back up

All of the communities affected by the flood had to implement their debris removal plans. The City of Detroit uses private contractors for its waste disposal.

The flooding took a heavy toll on the residents and the communities affected. There was an emergency declaration request issued by Wayne County which includes the City of Detroit. A damage assessment was completed by FEMA, along with local municipal representatives. As a result, Governor Rick Snyder declared a State of Emergency. President Obama approved a disaster declaration on September 26, 2014. Below are the damage results reported by the City of Detroit:

Damage Type	Total
Calls and complaints that are flood related	27,351 calls and complaints
Property damage	$78,132,835
City property damage	$1,097,948
City of Detroit Debris removal	$994,479
City personnel costs	$14,857

2-3. INFRASTRUCTURE FAILURE – ENERGY EMERGENCY (#2)

Hazard Description

The citizens of Detroit 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, power outages during periods of extreme heat or cold can lead to severe illness or death if immediate action is not taken. When the water or wastewater treatment systems are inoperable, serious public health problems arise that can lead to outbreaks of disease, if not addressed immediately. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur.

The Detroit area is susceptible to interruptions in infrastructure due to the additional volume of critical components of transportation, power, water, and telecommunications networks. Residents of Detroit are less likely to overcome infrastructure failures because of a lack of generators, wood, and fireplaces. Economic losses that occur when Detroit businesses and industries are incapacitated are greater, as well. These are just some examples of the types of infrastructure failures that can occur, and all these situations can lead to disastrous public health and safety consequences if immediate 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. Unfortunately, Detroit has experienced several infrastructure failures over the past several years.

Signifiant Infrastructure Failures Impacting Detroit

Date	Type of Failure	Summary of Impacts
August 2021	Electric Power	Due to severe storms and high winds DTE reported more than 77,100 customers were without power, with more than 1,200 crews in the field addressing outages. DTE said overall136,000 customers were impacted.
November 2020	Electric Power	Severe storms and damaging winds caused power outages to 195,279 customers with DTE in Metro Detroit. Power restoration efforts took nearly 3 days.
July 2019	Electric Power	DTE reported 360,000 customers without power following severe storms, power restoration took nearly 4 days for completion.
May 2018	Electric Power	Nearly 150,000 customers in Detroit Metro area reported power outages through DTE following severe wind storms.
March 2017	Electric Power	Severe storms impacted nearly the entire state of MI causing record breaking power outages. DTE reported nearly 700,000 customers without power, many within the Detroit Metro Area.
July 2016	Electric Power	120,000 customers were without power due to severe storms throughout the City of Detroit.
June 2015	Electric Power	The city experienced power failure to approximately 158,000 customers due to wind damages. Est restoration was completed within 48 hours of the event.
December 2014	Electric Power	The City of Detroit experience a power failure to the Public lighting system. This system provides electricity to all of the city properties, the public school system, and Wayne State University. Emergency crews responded to buildings with people trapped in elevators and assisted with traffic control where traffic lights were not working. The system failure was due to old/antiquated electrical equipment. Power was restored in the late evening.
August 2003	Electric Power	At approximately 4:00 p.m. on August 14, 2003, a disturbance within the Eastern Interconnection power grid began a rapid chain of events that resulted in a massive power outage affecting a significant portion of the northeastern United States, including Detroit. The outage hit the Detroit area at approximately 4:17 p.m. when the nearby Enrico Fermi nuclear power plant lost power and shut down. The blackout paralyzed transportation, disrupted communications, and left many people – particularly senior housing residents – in a potentially life-threatening situation. Four million customers of the Detroit Water and Sewage Department lacked drinking water because the power outage shut down the pumps that delivered water to homes and businesses throughout the region. In addition to the water supply, a number of key systems failed to operate effectively. While the city's 911-phone system

Date	Type of Failure	Summary of Impacts
		remained operational, the computer-aided dispatch system, used by police and fire departments, failed to operate at full capacity. The phone system used by the city also failed to operate, as did a number of cellular phones used by a number of key public safety personnel. The blackout shut down transportation systems and critically impacted traffic, especially at the border with Canada. Though most Detroit hospitals remained fully operational, they had to utilize back-up generators and keep hospital employees from using computers to conserve energy. Elective surgeries were cancelled, and patients from Children's Hospital were discharged to make room for 30 children who developed aggravated asthma problems due to the lack of air conditioning in their homes. Projected costs to the Detroit area related to the blackout are projected to have exceeded 220 million dollars.
September 2000	Drainage	On September 10 and 11, 2000, unusually heavy rainfall occurred in southeast Michigan, overwhelming municipal storm drainage systems and causing damage to 130,000 homes and businesses in Wayne and Oakland Counties. The majority of the flooding was due to sewer backups into homes and businesses caused by short-term power failures at pumping stations and/or the capacity of the storm water collection system being exceeded. As a result, raw sewage backed up into basements in at least 15 Wayne County communities, creating serious public health and safety concerns and causing widespread property losses. Due to the extensive damage and public health and safety threats, a Governor's Disaster Declaration was granted to Wayne County on September 20. On October 17, a Presidential Major Disaster Declaration was granted to Wayne County, making available disaster assistance to individuals and businesses that incurred flood damage. On October 27, Oakland County was added to that Major Disaster Declaration. All totaled, over $213 million in disaster relief assistance was provided to individuals to for temporary housing, to repair flood related damages and replace essential household items, and for other necessary disaster related expenses. An additional $30 million in hazard mitigation assistance was also made available to the state, bringing the total public cost of this disaster to nearly $250 million.
June and August 2000	Electric Power	Detroit fell victim to two significant power outages in 2000 – one that began on June 13 and lasted for 4 days, and another that occurred from August 31-September 1. The two outages

Date	Type of Failure	Summary of Impacts
		– the third and fourth major power failures in the city since 1991 – caused significant disruptions in commerce and city services. The June 13-16 outage actually began on June 12 when one of three main lines from Detroit Edison to the Detroit Public Lighting Department failed. During the process of repairing the line on June 13, a cable connection failed, setting off a chain reaction that completely disabled the two remaining connections. The resulting outage cut power to 1,250 traffic lights, 42,000 street lights, Detroit Receiving Hospital, four senior housing complexes, all public housing, Detroit City Airport, the Renaissance Center, Wayne State University and Wayne County Community College, the Detroit Institute of Arts, the U. S. District Courthouse, the City-County Building, and most city buildings and schools. Businesses and homes that received electricity directly from Detroit Edison were not affected. All totaled, the outage affected 4,500 buildings, idled over 167,000 school children, caused significant business and parking revenue losses, and forced the city to pay out millions in overtime costs for city workers. The power outage also left some public schools without their electronic alarm systems. The August 31 outage occurred when the Detroit Public Lighting Department cut electrical service to parts of the city (to avoid a widespread outage like the June 13-16 incident) after two generators failed due to high demand caused by hot weather. Power to municipal buildings and services was lost on much of the city's west side, and large portions of the east side – including schools, police stations, street and traffic lights, government offices, hospitals, and Wayne State University. Power was restored the next day. Follow up investigation of the cause of the outage revealed that a squirrel jumping on an electrical conductor might have caused an explosion at a substation that eventually led to the power failure.
December 1998	Natural Gas	Sometimes, failure of one type of utility infrastructure is directly caused by a failure in another type of utility infrastructure. That was the case in Detroit on December 12, 1998, when a 30-inch water main in the downtown area burst, crushing a nearby 12-inch gas main and flooding it with water. Approximately 200,000 gallons of water flooded nearly 20 miles of gas line, shutting down gas service to hundreds of downtown Detroit businesses and residents on both sides of I-375. Officials estimated that 600 buildings (including hotels, offices, restaurants, shops, and residences) were affected by the gas service shutdown. Crews from Michigan

Date	Type of Failure	Summary of Impacts
		Consolidated Gas worked around the clock for the next four days to drain water from the gas lines and hundreds of gas meters to get gas service restored. Even after restoration was complete, problems and service interruptions continued to plague some structures for several days until more permanent repairs could be made. Michigan Consolidated Gas called the water contamination incident the worst in the company's 150-year history. Economic losses for the hotels, restaurants, and other businesses affected were substantial because the incident occurred during the normally profitable pre-Christmas holiday period.

Impact and Analysis

Since 1980, Detroit has experienced an infrastructure failure once every 3.75 years. Although no deaths have been attributed to these incidents, 50% of residents who responded to an online survey indicated that an infrastructure failure had directly impacted their lives in a negative way. When the power blackout of 2003 hit Detroit, 2.1 million people lost power. In addition, the blackout demonstrated the City's vulnerability to this type of event. Several key systems failed to operate effectively during the blackout. These included:

- Four million Detroit Water and Sewage Department customers lost water.
- While the City's 911 telephone system remained operational, the computer-aided dispatch system used by police and fire departments failed to operate at full capacity.
- The phone system used by the City government failed to operate.
- Cellular phones used by several key public safety personnel, including Detroit's Homeland Security Director, failed to operate because a number of cellular carriers experienced partial network outages.
- The blackout shut down transportation systems and critically impacted traffic, especially at the border with Windsor, Canada.
- More than 100 million gallons of raw sewage and other contaminated waste was dumped into rivers in the Detroit metropolitan area when the blackout knocked out backup power at sewage treatment plants.
- Detroit Metropolitan Airport remained open, but with very limited operations. Northwest Airlines, the main carrier out of Detroit, cancelled 216 flights.
- Though most Detroit hospitals remained fully operational, they had to utilize back-up generators and kept hospital employees from using computers to conserve energy. In addition, elective surgeries were cancelled.

The risk of infrastructure failure grows each year, as physical and technological infrastructure gets steadily more complex, and the interdependency among various components of infrastructure, such as pipelines, telecommunication lines and roads, become more intertwined. In addition, essential repairs to vulnerable and aging

infrastructure do not keep up with the growing volume of rail lines, electrical components, bridges, roads, and sewers in need of repair. For these reasons, large-scale disruptions in various components of infrastructure are much more possible today than they were 10 or 20 years ago. The risk of failure will continue to grow, and such major disruptions could lead to widespread economic losses, reduced security, and altered ways of life.

The University of Michigan and the Detroit Regional Chamber of Commerce estimated that financial losses to the City would reach $220 million. Components of this estimate include: lost wages in private, service producing industries; lost perishable business inventories; household food losses; losses to eating establishments affected by the water ban; and direct losses to local government. Information from the U.S. Census Bureau and Michigan's Office of Labor Market Information was used to model the affected residential and business populations, while data from DTE Energy, county governments, and members of the Detroit Regional Chamber were used to assess the duration and severity of the power loss and water service interruption. Combined with the $243 million loss experienced in the blackout of September 2000, the City has experienced significant economic damage in a short period of time. Over a 10-year period, the average cost per year, assuming no costs for other infrastructure failures, is $46.3 million.

Although the City has been able to overcome the significant problems created by infrastructure failures, infrastructure disasters will become more common as the City's public and private utility systems continue to age. Because many of these systems were developed decades ago, the costs of repairing and replacing sections and components have greatly increased. Increasing demands on the systems also leads to increased deterioration.

A study by the Southeast Michigan Council of Governments estimated the costs of replacing aging infrastructure and accommodating new growth in Southeast Michigan will likely exceed $26 billion over the next three decades and may go as high as $52 billion when inflation and interest rates are added in. The Michigan Department of Transportation's Metro Region already invested $300 million in 2002 for road and bridge repairs, safety projects, engineering studies, maintenance programs, and capacity improvements in Wayne, Oakland, Macomb and St. Clair counties. Detroit's aging road system benefited from long-term pavement and bridge repairs on I-94, I-75, and the Lodge Freeway (M-10). The Michigan Department of Transportation (2022-2026 Five-Year Transportation Program) indicates several projects

Customers line up to buy supplies on 8/14/03 at a local food market in Detroit after the power blackout occurred.

designated for the City of Detroit including, Metro Region: US-12 Rebuilding, I-94 Modernization Project, Gordie Howe International Bridge, New Center Intermodal Facility, as well as Rebuilding of the First Detroit Metro Airport Runway.[9]

Homeland Security and Hazard Mitigation grant funding should allow more flexibility to best meet the needs of local communities. The needs of a large urban area like Detroit with high levels of vulnerable populations are enormously different from the needs of rural or more affluent areas.

[9] Source: Five-Year_Transportation_Program_713823_7.pdf (michigan.gov)

2-4. STRUCTURAL FIRES (#3)

Hazard Description

While the United States has made great strides in lessening deaths and injuries caused by other types of disasters, structural fires are a worse problem in this country than in many other industrialized countries (even those with denser development). The United States Centers for Disease Control and Prevention (CDC) figures indicate that fire-associated mortality rates in the United States are approximately 2-3 times greater than those in many other developed countries. According to FEMA's National Fire Data Center, 2019 statistics show that residential fires represent 29.9% of all fires and cause 72.2% of all fire fatalities. Between 2016 and 2019, the Detroit averaged 2,875 structural fires a year, resulting in 199 civilian deaths, and hundreds of millions in property damage. Approximately 85% of those fatalities occur in single-family homes and duplexes. Perhaps the most tragic statistic of all is that over 40% of residential fires and 60% of residential fatalities occur in homes with no smoke alarms. Studies have repeatedly shown that a working smoke alarm dramatically increases a person's chance of surviving a fire.

Although the City of Detroit has made progress in reducing the number of structural fires that occur each year, the City continues to suffer significant loss of life and property damage from structural fires. The table below provides a description of the impact structural fires have had on the city from 2008 through 2021. During the 2021 plan update, the City of Detroit was in the process of implementing a new data management and reporting system, due to system updates total dollar loss estimates were unavailable.

Year	Total Fires	Total Dollar Loss	Civilian Deaths
2008	6,968	$562,888,403	41
2009	9,607	$506,441,001	44
2010	8,707	$279,746,256	43
2011	6,843	$203,058,781	36
2012	7,922	$377,861,372	40
2013	7,038	$276,216,636	45
2014	4,414	N/A	N/A
2015	3,701	N/A	N/A
2016	3,400	N/A	N/A
2017	2,966	N/A	30
2018	2,737	N/A	39
2019	2,473	N/A	42
2020	2,394	N/A	31
2021	2,153	N/A	39

Source: Michigan State Police, Fire Marshal Division; Detroit Fire Department

Although the number of fires has fluctuated over a 14-year period, the number of lives lost were extremely high between 2011 to 2013. Since 2014, the number of structure fires have shown a steady decline. According to a report in "The Detroit News 2019"

there was a 40 percent decline in structure fires from 2014-2019 as a result of stepped-up arson investigations and fewer blighted buildings. Although the trend is showing declining numbers of fires annually, structural fires continue to present a major threat to the safety and livelihood of those who live and work in Detroit.

Significant Structural Fires in Detroit

As the table below indicates, structural fires in Detroit tend to impact the most vulnerable residents of the city, including children, the elderly, and those with disabilities.

Date	Type of Structure	Summary of Impacts
March 2017	Residential Structures	The Detroit Fire Department responded to nearly 200 fire calls as severe winds blew through southeast Michigan. Firefighters said in a normal day, they battle eight structure fires. But on this day, they responded to 64 structure fires, 82 downed wires a total of 174 fire calls and two reserve trucks that are were used. Firefighters said not all of the fires could be blamed on the severe winds, but the weather clearly played a major part in the department's activity. Source: WDIV-TV NBC 4 Detroit
September 2010	Residential Structures	The City of Detroit experienced very high sustained winds that resulted in 85 structural fires within 4hours. The high winds downed power lines and initiated fires on residential structures. On one block of homes there was a 90% loss of structures.
August 2009	Commercial Building	Commercial Building Fire led to a building collapsing and causing injury to 5 firefighters. Due to their injuries, 2 firefighters were forced to take duty disabilities, in which; 1 of them is now paralyzed. 1 individual was a senior officer, who was forced to a service retirement and the other 2 has since, returned to work. Through diligent investigations by the Detroit Fire Arson Squad, it has been proven that this fire was a case of Arson for profit and the person responsible has been convicted and sentenced.
December 2009	Apartment Building	3rd Alarm Fire Apartment Building located at 109 W. Alexandrine, Detroit, Mi. 48201 Tactical Mobile Squad 2, which; is located at 433 W. Alexandrine, was the first arriving fire company arriving at 8:24 pm. After helping to facilitate the emergency egress for many senior residents, the immediate rescue efforts of Fire Fighters assigned to TMS-2, saved the lives of 2 senior residents that were trapped in 2 separate top floor apartments. Unfortunately, after handing the civilians off to other fire fighters awaiting outside the multi-storied complex, ascended on ladders and escaping the intense heat themselves, there was one senior resident that perished in the fire and another who died from his injuries after jumping from the top floor to the pavement below.

Date	Type of Structure	Summary of Impacts
January 2005	Apartment Building	A four-alarm fire swept through an apartment building on the City's west side, killing a 3-year-old boy and a woman in separate apartments. Although the incident was tragic, many people were saved because smoke alarms in the building alerted tenants to the danger.
January 2005	House	A fire that began in an abandoned home on the west side destroyed two neighboring homes where families lived. Authorities believe someone seeking shelter from the cold in the abandoned house may have started the fire.
December 2004	Vacant Building	Fire that began in a 3-story vacant building, near Wayne State University, threatened nearby apartment buildings. Fire officials believe homeless people may have started the fire in an effort to keep warm.
October 2003	Group Home	Fire broke out at a group home for mentally and physically disabled adults early on October 22, killing at least 2 of the 13 people inside. The fire appeared to have started shortly before 4:00 a.m. on the first floor of a three- story home used as an adult care facility. Two people died on the third floor and nine others were taken to area hospitals.
February 2001	Apartment Building	On February 11, an apartment building fire killed 3 men and left 6 others homeless.
December 2001	House	On December 26, a house fire killed 3 children and injured 3 others.
December 2000	Public Housing	A 10:19 a.m. blaze on December 1, in the Brewster-Douglass housing project on Detroit's eastside killed 6 children and left a 7-month old boy in stable condition in Children's Hospital. Investigators indicate the blaze started on a mattress in a downstairs bedroom, where firefighters found lighters and smoking materials close by. The children had a history of playing with fire, but it was not certain if this was the cause.
February 1999	House	On February 17, three children, ages 2 through 8, and an adult died in a blaze in Detroit's Brush Park Neighborhood.
December 1999	House	On December 2, three children, ages 2 through 10, and three adults died in a house fire on the city's northwest side. No smoke detectors were in the home.
February 1998	House	Four children, ages 2 through 9 were killed on February 17, as a result of suspected arson in their home. Metal security bars in doorways kept out would-be rescuers.

Impact and Analysis

Given the age of the housing stock and the number of fires in previous years, the likelihood of occurrence for structural fires in Detroit is extremely high. Although the number of fires has significantly decreased since 2013, Detroit still experiences over 5,000 structural fires each year. From 2008 to 2021, an average of 5,095 fires occurred resulting in 39 civilian deaths per year with no available results included for years 2014-2016. Although the City's ability to respond to structural fires has

improved, this still represents one of the most significant threats to Detroit and its residents.

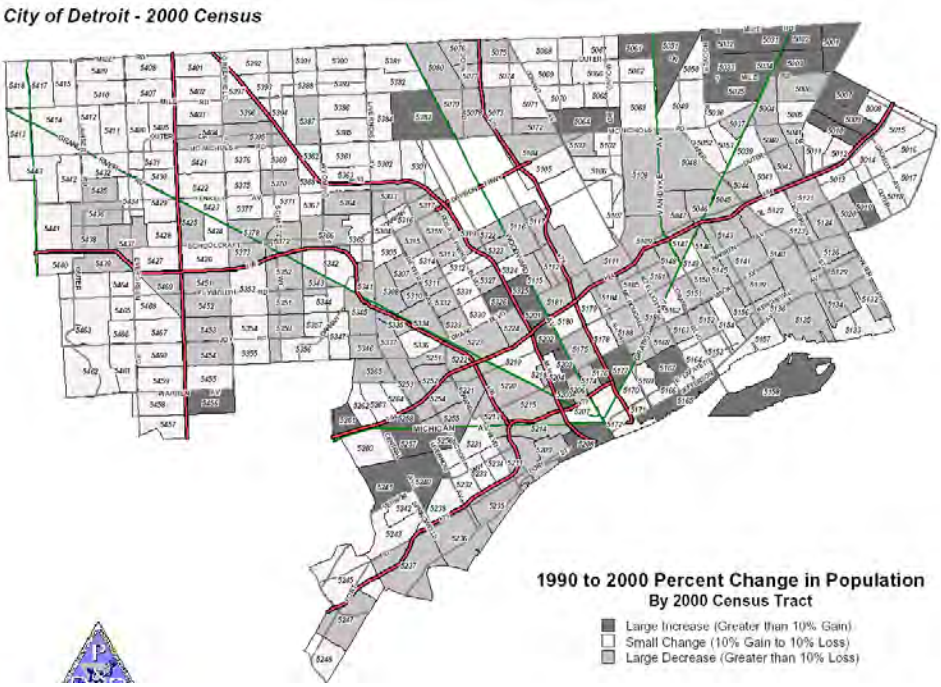
As indicated in the description of significant structural fires above, the greatest number of these fires occurs in residences, including private homes, public housing, and apartment buildings. Civilian fatalities occurred in these instances primarily because of a lack of smoke detectors, as indicated by the investigations conducted by the Detroit Fire Department. Occasionally, residents are displaced and must reside in temporary housing or shelters until permanent housing can be arranged.

As part of its responsibility to provide the Michigan State Fire Marshal's office with fire related statistics, the Detroit Fire Department tracks the costs of property losses caused by structural fires.

Although the general trend in dollar losses caused by structural fires is downward, the increase in 2012 suggests that the City is subject to fluctuations that could threaten the safety of Detroit's residents.

According to the 2010 Census, Detroit's population decreased by 237,493 (25%) between 2000 and 2010. Population trends within the City indicate that certain areas have experienced greater population losses than others. Although the 2020 census was conducted prior to the 2021 plan update, populations by census tract were not yet made available for mapping analysis to be performed. The map on the following page depicts areas with population losses. Those areas in medium gray with losses of more than 10% would expect to experience an increase in vacant housing, which in turn, could lead to greater fire risks. In the year 2010, there were a total of 79,725 vacant housing units within the city. In its Master Plan, Detroit addresses this concern by referencing several policies that pertain to housing. These include the following:

- Maintain habitable City housing stock in good repair by promoting regular maintenance programs for basically sound housing and rehabilitation programs to repair housing that is in a state of disrepair or substandard and suitable for rehabilitation.
- Continue to promote programs and policies that will curtail contagious and concentrated housing abandonment that is evident in some City neighborhoods.
- Maintain an adequate supply of City public housing.
- Take actions to stabilize the quality and quantity of City rental housing stock and insure that there is an adequate supply available to those who desire it, especially lower income households.



Source: City of Detroit, Planning and Development Department

In 2001, the Detroit Fire Department issued a report based on an audit of DFD conducted in 1999. The report identified improvements made, as well as corrective actions that need to be taken. Recommendations included the following:

- Provide minimum staffing of four personnel per company
- Reduce injuries and improve scheduling of vacation and recruit training
- Improve training of fire fighters
- Replace fire apparatus
- Complete preventative maintenance on apparatus
- Track vehicle maintenance records
- Implement effective inventory control system
- Inventory and test SCBA cylinders
- Deliver equipment and supplies to fire fighters
- Make repairs to fire stations and Training Academy
- Implement Department reorganization

Implementation of these recommendations and the mitigation strategies identified in Section 4 of this HMP, have contributed to the reduction in structural fires but more work must be done to further improve in this area.

Detroit House Fire, Courtesy of the Detroit Fire Department

2-5. EXTREME WINTER WEATHER (#4)

For the purposes of this HMP, extreme winter weather refers to snowstorms, ice and sleet storms, and extreme cold. This section will address each of these hazards.

Extent and Intensity

The National Weather Service provides a classification system for various types of winter storm events. Severe winter weather can often be forecasted a few days in advance, allowing more time to prepare life and safety measures, notify residents, and position resources. National Weather Service definitions include:

- **Winter Storm Warning for Snow:** Issued for winter storms producing at least 6 inches of snow in a 12-hour period or at least 8 inches of snow in a 24-hour period.
- **Winter Storm Warning for Sleet:** Issued by the National Weather Service for winter storms producing at least a half (½) inch of sleet.
- **Blizzard Warning:** Issued for winter storms with sustained or frequent winds of 35 mph or higher with considerable falling and/or blowing snow that frequently reduces visibility to a quarter (¼) mile or less. These conditions are expected to prevail for a minimum of 3 hours.
- **Ice Storm Warning:** Issued when freezing rain produces more than a quarter (¼) inch accumulation of ice.
- **Winter Storm Watch:** Issued when there is a potential for heavy snow or significant ice accumulations, usually 24 to 36 hours in advance.
- **Winter Weather Advisory for Snow and Blowing Snow:** Issued for winter storms with 25-34 mph winds and blowing snow that frequently reduces visibility to a quarter (¼) mile or less.
- **Winter Weather Advisory for Snow:** Issued for winter storms producing 3 to 5 inches of snow. Occasionally will be issued for winter storms producing 2 to 4 inches of snow.
- **Winter Weather Advisory for Sleet:** Issued for winter storms producing less than a half (½) inch of sleet.

Hazard Description: Snowstorms

As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The average annual snowfall accumulation ranges from 26 to 186 inches of snow throughout the state. From 1991-2020 the annual average snowfall amount In Detroit was 45 inches.

Top 10 Snowiest Years (Total Snowfall Amount in Inches) - Detroit Metropolitan Area										
Month	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
January	2014 (39.1)	1978 (29.6)	1999 (27.3)	2005 (26.9)	2009 (25.2)	1987 (24.0)	1893 (23.1)	1910 (22.2)	1929 (21.9)	1914 (21.8)
February	1908 (38.4)	2011 (31.7)	1881 (28.4)	1900 (28.0)	1926 (27.6)	2010 (27.0)	2008 (24.2)	2013 (23.5)	2014 (23.4)	1986 (20.8)
March	1900	1899	1881	2008	1916	1912	1993	1954	1904	1930

Top 10 Snowiest Years (Total Snowfall Amount in Inches) - Detroit Metropolitan Area										
Month	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
	(30.2)	(24.1)	(21.8)	(21.0)	(21.1)	(15.8)	(15.7)	(15.5)	(14.7)	(14.6)
April	1886 (25.7)	1923 (9.1)	1982 (9.0)	1926 (9.0)	1885 (8.0)	2009 (7.4)	1943 (6.8)	1881 (6.2)	1894 (6.0)	1920 (5.1)
November	1966 (11.8)	1993 (10.6)	1932 (10.1)	1950 (9.2)	1940 (9.1)	1898 (8.9)	1951 (8.3)	1921 (8.3)	1959 (8.1)	1925 (7.9)
December	1974 (34.9)	1929 (27.4)	2000 (25.1)	1951 (24.0)	1895 (22.5)	2008 (21.4)	1886 (20.8)	1910 (20.1)	1983 (19.9)	2005 (19.8)
Winter	1978 (51.5)	1982 (50.6)	1975 (47.3)	1985 (45.6)	1986 (44.0)	1974 (41.7)	1988 (41.5)	1976 (39.8)	1984 (38.5)	1994 (36.9)
Annual	2014 (94.9)	1881 (93.6)	1926 (78.9)	1982 (74.0)	2007 (71.7)	1900 (69.1)	2011 (69.1)	1908 (67.2)	1930 (67.2)	2009 (65.7)

Source: National Center for Environmental Information

List of significant snowfall events from 2015-2021

- 16.7 inches February 2015
- 4 inches February 2016
- 11 inches December 2016
- 8.7 inches February 2018
- 9.2 inches November 2019
- 6.8 inches January 2020
- 8.6 inches February 2021

The table below identifies total snow amounts on average by month from 2010-2019 including days with at least 0.1 inch of snow on average.

Days	Month	Inches
10.2	January	12.5
8.2	February	10.4
5.4	March	6.9
1.6	April	1.7
0.2	October	0.1
2.3	November	1.4
8.5	December	9.7
36.4	Year	42.7

Source: National Centers for Environmental Information

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

Summary of Significant Snowstorms in Detroit, 2003 to 2021		
Date	Location	Summary of Impacts
February 15, 2021	Southeast Michigan	A significant winter storm impacted Southeast Michigan from the evening of February 15 into the morning hours of February 16. A potent southern stream wave lifted northeast from eastern Texas and through the Ohio Valley. The system produced liquid equivalent precipitation amounts of 0.30 to over 0.50 inches and snow-to-liquid ratios ranging from 13:1 to 20:1. The result was heavy dry snow across most of the region with a widespread 6 to 9 inches outside of the Tri-Cities region. Gusty northeast winds during the event brought enhanced moisture in along the Lake Huron shoreline with locations across St. Clair and southern Sanilac County reporting over a foot of snow. Snowfall rates exceeded 1 inch per hour during the peak of the event, which occurred shortly after midnight. Winds gusted in excess of 30 mph during the morning which led to significant blowing and drifting of snow. Snowfall tapered off from south to north as the dry slot moved in during the mid-morning hours. Here are some of the higher snowfall reports received: Peck... 12.0 inches. Marysville... 15.5 inches. Flint... 9.6 inches. Caro... 9.5 inches. Lapeer... 9.3 inches. Rochester Hill... 9.0 inches. Detroit Metro... 8.6 inches. Britton... 7.5 inches. Howell... 7.2 inches. Ann Arbor... 7.0 inches.
January 18, 2020	Southeast Michigan	Snow quickly moved in during the late evening on Friday, January 17, 2020, as a strong low pressure system moved in from the Midwest and across the Great Lakes region. The majority of the snow fell overnight and into the morning hours on Saturday before tapering off and transitioning to rain showers and drizzle over some parts of Southeast Michigan. With the amount of moisture that was available with this system, the characteristic of this snow was heavy and wet, making shoveling rather difficult. During the heaviest snow, snowfall rates were 1+ inches per hour leading to many locations along and south of I-69 seeing 5 to 7 inches of total snow, with mostly 4 to 5 inches north. These amounts occurred in a 9–10-hour period. Here are some of the higher totals received: St. Clair Shores 7.5 inches. Flint 7.1 inches. Rochester Hills 7.0 inches. Detroit Metro 6.8 inches. Adrian 6.4 inches. Ypsilanti 6.4 inches. Stony Point 6.4 inches. Cohoctah 6.1 inches.
November 11, 2019	Southeast Michigan	A long duration heavy snow event impacted southeast Michigan on Veterans Day 2019. The storm peaked during the noon/early afternoon timeframe when 1 inch per hour snowfall occurred over the western and northern suburbs of Detroit. Meanwhile, northerly flow off Lake Huron allowed for lake-enhanced snowfall rates over the Thumb, especially over areas on the northern and eastern

Summary of Significant Snowstorms in Detroit, 2003 to 2021		
Date	Location	Summary of Impacts
		shorelines with some locations seeing over a foot of snow. In general, most of southeast Michigan saw between 6-12 inches of snow, with less than 6 inches over Tri-Cities region and near the southern Michigan border. Here are some of the higher snowfall totals reported: Lexington... 14.0 inches Port Huron... 14.0 inches Bad Axe... 12.0 inches Ann Arbor... 11.0 inches Shelby Township... 11.0 inches Sterling Heights... 10.0 inches Wixom... 10.0 inches Elba... 9.5 inches Romulus (Detroit Metro)... 9.2 inches Flint Bishop Airport... 9.0 inches Pinckney... 8.2 inches Caro... 7.5 inches.
February 9, 2018	Southeast Michigan	Six to nine inches of snow fell along and south of the I-69 corridor over a 14-to-18-hour period, with four to six inches north. Heavy snow, with 1 inch per hour rates at times impacted the Friday morning commute and persisted through the day. This heavy snowfall resulted in numerous traffic accidents and school closures across southeast Michigan. Snow finally began to diminish by early evening. Here are some of the higher totals received: Saline 8.9 inches. Detroit Metro Airport 8.7 inches. Northville 8.5 inches. Carleton 8.0 inches. Ann Arbor 7.0 inches.
December 13, 2017	Wayne County	A strong clipper system tracked across southern lower Michigan. Snowfall totals ranged between 3 and 9 inches across Southeast Michigan. Travel was significantly impacted as the heaviest snow fell during the evening rush hour. Here are some of the higher snowfall totals received: Utica 9.0 inches. Clarkston 8.5 inches. Birch Run 8.1 inches. Corunna 7.5 inches. Ann Arbor 7.1 inches. Howell 7.1 inches. Flint 7.0 inches. Peck 7.0 inches. Northville 7.0 inches. Marine City 7.0 inches. Lapeer 6.8 inches. Elba 6.5 inches. Yale 6.1 inches. Vassar 5.0 inches. Dundee 5.0 inches. Bay City 4.0 inches. Adrian 4.0 inches.
December 11, 2016	Wayne County	A long-duration snowfall occurred on December 11. A low-pressure system over the Central Plains moved northeast over Lower Michigan, bringing good moisture to the region. With cold air in place, the precipitation fell as all snow through the entire event. Snow began as a dry and fluffy type with temperatures in the lower 20s during the morning hours. Temperatures then slowly rose into the lower 30s during the afternoon and evening hours, causing the snow to become wetter. Total snowfall accumulations ranged from 7-11 inches across most of Southeast Michigan, with the exception being over Huron County where accumulations came up short of 6 inches. Here are some of the higher totals received: White Lake... 11.3 inches Ann Arbor... 11.2 inches Corunna... 11.1 inches Sterling Heights... 11.0 inches Detroit Metro Airport... 10.7 inches Dundee... 10.0 inches

Summary of Significant Snowstorms in Detroit, 2003 to 2021		
Date	Location	Summary of Impacts
		Fort Gratiot... 9.6 inches Brighton... 9.5 inches Lapeer... 9.5 inches Grand Blanc... 9.5 inches Onsted... 9.0 inches Oil City... 8.6 inches.
February 24, 2016	Wayne County	A strong low-pressure system with copious moisture moved northeastward from the Southern Plains to Lake Erie on February 24. Precipitation broke out across Southeast Michigan during the early morning hours of the 24th, spreading from south to north during the morning hours. Temperatures were marginal for snow, but it was cold enough for mainly snow north and west of the glacial ridge. To the south and east, including the city of Detroit, much of the precipitation fell as rain or a wintry mix, drastically reducing snowfall totals there. The snowfall was heavy at times during the afternoon and evening hours north of a line from roughly Ann Arbor to Port Huron, with 1 inch per hour rates common. The snowfall tapered off for a time overnight as the main precipitation shield was shunted to the west but lingering moisture and forcing moved across Southeast Michigan once more during the morning hours of the 25th, adding a few more inches to storm totals. All told, the heaviest amounts from 12 to 14 inches occurred in a stripe across Lapeer County, southern portions of Shiawassee and Genesee Counties, and northern portions of Oakland and Livingston Counties. At least 8 was common north and west of the glacial ridge. Lesser amounts of 2 to 4 inches occurred over the city of Detroit, with a tight gradient in snowfall in between. Here are some of the higher reports received: Burton... 14.0 inches. Lyndon Township... 13.0 inches. Hartland... 13.0 inches. Perry.... 12.8 inches. Lake Orion... 12.4 inches. Kingston... 12.0 inches. Sanford.... 11.0 inches. Plymouth... 9.0 inches.
February 1, 2015	Southeast Michigan	A strong and slow-moving low-pressure system tracked through the Ohio Valley delivering eight to seventeen inches of snow along and south of the I-69 corridor, with four to eight inches north of I-69. Highest amounts where in and around southern Wayne County, as Detroit Metro Airport recorded 16.7 inches, the third highest snowfall total on record in Detroit. High pressure to the north maintained a cold feed of air with brisk northeast winds gusting around 25 mph, along with air temperatures mostly in the low 20s, leading to powdery snow. The drier nature of the snow and strong winds led to significant drifts. This was a long duration event, as snow fell over a 24-hour period, with some locations toward the Ohio Border seeing snow for close to 30 hours. Here are some of the higher snowfall totals received:

Summary of Significant Snowstorms in Detroit, 2003 to 2021		
Date	Location	Summary of Impacts
		Romulus (Detroit Metro)... 16.7 inches. Ann Arbor... 14.1 inches. Monroe... 14.0 inches. Algonac... 14.0 inches. Lapeer... 11.9 inches. Morenci... 11.7 inches. Richmond... 11.7 inches. White Lake... 11.2 inches. Linden... 11.2 inches. Whitmore Lake... 11.0 inches. Owosso... 10.5 inches. Lexington... 10.0 inches. Flint (Flint Bishop)... 9.2 inches.
February 5, 2014	Southeast Michigan	Yet another winter system impacted Southeast Michigan during the morning of Wednesday February 5th. Snow developed during the late evening hours on the 4th. The snow increased in intensity during the morning of the 5th. Unfortunately, the snow intensified during the morning commute. In addition to the snow, gusty winds led to considerable blowing and drifting. Needless to say, roads become snow covered and extremely slippery. The snow was the result of a storm system which moved across the Ohio Valley and into New York state. This storm system dropped heavy snow from Kansas and Missouri, across the Ohio valley and southern Great Lakes and into the Northeast. Four to eight inches of snow fell along and south of I-69 corridors, highest amounts toward the Ohio border. Here are a few of the higher snowfall totals reported: Monroe... 8 inches. Romulus (Detroit Metro Airport)... 8 inches. Ypsilanti... 7.8 inches.
January 28, 2014	Detroit	A major snowstorm developed and snow from that day broke the 30 day record for a snowfall at 39.1 inches. The former record was from 1978.
January 5, 2014	Southeast Michigan	A major winter storm impacted southeast Michigan with heavy snow. Generally, 6 to 18 inches of snow across the area in about 30 hours. The M-59 and I-69 corridors received the highest amounts, as Flint Bishop Airport recorded 17.1 inches, making it the 3rd highest snowstorm on record.
January 1-2, 2014	Wayne County	A stationary frontal boundary produced a long duration snowfall over southeast Michigan. Up to eleven inches over a 40-hour period fell across Monroe and Wayne counties, with amounts quickly tapering off farther North.
December 26, 2012	Southeast Michigan	The northwest flank of a significant winter storm impacted post-holiday travel across southeastern Michigan on December 26th. Widespread snow lifted across the Michigan-Ohio state line during the late morning hours, arriving over portions of the I-69 corridor during the midafternoon. While the storm system tracked through the Tennessee valley transferring energy to the east coast during the afternoon, an axis of enhanced moisture became anchored over much of southeast Michigan throughout the evening. By daybreak of December 27th, a general 4 to 7 inches of snowfall fell southeast of a line from Bad Axe to

Summary of Significant Snowstorms in Detroit, 2003 to 2021		
Date	Location	Summary of Impacts
		Manchester, with amounts in excess of 10 inches common for locations in eastern St Clair and Sanilac counties adjacent to Lake Huron.
March 3, 2008	Wayne County	A strong low-pressure system tracked through the Ohio Valley, resulting in heavy snow along and south of M-59. There was a very sharp cutoff to the snow to the north, as little accumulating snow occurred north of I-69. Here are the average snowfall ranges reported across each county: Lenawee 7-10 inches. Livingston 3-6 inches. Macomb 2-5 inches. Monroe 6-10 inches. Oakland 2-6 inches. Washtenaw 7-10 inches. Wayne 5-7 inches.
February 12, 2008	Southeast Michigan	A strong upper-level system crossing southern Lake Michigan allowed snow to spread into Southeast Michigan after 2 PM. The snow intensified during the evening commute, causing very poor driving conditions. Widespread snow accumulations ranged from 2 to 5 inches with locally higher amounts, occurring in less than 9 hours.
December 2004	Southeast Lower Michigan	A strong storm system lifted northeast out of eastern Texas and moved through the Ohio Valley on the morning of 12/23. Snow tapered off by early afternoon with most locations receiving between 6 to 10 inches. Strong northerly winds up to 30 mph caused significant blowing and drifting of snow.
February 2003	Southeast Lower Michigan	A strong low-pressure system moved from the Gulf of Mexico to eastern Ohio and western Pennsylvania by the early morning of February 22. A mix of snow, sleet and rain affected locations along and south of I-94 during the afternoon. The precipitation then turned to all snow by evening and continued through much of the night. Winds gusting as high as 40 MPH created considerable blowing and driving snow. Drifts as high as 2 to 3 feet were reported. Dozens of traffic accidents were reported during the storm with no major injury reports received. Several tree limbs and power lines were blown down in the wind, leading to a loss of power for an estimated 9,000 homes. Many communities in the metro-Detroit area declared snow emergencies as a result of the deep snowdrifts.

Hazard Description: Ice and Sleet Storms

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is like hail only smaller and can be easily identified as frozen raindrops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires, and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, households may be without power for several days, resulting in significant economic loss and disruption of essential services in affected communities. The following table depicts significant reported Ice or Sleet events throughout Wayne County, MI including the City of Detroit. Based on NCEI records, no events were reported from 2007-2021.

Significant Ice or Sleet Storms in Detroit, 1995-2021		
Date	Location	Summary of Impacts
January 14, 2007	Wayne County	A strong and developing low pressure system lifted northeast out of the Plains and tracked across northwest Ohio and eventually into upstate New York. Cold arctic air, drawn from the north, clashed with warm moist air from the Gulf to create a favorable setup for all types of winter precipitation across Southeast Michigan. An ice storm ensued from I-69 south to I-94. Widespread ice accumulations of a quarter to a half inch brought down numerous trees, power poles and power lines. Over 150,000 customers were without power at one time during the ice storm. Many were without power for 2 days, and some for over 3 days. Several senior homes lost power and 200 residents had to be evacuated from one of them. Most of the damage and associated power outages occurred between M59 and I94. Although roads were just warm enough to remain mainly wet, patchy slick spots and downed tree debris made traveling very hazardous. Along and just north of the I-69 corridor, a mixture of freezing rain, sleet, and snow fell, where reports confirmed up to 5 inches of snow and one tenth of an inch of ice. Mostly all snow fell across the Tri-Cities and Thumb, where 4 to 6 inches of snow accumulated across portions of these areas. Although many schools were already closed to observe Martin Luther King Jr Day, nearly all of the other schools in Southeast Michigan closed on Monday due to the storm, with the exception of Monroe County schools, where precipitation fell as mostly rain. Over 50 Detroit metro area schools remained closed on Tuesday due to power outages. Numerous car accidents occurred across the affected areas. Several vehicles were destroyed by large trees that fell under the extra weight of the ice and there were at least two incidents of trees falling onto moving vehicles. Most injuries (all indirect) were minor. Total property damage was roughly estimated in excess of $2M. This included damage to vehicles, homes, businesses, and electrical poles

Significant Ice or Sleet Storms in Detroit, 1995-2021		
Date	Location	Summary of Impacts
		and transformers. Downed power lines also sparked several garage fires. In addition, many businesses in the hardest hit areas reported losses due to the extended power outages.
January 2002	Southeast Lower Michigan	A narrow band of heavy snow fell along the I-94 corridor from Ann Arbor to Detroit from the morning of January 30 through the early evening hours. As the snowfall diminished, a low-pressure system moved into the area with precipitation beginning as snow. The precipitation changed over to freezing rain south of I-96 as warm air moved over the colder air near the surface. The heaviest freezing rain fell along and south of a line from Ann Arbor to Detroit. Freezing rain redeveloped during the evening of January 31 across all of southeast Michigan. One quarter to one-half inch of ice accumulated onto trees and power lines by the evening of the 31st. In addition to the freezing rain, many areas in the Detroit area also received from 5 to 9 inches of snow. The weight of the snow and ice on trees caused hundreds of tree limbs to break and even uprooted a few large trees. This did damage to dozens of homes and automobiles. A girl was struck by a falling tree branch in Detroit and went to the hospital with minor head injuries. Flooded roadways also led to traffic problems across portions of metro-Detroit, as storm drains became blocked with snow and ice. At least 5 fatal traffic accidents occurred, and several people were treated for heart attacks after shoveling heavy snow. Falling tree branches and the weight of ice downed hundreds of power lines and left an estimated 290,000 residents and businesses without power, especially in the Detroit area.
February 2001	Southeast Lower Michigan	A low-pressure system exiting the central plains pushed a warm front into Indiana and Ohio. A wintry mix of precipitation broke out north of the front, with freezing rain being the dominant precipitation type. In a few locations ice storm criteria was barely reached, with ice accumulations around a quarter inch. The ice produced relatively little tree and power line damage, but it may have contributed to damage done the next day in strong winds.
March 1997	Eastern and Southern Lower Michigan	A storm from the central plains brought widespread precipitation to southeast Michigan on March 13 and 14. 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 the state line, the freezing rain changed to rain, but not before heavy ice accumulations occurred. In the Detroit metropolitan area, the ice storm resulted in power outages to over 425,000 homes and businesses. This was the third largest outage in history and the worst ever for an ice storm. Several thousand

Significant Ice or Sleet Storms in Detroit, 1995-2021		
Date	Location	Summary of Impacts
		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.
March 1995	Southern Lower Michigan	The same storm that brought heavy snow to northern Michigan brought mainly freezing rain and sleet to the southern part of the state. Freezing rain occurred across much of southern Michigan during the early morning of March 6, but the heaviest accumulation of ice occurred early on March 7, when many areas reported accumulations of one-quarter inch. Scattered power outages occurred, but the outages were not as widespread as what might have occurred if the storm had been accompanied by strong winds. Many serious traffic accidents were reported throughout the state, with several fatalities.

Hazard Description: Extreme Cold

Like heat waves, periods of prolonged, unusually cold weather can result in a significant number of temperature-related deaths. Each year in the United States, approximately 700 people die because of severe cold temperature-related causes. This is substantially higher than the average of 200 heat-related deaths each year. It should be noted that a significant number of cold-related deaths are not the direct result of "freezing" conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia. It could convincingly be argued that, were it not for the extreme cold temperatures, death in many cases would not have occurred at the time it did from the illness or disease alone.

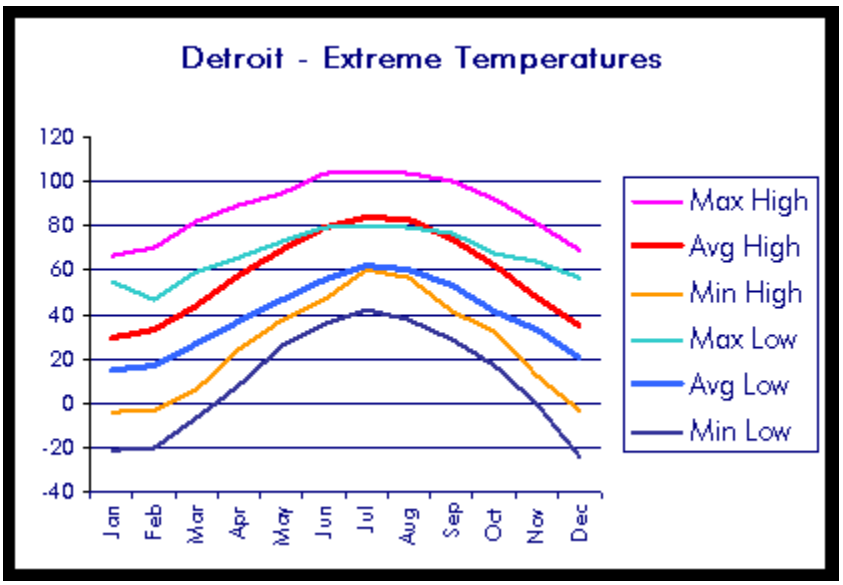
Hypothermia (the unintentional lowering of core body temperature), and **frostbite** (damage from tissue being frozen) are the two conditions most closely associated with cold temperature-related injury and death. Hypothermia is usually the result of over-exposure to the cold and is generally thought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

The special vulnerability of elders to hypothermia has become readily apparent. Over half of the approximately 700 persons who die each year due to cold exposure are 60 years of age or older, even though this age group only represents about 20% of the country's population. This remarkable statistic may be due, in part, to the fact that elderly people appear to perceive cold less well than younger people and may voluntarily set thermostats to relatively low temperatures. In addition, energy costs and the relative poverty among some elderly people may discourage their setting

thermostats high enough to maintain adequate warmth. Because many elderly people live alone and do not have regular visitors, the cold conditions may persist for several days or weeks, thus allowing hypothermia to set in.

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

Detroit's historical experience with extremely cold temperatures is reflected in the following chart. The chart suggests that from November through March, temperatures in Detroit can drop below zero degrees F.



Source: City of Detroit, Convention and Visitors Bureau

Significant Incidents of Extremely Cold Temperatures in Detroit, 1995 to 2021	
Date	Impact
January 2019	An arctic air outbreak into the Midwest at the end of January 2019 brought extreme low temperatures and dangerous wind chills for several days. Numerous low temperature records were set across the area. The arctic front moved through Southeast Michigan on Tuesday, January 29 and temperatures fell to below zero by early Wednesday morning. In fact, the high temperatures for Wednesday in Detroit and Flint were recorded at midnight as temps remained below zero all day into Thursday. Detroit spent 36 consecutive hours below 0 - this was the longest such streak since Jan. 1994 (66 hours). Flint also spent 36 hours below 0. A tightened pressure gradient over the region and excellent mixing led to winds gusting over 35 mph at times from Tuesday night through Wednesday evening. The result was wind chills near or below -35 for hours. Two deaths were attributed to the cold in Wayne County.
January 2018	A prolonged cold spell gripped southeast Michigan January 1st to January 7th leading to the deaths of at least 4 people in the Detroit Metro

Significant Incidents of Extremely Cold Temperatures in Detroit, 1995 to 2021	
Date	Impact
	Area. High temperatures were in the single numbers and teens during this stretch, with low temperatures mostly in the -15 to +5 F degree range. The cold peaked January 4-5th, when wind chills reach -25 F degrees along and north of the M-59 corridor. Flint set daily low record temperatures on January 5th and January 6th, -10 and -14 F respectively, along with record high minimums of 4 and 5 degrees.
February 2015	Arctic airmass ushered in by northwest winds produced Wind Chills around 30 below zero across most of Southeast Michigan the early morning of February 15th. Temperatures of -5 to 5 above zero in the evening hours of February 14th coupled with northwest winds of 15 to 20 mph produced wind chills around 25 below zero. Although winds diminished to around 10 mph during the early morning hours of February 15th, temperatures bottomed between 5 to 15 below zero. The official lows at the climate sites were as follows: Detroit -8 degrees, Flint -11 degrees, and Saginaw -12 degrees. Temperatures slowly rose during the morning hours with corresponding wind chills climbing above -20 degrees during the afternoon hours.
January 2009	An arctic air mass become firmly established over the Great Lakes region on January 14th and persisted through the 18th. Temperatures fell below zero all four days, with wind chill values in the 5 to 30 below range during most of the time. Detroit's low temperatures for January 14-18th were as follows: -3, -3, -15, -11.
January 2003	Temperatures averaged well below normal across the Great Lakes for much of January. For a 3-week period, the temperature never rose above freezing. Temperatures fell below zero for several nights during this period. Frozen pipes and water breaks occurred in many areas of Detroit and its suburbs. Several area schools had to cancel classes due to frozen pipes. Three deaths were attributed to the cold, including a 70-year-old woman suffering from Alzheimer's disease who wandered from her home and was found frozen to death behind her garage and a 50-year old homeless man who died in an alley from hypothermia.
December 2002	Temperatures across the state averaged well below normal the first week of December. Detroit tied a 131-year record low of 3 degrees F on the morning of 12/3. Combined with the winds, wind chill readings dropped to near 15 degrees below zero. A 70-year-old homeless man was found frozen to death, and a 41-year-old man was found lying outside his home and was pronounced dead at a nearby hospital. This was the fourth coldest December in Detroit history.
December 2000	On December 22, Detroit saw a high of only 4 degrees, after a morning low of 3 below zero. The cold also hampered shipping interests. Ice formation was extremely rapid on the Great Lakes and the connecting waterways. Several freighters got stuck in ice on both the Detroit River and Lake St. Clair, blocking the shipping channel and bringing dozens of ships to a halt. Ferry service on the St. Clair River between Michigan and Canada was also interrupted due to ice jams. The average temperature in Detroit for December was 19.3 degrees. This was the fourth coldest December in Detroit history.

Significant Incidents of Extremely Cold Temperatures in Detroit, 1995 to 2021	
Date	Impact
January 1999	Arctic air invaded Michigan behind a massive snowstorm. After a high of 10 degrees on January 4, temperatures nose-dived that evening. The mercury plunged to 10 below zero at Detroit Metro Airport, and it was not until the afternoon of January 5 that temperatures rose above zero. The bitter cold caused numerous cases of frostbite. The cold also resulted in over 120 water main breaks in Detroit.
February 1996	The coldest weather of the winter occurred across southeast Michigan during the first week of February. At Detroit, the lowest temperature was 7 below zero on February 3. An elderly man died of hypothermia on February 2 after wandering away from a nursing home in the city.
December 1995	A cold wave resulted in 3 deaths from hypothermia in the City of Detroit during the period from the early morning on December 9 through the morning of December 10. Two of the deaths occurred on the street, and the third occurred in a van. On December 9, winds averaging 20 to 25 mph combined with afternoon temperatures in the single digits to produce wind chills of 30 to 35 below zero.

Source: National Center for Environmental Information

A summary of the deaths and property damage caused by severe winter weather between 1995 and 2021 in Detroit and Wayne County is provided below. There were 6 new reported deaths and $5 million in property damage information from 2015 until 2021(information on Detroit alone was not available.) The original property damage estimate assigned to the March 1997 event reflected a total of $19 million in damages; however, upon review it was determined this number was inclusive of the entire event, NCEI indicates that Wayne County experienced a total of $4 million in damages.

Date	Type of Event	Deaths	Property Damage
January 2019	Cold/Wind Chill	2	0
April 2018	Winter Storm	0	5M
January 2018	Cold/Wind Chill	4	0
January 2007	Ice Storm	0	300K
March 2003	Extreme Cold	2	0
January 2003	Extreme Cold	2	0
December 2002	Extreme Cold	2	0
January 2002	Ice Storm	0	820K
February 2001	Ice Storm	0	2K
December 2000	Snowstorm	0	75K
December 2000	Extreme Cold	0	475K
January 1999	Snowstorm	0	1.85M
January 1999	Extreme Cold	3	1.3M
March 1997	Ice Storm	0	4M
January 1997	Extreme Cold	2	0
February 1996	Extreme Cold	1	0
December 1995	Extreme Cold	3	0
Totals		**21**	**$9,822,000**

Source: National Centers For Environnemental Information

Impact and Analysis

For the past 26 years, Detroit has experienced 17 extremely cold temperature events and 55 winter weather events for an average of 2.9 events per year. Based on this history, the likelihood that Detroit will experience extreme winter weather in any given year is high. Although the number of reported deaths is 21, NCEI admits that the actual number of deaths caused from severe winter weather is higher because of underreporting. As mentioned above, NCEI reported $9,822,000 in property damage from 1995 to 2021 from extreme winter weather. Although this figure represents property losses for all of Wayne County and not for Detroit alone, the NCEI admits that this figure is also a minimum amount because of underreporting. Also, the ranking of this hazard increased because representatives from the City believe that Detroit has some capability to respond to these types of events, but that the City does not have all the resources that are required to mitigate hazards in this category.

April 2018 Detroit Winter Weather event, photo credit: The Detroit News

As indicated in the description of significant events, many segments of Detroit are vulnerable to severe winter weather. First and foremost, the residents of Detroit are vulnerable to hypothermia, frostbite and death caused by extremely cold temperatures. The hazard description suggests that the elderly and the young are the most susceptible to the hazards of extremely cold weather. Residents also increase the risk for heart attacks as they attempt to shovel heavy snow. They may experience a higher incidence of automobile accidents while attempting to drive during wintry conditions.

As the population of Detroit continues to decrease, the concentration of poor and elderly residents will increase, exacerbating these hazards. Vulnerable infrastructure in the city includes water pipes frozen by cold temperatures; roadways damaged by flooding when snow and ice block drains; commercial buildings on which snow may build up and cause roofs to collapse; power transmission lines damaged by ice; homes and automobiles damaged by trees that fall during ice storms; businesses that are forced to close because of snow or ice storms; and shipping on the Detroit River that is interrupted by ice buildup.

Although the western half of the state experiences more snowfall, Detroit has experienced several significant storms. By observing winter storm watches and warnings, adequate preparation can usually be made to reduce the impact of snowstorms on Michigan communities. Providing for the mass care and sheltering of residents left without heat or electricity, and mobilizing sufficient resources to clear blocked roads, are the primary challenges facing community officials. Severe snowstorms can affect every Michigan community. Therefore, every community should plan and prepare for severe snowstorm emergencies. That planning and preparedness effort should include the identification of mass care facilities and necessary resources such as cots, blankets, food supplies and generators, as well as snow clearance and removal equipment and services. In addition, communities should develop debris management procedures (to include the identification of multiple debris storage, processing, and disposal sites) so that the tree and other storm-related debris can be handled in the most expedient, efficient, and environmentally safe manner possible.

2-6. EXTREME SUMMER WEATHER (#5)

For the purposes of this HMP, Extreme Summer Weather refers to thunderstorms, and extreme summer heat. Each of these hazards will be addressed separately in this section of the Plan.

Hazard Description: Severe Thunderstorms

Severe thunderstorms are weather systems accompanied by strong winds, lightning, heavy rain, and possibly hail and tornadoes. Severe thunderstorms can occur at any time in Detroit, although they most frequently occur during the warm spring and summer months between May and September. According to the National Weather Service, Detroit and Wayne County experience 40-60 thunderstorm days per year. NCEI reports that 322 thunderstorm and high wind events occurred in Wayne County between 1/1/50 and 12/31/21. NCEI lists the following storms as impacting the City of Detroit between 2007 and 2021.

Date	Injuries	Deaths	Property Damage
8/26/2014	0	0	0
8/19/2014	0	0	4K
9/11/2013	0	0	0
7/19/2013	0	0	0
7/18/2011	0	1	0
6/22/2011	0	0	0
6/8/2008	0	0	50K
8/23/2007	0	0	3K
7/19/2007	0	0	
6/8/2007	0	0	0
5/11/2015	0	0	8K
5/26/2015	0	0	0
6/23/2015	0	0	0
8/2/2015	0	0	0
9/3/2015	0	0	0
7/8/2016	0	0	5K
7/18/2016	0	0	0
7/21/2016	0	0	0
9/7/2016	0	0	0
6/22/2017	0	0	5K
6/30/2017	0	0	0
7/23/2017	0	0	0
8/2/2017	0	0	0
5/2/2018	0	0	0
5/4/2018	0	0	0
7/1/2018	0	0	0
7/26/2018	0	0	0
7/31/2018	0	0	0
8/6/2018	0	0	0
10/20/2018	0	0	0

Date	Injuries	Deaths	Property Damage
5/25/2019	2	0	0
7/2/2019	0	0	0
7/20/2019	0	0	0
8/18/2019	0	0	0
10/27/2019	0	0	0
12/30/2019	0	0	0
6/10/2020	0	0	0
6/26/2020	0	0	0
7/19/2020	0	0	200K
Totals	0	1	275K

Source: National Center for Environmental Information

In addition to high wind, lightning is another product of a thunderstorm's tremendous energy. The energy in the storm produces an intense electrical field, with the positive charge concentrated at the top and the negative charge concentrated at the bottom. Lightning strikes when a thunderstorm's electrical potential becomes great enough to overcome the resistance of the surrounding air. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often heated to higher than 50,000 degrees F and speeds approaching one-third the speed of light. Lightning deaths usually result from the electrical force shocking the heart into cardiac arrest or throwing the heartbeat out of its usual rhythm. A listing of lightning strikes in Detroit between 1995 and 2021 is provided below.

Lightning Strikes in Detroit			
Date	Injuries	Deaths	Property Damage
8/03/2015	0	0	300K
6/27/2007	0	1	0
6/16/98	0	1	0
6/24/95	2	0	0
Total	**2**	**2**	**300K**

Source: National Center for Environmental Information

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

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. The typical length of a tornado path is approximately 16 miles but tracks much longer than that – even up to 200 miles – have been reported. Tornado path widths are generally less than one-

quarter mile wide. Typically, tornadoes last only a few minutes on the ground, but those few minutes can result in tremendous damage and devastation.

Tornado intensity is measured on the Enhanced Fujita Scale, which examines the damage caused by a tornado on homes, commercial buildings, and other man-made structures. The Enhanced Fujita Scale rates the intensity of a tornado based on damaged caused, not by its size. A chart depicting the Enhanced Fujita Scale is provided on the next page. It is important to remember that the size of a tornado is not necessarily an indication of its intensity. Large tornadoes can be weak, and small tornadoes can be extremely strong, and vice versa. It is very difficult to judge the intensity and power of a tornado while it is occurring. Generally, that can only be done after the tornado has passed, using the Enhanced Fujita Scale as the measuring stick. The Enhanced Fujita Scale is used to measure the intensity of a tornado based on estimated wind speeds and related damages, detailed in the table below.

TABLE: Enhanced Fujita Scale[10]	
EF Rating	3 Second Gust (miles per hour)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Source: National Oceanic and Atmospheric Association (NOAA)

The National Weather Service reports that 33 tornadoes occurred in Wayne County between 1950 and 2021. The following table provides a listing of tornadoes that have struck Wayne County and the City of Detroit.

Strongest Tornadoes in Wayne County 1950-2021					
Location	Date	Magnitude	Injuries	Deaths	Property Damage
Allen Park and Ecorse	5/12/1956	F4	22	0	250K
Detroit	11/20/1957	F3	12	1	250K
Flat Rock	7/4/1969	F3	50	0	2.5M
Allen Park and Ecorse	7/16/1980	F2	0	0	25M
Detroit	7/2/1997	F2	90	0	90M
Plymouth	9/13/2008	F2	0	0	250K
Wayne Co	12/23/2015	EF1	0	0	500K
Wayne Co	7/31/2018	EF0	0	0	50K
Wayne Co	9/25/2018	EF0	0	0	150K
Wayne Co	9/25/2018	EF1	0	0	500K
Totals			**152**	**1**	**119,200,000**

Source: National Centers for Environmental Information Storm Reports

[10] https://www.weather.gov/oun/efscale

Other than those tornadoes described in the table, all tornadoes in the Detroit/Wayne County area have been EF2, EF1, or EF0. As the table above indicates, the most active months for tornadoes since 1950 are June and July with 6 each and August with 5.

The figure below was developed utilizing an historic EF3 tornado event occurring in the northeast corner of Detroit. The historic event was shifted to the southwest using ArcGIS. The resulting tornado track was assigned a 1-mile buffer zone. An analysis of the intersecting critical assets was performed yielding results of 160 critical assets potentially being impacted by a single EF3 tornadic event.

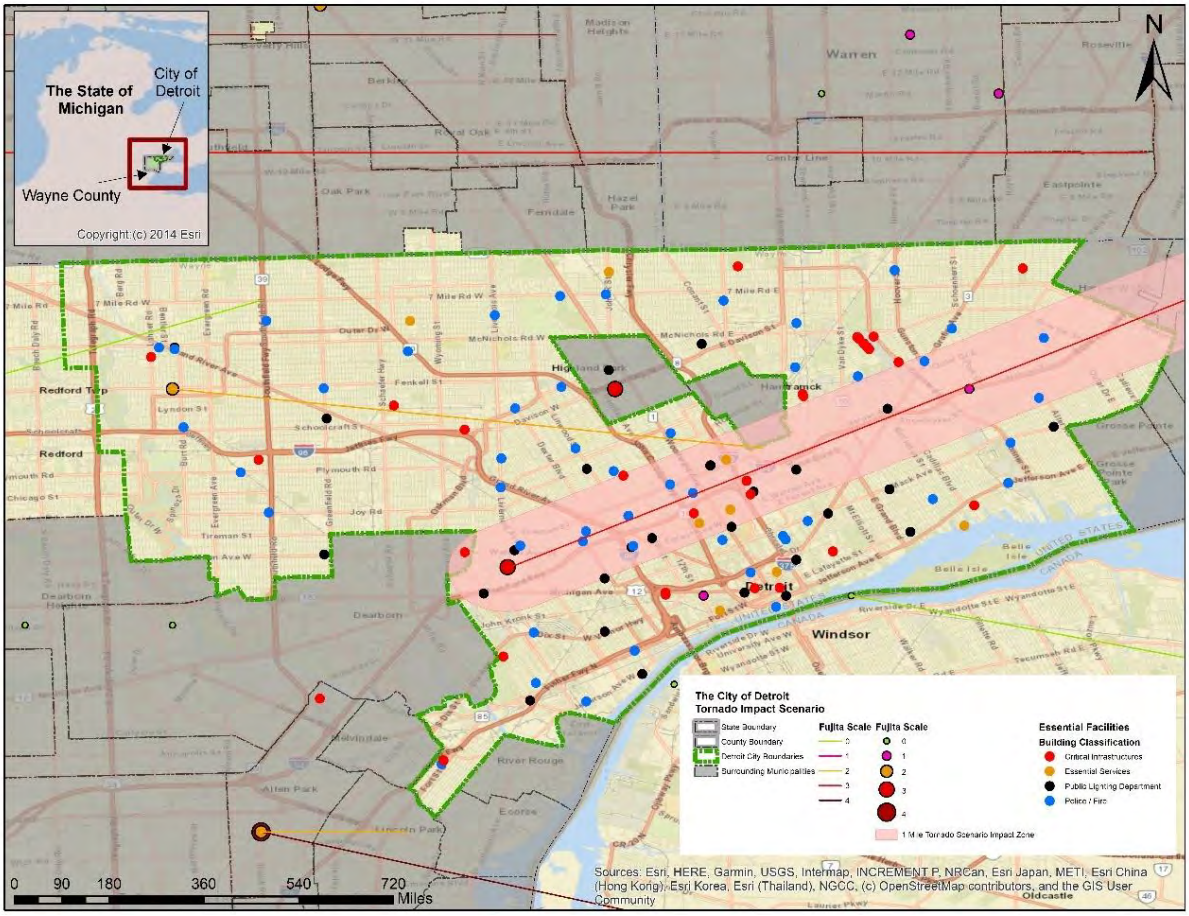


Figure: Tornado Scenario Map, City of Detroit

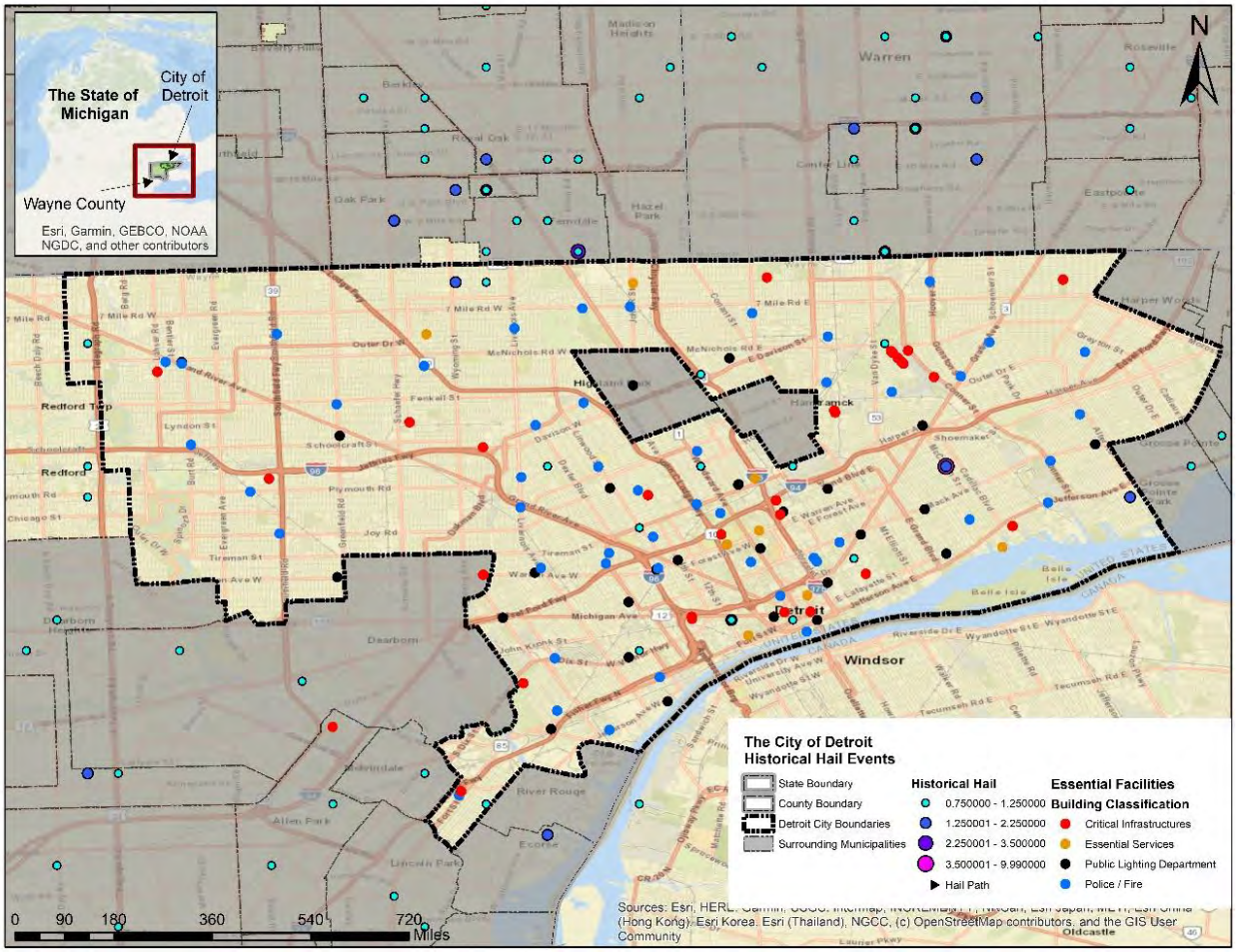
Hail is another product of strong thunderstorms that frequently move through Detroit. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred with the most severe thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where

they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado.

The National Weather Service began recording hail activity in Michigan in 1967. Statistics since that time indicate that approximately 35% of the severe thunderstorms that produce hail occurred during the months of June and July, and nearly 80% occurred during the growing season of May through August. As a result, the damage to crops from hail is often extensive. A listing of hail events in Detroit is provided below.

Hail Events in Detroit (1995-2021)				
Date	Magnitude	Injuries	Deaths	Property Damage
7/15/1995	1.75 inches	0	0	0
10/13/1999	0.75 inches	0	0	0
5/12/2000	0.88 inches	0	0	0
5/9/2000	1.75 inches	0	0	0
5/28/2001	0.75 inches	0	0	0
4/20/2004	0.88 inches	0	0	0
5/7/2004	1.50 inches	0	0	0
5/17/2004	1.00 inch	0	0	0
5/21/2004	0.75 inches	0	0	0
8/2/2014	1.00 inch	0	0	0
8/4/2014	1.00 inch	0	0	0
8/2/2015	1 inch	0	0	0
9/3/2015	0.88 inches	0	0	0
9/3/2015	0.88 inches	0	0	0
7/8/2016	1 inch	0	0	0
7/8/2016	0.75 inches	0	0	0
7/8/2016	1.75 inches	0	0	0
9/7/2016	0.88 inches	0	0	0
7/7/2017	1 inch	0	0	0
8/2/2017	0.88 inches	0	0	0
8/11/2017	0.88 inches	0	0	0
9/4/2017	0.75 inches	0	0	0
7/26/2018	1 inch	0	0	0
7/19/2019	1 inch	0	0	0
6/10/2020	1 inch	0	0	0
7/8/2020	1 inch	0	0	0

Source: National Center for Environmental Information



Hail History Map City of Detroit
Source: National Center for Environmental Information (NCEI) NOAA Storm Prediction Center

Although Detroit has experienced hail on numerous occasions over the past several years, the city has been fortunate in that no injuries, deaths, or property damage have been inflicted.

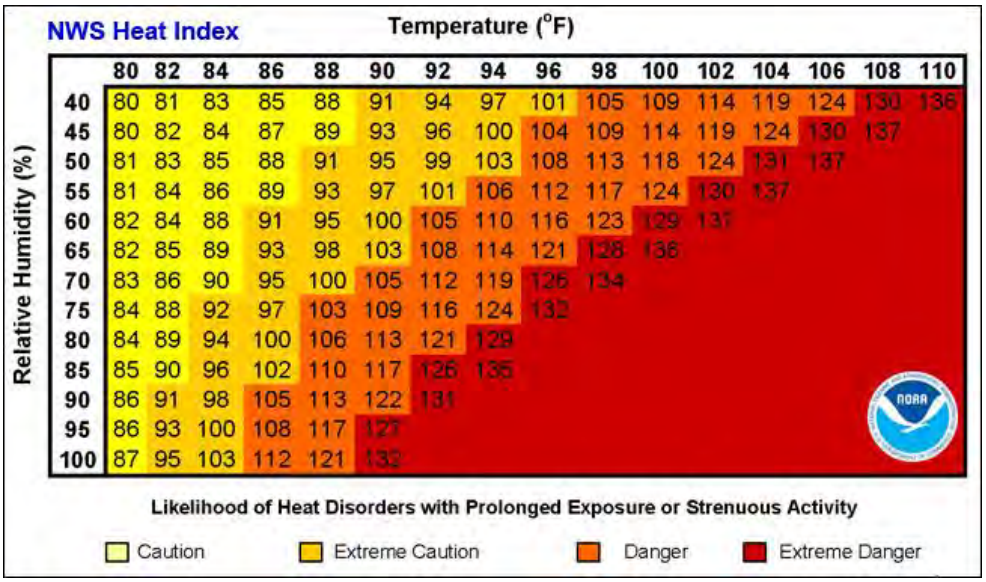
Hazard Description: Extreme Summer Heat

The second major category of Extreme Summer Weather is heat, which is characterized by a combination of very high temperatures and exceptionally humid conditions. When persisting over a long period of time, this phenomenon is called a heat wave. The major threats of extreme summer heat are heatstroke and heat exhaustion. Heatstroke often results in high body temperatures, and the patient may be delirious or comatose. Rapid cooling is essential in preventing brain damage or death.

Heat exhaustion is a less severe condition that 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

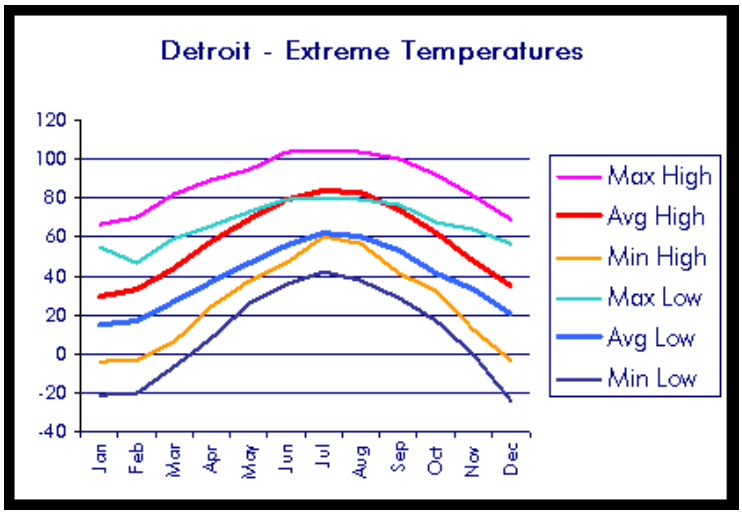
usually consists of restoring body fluids and staying indoors in a cooler environment until the body returns to normal. Because the combined effects of high temperatures and high humidity are more intense in urban centers, like Detroit, heatstroke and heat exhaustion are a greater problem. Air conditioning is the most effective measure for mitigating the effects of extreme summer heat. Unfortunately, many of the most vulnerable to this hazard do not have access to air-conditioning at home or at work.

The following chart, provided by the National Weather Service indicates extreme heat dangers. The red area without numbers indicates extreme danger. The National Weather Service will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days. The National Weather Service also offers a Heat Index chart for areas with high heat but low relative humidity.



Source: National Weather Service

The graph below provides a listing of the months that present the greatest hazards related to extreme summer heat in Detroit.



Source: City of Detroit, Convention and Visitors Bureau

Although the average high temperatures for June through August are between 80- and 90-degrees (F), the maximum highs during these months can reach above 100 degrees. Between 1995 and 2021, NCEI reported five incidents involving excessive heat in Detroit. These incidents are described in the table below.

Excessive Heat Incidents in Detroit	
Date	Impact
June and July 2018	A prolonged heat wave impacted southeast Michigan June 30th- July 5th. Here are the Detroit High Temperatures for that period: 94, 93, 90, 91, 93, 96. Heat related emergency rooms visits spiked and peaked on July 1st and remained elevated through the rest of the heat wave.
July 2013	A six-day heat impacted Southeast Michigan July 14th through the 19th with high temperatures ranging from the upper 80s to mid-90s. Heat Indices were in the 90s for the most part, but Detroit Metro area hospitals reported an increase of 173 heat related illnesses during this stretch. Here are the daily maxes reported at Flint Bishop Airport and Detroit Metro Airport during the six days. Flint: 90, 93, 94, 95, 95, 96. Detroit: 89, 93, 90, 94, 94, 95.
July 1, 2002	Local television reported that an estimated 25 people across metro Detroit were treated for heat stroke during the beginning of the month as afternoon highs soared in to the 90's, while heat indices broke 100 degrees.
August 6, 2001	A large high-pressure ridge settled across the Great Lakes region during the first week of August. With this ridge in place, temperatures soared into the 90's across southeast Michigan. Detroit broke a record on August 8, when the temperature reached 99 degrees F. The high heat and humidity allowed daytime indices to exceed 100 degrees four days in a row. From August 7 through August 9, heat indices ranged from 105 to 110 degrees. The heat caused several people to seek emergency treatment for heatstroke and heat exhaustion. Thousands of power outages occurred throughout the region as demand exceeded supply.

Excessive Heat Incidents in Detroit	
Date	Impact
June and July 2001	Extreme heat and humidity sent heat stress index readings soaring well above 100 degrees on many days. Communities across the region, including Detroit, were forced to open cooling centers and take other steps to avoid heat-related deaths. In mid-June, three elderly residents of a Detroit-area nursing home died and five more were hospitalized due to heat-related stress.

Impact and Analysis

According to NCEI, the City of Detroit experienced 43 thunderstorms, 4 lightning strikes, 5 tornadoes, 32 hail events, and 5 incidents of extreme heat, between the years 1995 and 2021. This results in an average of 3.42 incidents per year for that timeframe. During that same period, a lightning strike killed one person, and 3 others died from excessive heat. The average number of fatalities for this 10-year period is 0.16 deaths per year. Detroit can expect one or more of these hazards to impact the City on an annual basis.

Property damage sustained during the 1995 to 2021 period includes $275,000 in thunderstorm damage and total of $119,200,000 in damages from tornadoes, including the $90 million in damage caused by the tornado in July 1997. Including totals from all hazards within the extreme summer weather profile, the average amount of property damage over this 26-year period equals $4,606,731. Extreme summer weather might have received a higher hazard rating if Detroit was not prepared to respond to these events. Because the City has identified vulnerable populations and created cooling centers for those individuals, the greatest threat is currently being managed. The hazards created by extreme summer weather will continue to impact the City because of the vulnerable populations that reside in Detroit. This includes the elderly, the young, and the poor.

Detroit is also vulnerable to extreme summer weather because it may result in infrastructure failure, whether from heat induced or thunderstorm induced power outages. This could impact all critical facilities within the City, as described earlier in section 2.3. Infrastructure Failure.

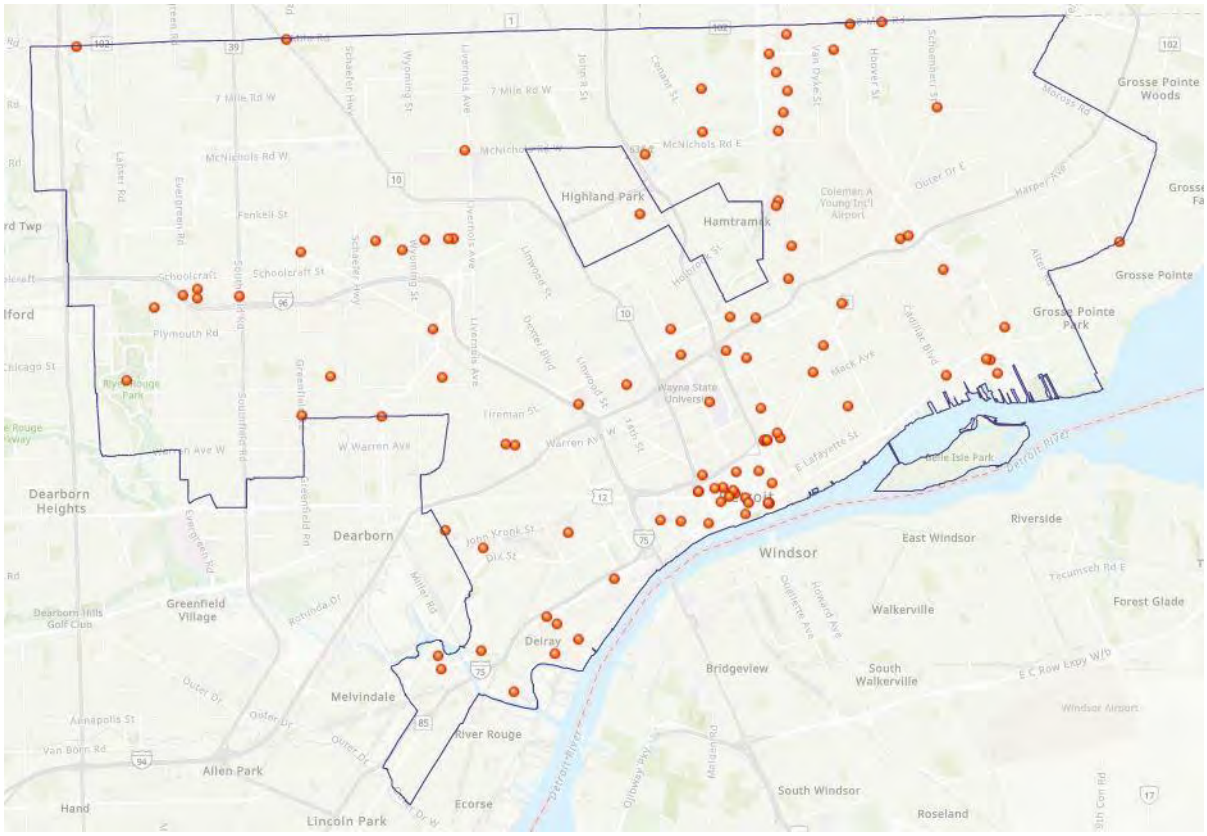
Detroit Recreation Department staff opened a hydrant on Hurlburt Street to offer some relief from the heat, Detroit Free Press, July 2, 2002.

Development trends suggest that as more residents move out of the City, there will be a higher concentration of residents who are most vulnerable to the hazards caused by extreme summer weather. With fewer resources to apply to mitigation strategies, Detroit will need the assistance of federal and state agencies in helping to protect its citizens from extreme summer weather.

2-7. HAZARDOUS MATERIALS RELEASES (#6)

Hazard Description: Hazardous Materials Incidents - Fixed Site

Over the past few decades, new technologies have developed at a stunning pace. As a result, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities in our communities. Hazardous materials are materials or substances that, because of their chemical, physical, or biological nature, pose a potential risk to life, health, property, or the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gasses. The Detroit Fire Department, in its survey of critical facilities within the City, has identified 103 fixed sites that use, store, or produce hazardous materials. **Appendix B** provides a full list of these identified sites. Although the Detroit LEPC has begun working with these facilities to develop emergency response plans, each of these facilities has the potential for experiencing a fixed site incident. Examples of previous incidents are provided in the table below.

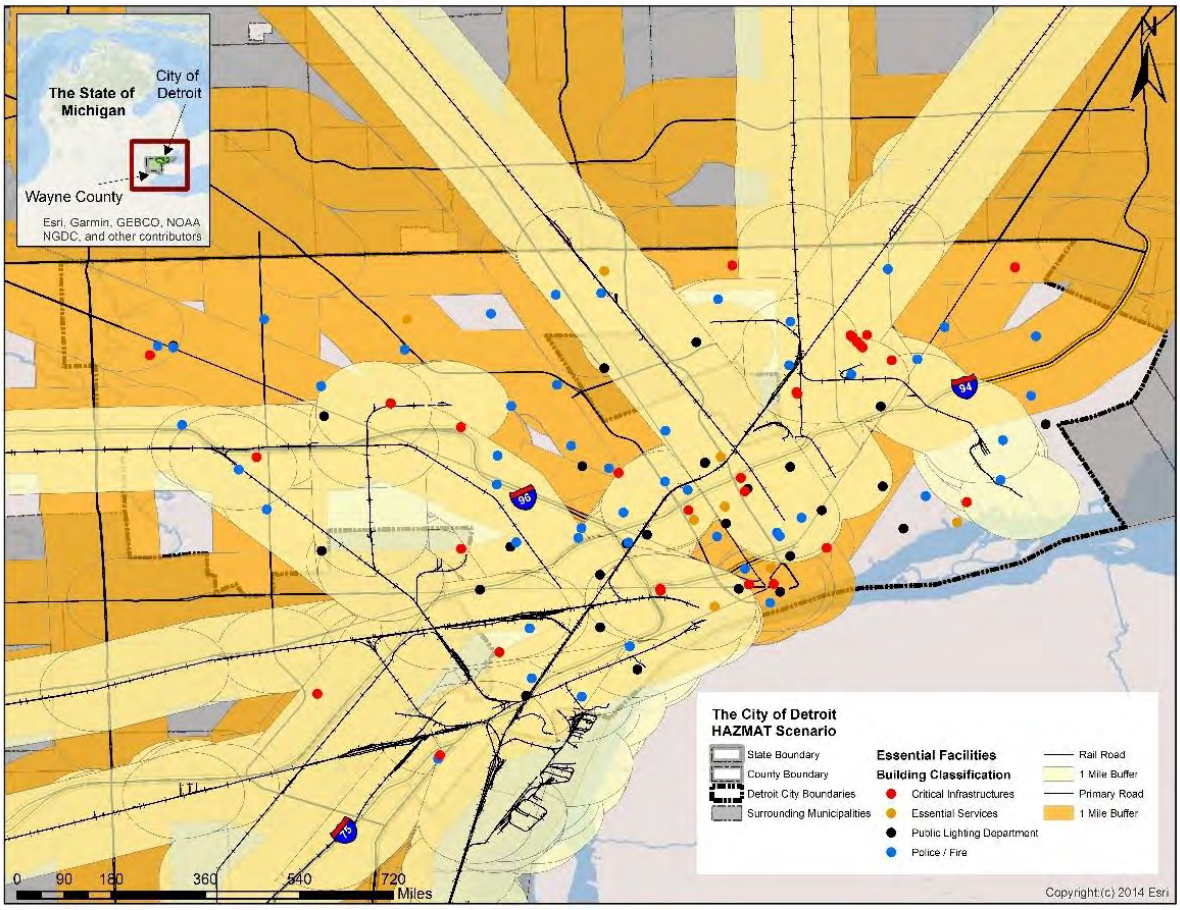


302 Fixed Sites
Source: Detroit Fire Department

Hazard Description: Hazardous Materials Incidents - Transportation

As a result of the extensive use of chemicals in our society, all modes of transportation – highway, rail, air, marine, and pipeline – are carrying thousands of hazardous materials shipments daily through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. Detroit has had hazardous materials transportation incidents that affected the immediate vicinity of an accident site or a small portion of the surrounding community. Those types of incidents, while problematic for the affected community, are fairly commonplace. They are effectively dealt with by local and state emergency responders and hazardous material response teams. Larger incidents, however, pose a whole new set of problems and concerns for the affected community. Large-scale or serious hazardous material transportation incidents that involve a widespread release of harmful material (or have the potential for such a release) can adversely impact the life safety and/or health and well-being of those in the immediate vicinity of the accident site, as well as those who encounter the spill or airborne plume.

In addition, damage to property and the environment can be severe as well. Statistics show most 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. One of the most dangerous hazardous material transportation accident scenarios that could occur in Detroit would be a spill or release of oil, petroleum or other harmful materials into the Detroit River from a marine cargo vessel. Such an incident, if it involved a large quantity of material, could cause serious environmental contamination.



Oil and Gas Pipelines with a 1-Mile Buffer

A full listing of the 302 fixed sites containing large quantities of hazardous materials throughout the City of Detroit is located within **Appendix B**.

Significant Hazardous Materials Incidents in Detroit

Fixed Sites

Fortunately, Detroit has not experienced a large-scale hazardous materials release from a fixed site that resulted in multiple deaths or serious injuries. That can be attributed, in large part, to the steps taken by government and private industry to carefully regulate those processes and practices that could cause an accidental hazardous material release. Despite these protective measures, the Detroit area has had numerous fixed-site hazardous materials incidents in recent years that required a response by local fire departments and hazardous materials response teams and implementation of evacuation, in-place sheltering, and other protective actions. Between 1999 and 2004, the City of Detroit responded to 891 hazardous materials incidents for an average of 149 per year. At the state level, approximately 15-20% of incidents occurred at an industrial or service business site. Using this percentage range, the City of Detroit responded to approximately 134 to 178 fixed site incidents

during this 6-year timeframe. During the time of the 2021 plan update, additional comprehensive statistics were unavailable.

The table below provides a summary of significant fixed sites incidents that have occurred since 1984.

Hazardous Materials Incidents – Fixed Sites (1984-2021)		
Date	Location	Summary of Impacts
May 12, 2018	Detroit	7515 Lyndon – Detroit Chrome Inc, Aerotech, Chrome Plating Shop, (Event #2018-132-02270 Hazmat Level 3) 302 Site Scenario – Fire in a Commercial Building, large amount of water with an unidentified substance inside of it, no evacuation in the area Dispatch Time: 14:14:07 Clear: 21:09:26 Total Time – 6 hours and 59 minutes No Injuries
April 27, 2018	Detroit	5101 Cass Ave – Wayne State Chemistry Building (Event #2018-117-02494) Hazmat Level 2 Scenario: Gas Leak, Hazardous Conditions, Strong Odor of Natural Gas Near RM 365, all buildings west of Cass were evacuated, Unified Command established Dispatch Time: 14:46:40 Clear: 18:58:20 Total Time: 4 hours and 11 minutes No Injuries
December 2, 2004	Detroit	A possible cyanide scare at a metal plant on Detroit's west side sent hazmat teams to the scene early Thursday morning. A fire started overnight at the Silvercraft Corporation, located at Telegraph and Fenkell. The two-alarm blaze was quickly contained. The building contained chemicals, such as cyanide, but no one was exposed to the vapors. No evacuations were reported.
June 26, 2003	Detroit	Members of the police hazmat team removed and discarded 16 ounces of picric acid, an explosive material that had been stored in a jar with a handwritten label. Detroit police and fire officials evacuated residents within a two-block area of the building, a boarded up, three-story facility on Gratiot and Whithorn. They also closed a block of Gratiot Avenue while they removed the volatile acid. City officials did not know who owned the building, but the last occupant was Universal Scientific Industrial Supply. A homeless woman discovered the chemicals in the basement and reported them to the City.
April 8, 2003	Detroit	An industrial fire occurred at the Gateway Additive Company, overcoming the entire facility and impacting several strong acid and caustic drums, a railcar of product, and several hundred drums of finished product. In addition, the EPA found several aboveground storage

Hazardous Materials Incidents – Fixed Sites (1984-2021)		
Date	Location	Summary of Impacts
		tanks behind the facility that did not have proper containment. From the beginning of the response, GA reported that no hazardous materials were stored or used in the process. However, during the emergency response, the Detroit Fire Department discovered several totes of acid and fifteen drums of caustic. The areas surrounding these containers contained fire runoff water in various pH ranges. In addition, the finished product drums released their contents and covered the floor of the facility in up to 6 inches of oil.
August 26, 2001	Detroit	A fire at a metal plating plant injured eight firefighters, forced the evacuation of residents within a five-block radius, and completely destroyed the plant. The fire, which continued to smolder for more than 24 hours, consumed large tanks of cyanide, sulfuric acid and other chemicals. Toxic fumes from the fire forced a one-week closure of a local elementary school.
May 12, 1988	Detroit	A chemical fire, involving sulfur chloride, at a manufacturing plant forced the evacuation of persons living around the plant.
August 6, 1984	Hamtramck	A fire at a chemical plant involved exploding tanks of anhydrous ammonia, forcing the evacuation of 300 from the scene. Several firefighters were injured during the incident.

Source: State of Michigan, Hazard Mitigation Plan; Detroit Free Press; Detroit Fire Department

Transportation

Detroit has been fortunate not to have a large-scale, serious hazardous material transportation incident. However, Detroit has had numerous smaller-scale incidents that required a response by the Detroit Fire Department and other response organizations. Many required the implementation of evacuation and other protective actions. As a major manufacturer, user, and transporter of hazardous materials, Detroit will always be vulnerable to the threat of a serious hazardous material transportation incident. The table below provides a summary of significant incidents that have occurred in Detroit since 1995.

Date	Location	Summary of Impacts
January 7, 2019	Detroit	1/75 to I/375 Service Drive on the freeway (Event 2019-007-04146) Hazmat Level 2, Scenario – Tanker truck flipped over leaking a large amount of fuel, freeway was shut down, however, traffic was flowing topside Dispatch Time: 23:57:51 Clear: 1/8/2019, 12:28:58 Total Time – 12 hours and 29 minutes No injuries

Date	Location	Summary of Impacts
May 24, 2015	Detroit	I-17NB at I-375 Bridge (Stroh's Curve) Scenario – A tanker carrying unleaded fuel (9000 gal), the wheels locked and the semi flipped over causing fuel to catch fire. The accident caused several roadway closures. Construction was required to restore the bridge. Total Time – 9:08 hours No Injuries
March 11, 2015	Detroit	I-94 at Southfield Fwy (M-39) A tanker carrying diesel fuel (6800 gal) and regular gas (6500 gal) caught fire causing structural damage, road closures, and fuel leaking into the catch basins. Total Time – 9:08 hours
January 31, 2013	Detroit	I-75 SB on Rouge River Bridge Winter white-out weather conditions caused 32 cars and semi-trucks to crash creating a one-mile-long wreckage. This was declared a Level 3 HazMat scene due to a diesel fuel spill. Three motorists were entrapped and required the Jaws-of-Life. Total Time – 6:17 hours 15-20 motorists were transported to local hospitals and three people died (1 adult, 2 children).
July 15, 2009	Detroit	I-75 SB at 9 Mile Bridge A tanker traveling I-75 NB hit 9 Mile Rd. overpass due to a reckless, speeding driver. The tanker, car and a semi-truck carrying perishables caught fire. Heat from the flames caused the bridge to collapse on top of both semis within 20 minutes of accident. The tanker fire caused 9 Mile bridge to collapse, which had to be rebuilt. Total Time - I-75 NB was closed for 4 days, 18 hrs. and I-75 SB was closed 3 days, 19 hrs. 1 injury
January 10, 2008	Detroit	I-75 NB on Rouge River Bridge A tanker rolled over on the bridge, breaking through barriers and falling to the ground causing explosive fire, structural bridge damage, and road closures. Total Time – 2:00 hours. Construction restoration did not complete until March.
January 7, 2005	Detroit	A tractor-trailer, carrying 5,000 gallons of waste xylene and toluene, overturned on northbound I-75, causing the flammable liquid to spill on the freeway. The Michigan State Police closed the freeway while the chemicals were transferred to two other tankers at the scene. No evacuations were reported, but the highway remained closed for approximately 9 hours.
October 25, 2004	Detroit	Nine cars of a 79-car train derailed, resulting in the evacuation of nearby residents. The derailed cars contained methanol, a flammable chemical used in antifreeze, as a fuel additive, and as an industrial solvent. There were no injuries to residents or the train crew, but fire and police crews that

Date	Location	Summary of Impacts
		arrived on the scene evacuated a 1-square mile area because of the explosive nature of the chemical involved.
October 7, 2003	Detroit	A truck driver lost control of a tanker truck carrying gasoline, as he drove from southbound I-75 to eastbound I-94. The truck's trailer flipped over the ramp's guardrail and burst into flames on Rivard, the street below. The truck's cab remained on the bridge but also caught fire, burning the driving surface and the underside of the ramp. The damage was substantial. Flames warped concrete and steel, and broken chunks of pavement and guard walls fell to the street below. The driver was killed in the one-vehicle crash.
September 17, 2003	Detroit	A truck traveling down I-75 cut off a tanker truck carrying 13,400 gallons of gasoline. The tanker flipped onto its side, slid about 15 feet and caught fire. The driver, suffering second and third degree burns, collapsed next to the burning truck. Three 20-year old passersby leaped from their car and dragged the driver to safety. Moments later, the tanker exploded into a fireball that sent flames shooting across the expressway. The driver was treated for burns and possible broken bones at a local hospital.
May 27, 2000	Detroit	A semi-tanker carrying 13,000 gallons gasoline overturned, exploded, and caught fire on I-75 in downtown Detroit, killing the driver and forcing the cancellation of the City's Memorial Day parade. Officials cancelled the parade fearing that fuel entering the sewer system could ignite and launch manhole covers into the crowd. Firefighters pumped foam and water into storm drains to prevent further explosions. The section of I-75 was closed for several hours to allow for clean-up activities.
April 5, 1995	Detroit	A tractor-trailer transporting 8,500 gallons of gasoline overturned on a ramp at I-94 and I-75. The driver was killed in the crash and ensuing fire. A one-half mile area around the crash scene was evacuated due to the risk of explosion from leaking gasoline that washed down into the sewer.

Source: State of Michigan, Hazard Mitigation Plan; Detroit Free Press; Detroit Fire Department

Tanker truck, carrying gasoline, flips over while traveling down I-75 and catches on fire. September 17, 2003.

Impact and Analysis

From 2009-2015, Detroit experienced an average of 149 hazardous materials incidents per year, including fixed sites and transportation events. Because of the number of facilities that use, store, or produce hazardous materials, as well as the amount of materials shipped through the city each year, the likelihood of an event occurring in any one year is extremely high. In surveys conducted at community relations meetings held at Police Precincts and in an online survey of residents and employees, 16% of respondents indicated that their family or employer had been impacted by a hazardous material event in the previous 5 years. This would suggest Detroit should expect multiple hazardous materials incidents in the coming years, although the rate of incidents has decreased due to safeguards in the transportation and chemical industries. More recent data was unavailable for the 2021 plan update due to a reporting system change. All data within the HMP reflects the best available comprehensive data.

When a hazardous materials incident occurs in the City, the greatest impact occurs to those residing or doing business near the incident site. This would include residents, businesses, and critical facilities in the city where those facilities using, storing, or producing chemicals are most heavily concentrated. This would also include residents, businesses, and critical facilities located along major truck and rail transportation routes. As is indicated in the incidents described above, the impact of hazardous materials releases includes the following: damage to fixed sites where such incidents occur; damage to highway overpasses, railroad track and other infrastructure; damage to the vehicles involved in transportation incidents; acute and chronic health effects caused by exposure to these materials; and disruption to normal

functions that occur because of evacuations, temporary loss of traffic routes, and the time and expense required to respond to these incidents.

Although the City does not track of dollar losses to buildings, infrastructure, or critical facilities attributed to hazardous materials incidents, Detroit does monitor expenses associated with hazardous materials response. Each year, Detroit pays a retainer fee of $250,000 for the cleanup of hazardous materials incidents. In addition, the city government spends approximately $125 per hour for fire department personnel to respond to each incident. The average duration of each incident is one hour. The table below provides annual expenditures for incident response. Detroit spent $271,063 per year on average responding to hazardous materials incidents between 1999 and 2004. Additional updated data was not available during 2021 plan update.

Expenditures for Hazardous Materials Incidents				
Year	# Incidents	$125/hour	Retainer Fee	Total
1999	163	$20,375	$250,000	$270,375
2000	174	$21,750	$250,000	$271,750
2001	234	$29,250	$250,000	$279,250
2002	202	$25,250	$250,000	$275,250
2003	118	$14,750	$250,000	$264,750
2004	120	$15,000	$250,000	$265,000
Total				**$1,626,375**

Source: Detroit Fire Department

The City is implementing several policies regarding land use and development that will help to mitigate damage caused by future hazardous materials incidents. The following table provides a list of policies and the possible impacts.

Policy	Impacts
Re-use of abandoned structures	Identify the presence of hazardous materials and eliminate the potential threat
Attract diversified employment centers	Bring in businesses that use fewer hazardous materials
Eliminate or minimize truck traffic in residential areas	Reduce the likelihood of exposure to transportation related incidents
Improve roads and freeways	Reduce the likelihood of accidents involving trucks carrying hazardous materials

In order to mitigate the impacts of hazardous materials incidents, the Planning and Development Department will incorporate the policies listed above when making decisions related to land use planning, zoning and development.

2-8. PUBLIC HEALTH EMERGENCIES (#7)

Hazard Description

Each year Detroit residents' contract communicable diseases that impact their health and threaten their lives. The growth in those living with the disease increases the likelihood that the disease will continue to spread unless dramatic new treatments are discovered. This includes influenza/pneumonia, tuberculosis, hepatitis, AIDS, and chicken pox, as well as several other diseases. Although the reported number of cases for several of these diseases has been dropping since 1990, the fragile nature of the health care system in Detroit and the vulnerability of the population could combine to produce catastrophic results. The table below indicates the trend in new communicable disease cases for Detroit residents.

Disease	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Chicken Pox	23	15	10	4	9	8	12	12	29	10	15	6
Influenza	2266	240	316	333	688	682	462	1821	2249	4944	4196	4231
Hepatitis (A, B, and C)	1400	1531	1577	1514	1300	1365	1267	2593	2353	1708	1263	2889
HIV/AIDS	479	115	11	228	181	364	325	340	328	301	289	
Tuberculosis	39	52	54	37	42	28	23	35	23	23	29	16
Totals	3,963	1,953	1,968	2,116	2,220	2,447	2,089	4,801	4,982	6,986	5,792	7,142

Source: Detroit Health Department, Recorded Cases of Selected Communicable Diseases and the Michigan Disease Surveillance System

During the 2021 plan update, it was found that updates to the following statistics and data were not available. It was assumed that the best available data was represented in the previous plan update. Although the number of reported cases steadily increased up until from 2017 to 2018, the decrease in total reported cases that occurred in 2018 to 2019 suggests that Detroit is susceptible to fluctuations that are based on increases in cases reported for individual diseases.

In addition, human immunodeficiency virus (HIV) if left untreated, a person can eventually develop AIDS, also known as HIV Stage 3, which is the most serious stage of HIV infection. However, in 2018, Detroit had the four times the state's average of HIV cases. The latest numbers of people living with HIV is 7,165 in 2019. According to the Michigan Statewide HIV Surveillance Report, the rate of people living with HIV per 100,000 is 719 compared to the 163 per 100,000 statewide since 2019.

Poor economic and health status are most vividly demonstrated when comparing Detroit to other parts of Michigan. For example, 35.02% of Detroit's population has an income below the poverty level, as compared to 15.6% of Michigan's population. Overall life expectancy in the state is 77.8 years, compared to 77.3 years in Detroit. The implications of high rates of poverty for the health care system are profound. Income is inversely related to health status: the lower one's income, the higher the incidence and severity of illness, injury, or death. In addition, low- income individuals

are more likely to be uninsured or to rely on public sources of financing for health services. Since the public health has seen the introduction of the Affordable Care Act, a healthcare law requiring all citizens to carry insurance or face a penalty, will undoubtedly help but will not be the solution to the health care crisis. There will still be individuals that haven't applied or still can't afford the insurance being offered. The high unemployment rates of Detroit make this problem worse. Considering these circumstances, a public health emergency in Detroit, could be devastating.

Many diseases causing morbidity and complications that can lead to death are vaccine preventable, yet Michigan has a high rate of exemptions. During the 2012-2013 school year almost 6% of children enrolled in kindergarten had claimed vaccination exemptions according to the CDC. Of that, 5.3% of exemptions were due to non-medical reasons. These numbers represent the best available data through the CDC due to updated data not being available for the 2021 plan update. With the current Coronavirus Pandemic (COVID-19) outbreaks nationwide and globally it clearly demonstrates how these diseases occur causing unnecessary mobility and mortality.

Significant Public Health Emergencies in Detroit

The following chart provides a description of public health emergencies that have implications for the City of Detroit. Although some of the emergencies may have started outside the city, each had the potential to inflict harm on Detroit residents.

Date	Emergency	Summary of Impacts
2020-Ongoing	Coronavirus (COVID-19) Nationwide	Coronavirus disease 2019, commonly called COVID-19, is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease was first identified in December 2019 in Wuhan, Hubei, China, and has since been traced back to an open animal market. COVID-19 is an ongoing pandemic at the time of this plan update At the end of 2021, there were over 300 million cases reported, with more than 5 million deaths globally. In the United States alone, there were over 60 million cases and 800,000 deaths.
2009-2010	H1N1 Pandemic Influenza	Initially coined an "outbreak", the stint began in the state of Veracruz, Mexico in April 2009, with evidence that there had been an ongoing epidemic for months before it was officially recognized as such. The Mexican government closed most of Mexico City's public and private facilities in an attempt to contain the spread of the virus; however, it continued to spread globally, and clinics in some areas were overwhelmed by infected people. In late April the World Health Organization (WHO) declared its first ever "public health emergency of international concern," or PHEIC, and in June the WHO and the U.S. CDC stopped counting cases and declared the outbreak a pandemic. The City of Detroit monitored for cases of this novel influenza strain during the spring and summer. The Centers for Disease Control and Prevention (CDC) released Strategic National Stockpile (SNS) assets, including antivirals and personal protective equipment; Detroit utilized antivirals to treat and provide prophylaxis to suspected or confirmed cases, as well as immediate family members. In the Fall of 2009, the CDC released the first wave of influenza vaccine that was formulated specifically for H1N1. The City of Detroit undertook a massive vaccination effort, focusing on school aged children, as well as middle-aged adults (which this particular strain of flu affected with an unusually high number). Mass vaccination operations continued through January 2010, when the cases began to drop off and attendance at flu clinics dropped off. The CDC and WHO declared the pandemic officially over in August 2010, although H1N1 strains continued to be included in seasonal influenza vaccines for the next several years. It should be noted that while infection and death rates for H1N1 closely resembled those of typically influenza, the media and government interest resulted in a much higher level of health

Date	Emergency	Summary of Impacts
		and medical system response. While existing systems were not taxed by this response, the effort was much higher, most time consuming, and more costly than typical seasonal influenza responses.
2008	Communicable Disease Epidemic	Influenza is an example of a potential public health emergency of very large proportion. No one knows when the influenza virus might shift its structure in a major way to produce a virus to which no one will be immune. Influenza can extract a terrible toll on communities. During a typical influenza season, approximately 200-500 people in Michigan might die from it. In 2000, 218 people in Detroit died from influenza and pneumonia. During the next worldwide influenza epidemic, as many as 10-100 times that many might die without an adequate and well-organized public/community health care system to combat the disease. As hard as the world public health community is trying to conduct influenza surveillance in order to provide the most advance notice possible, if pandemic influenza were to strike, it would likely do so very early in the season and spread so rapidly that preparation would need to be done on an emergency basis. Because of the health status of its citizens, Detroit would be hit hard by an influenza outbreak.
2001 to 2003	Communicable Disease Epidemic	The West Nile Virus arrived in Michigan in August 2001. Transmitted to humans by the bite of an infected mosquito, WNV is commonly found in Africa, Central Asia, and the Middle East. Mosquitoes are carriers of the disease that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals they bite. About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent. In 2002, Michigan reported 614 cases of WNV and 51 fatalities. In 2003, as of November 5, the number of reported cases dropped to 8, and the state only reported 1 fatality. Federal and state governments reduced the number of cases through public education, mosquito prevention and control programs, WNV monitoring and testing procedures, and a nation-wide electronic database.
1990 to 2000	Communicable Disease Epidemic	The Human Immunodeficiency Virus (HIV) is the virus that causes immune deficiency syndrome or AIDS. HIV attacks the cells of the immune system, weakening the body and making it unable to fight other diseases. The disease is transmitted by sexual contact, sharing hypodermic needles, from a mother to an unborn child, accidental punctures from contaminated

Date	Emergency	Summary of Impacts
		needles, and contact between broken skin and infected body fluids. In the Detroit metropolitan area, the total number of persons diagnosed with HIV was about 1,400 in 1990. Although deaths caused by HIV have decreased since 1990, the number of Detroit residents living with HIV increased to 6,060 in 2000.
1990 to 2000	Communicable Disease Epidemic	Hepatitis is a virus that infects the liver, normally through blood-to-blood contact. There are several types of the virus, including Hepatitis A, B, and C. The number of cases of Hepatitis has been increasing in Detroit since 1990. In 1990, 84 cases of Hepatitis A, B, and C were diagnosed. In 1999 the number of cases increased to 879, a tenfold increase. Diagnosed cases of Hepatitis decreased in 2000 to 413.
August 1998 to February 1999, Multiple States	Foodborne Pathogenic Contamination	A multi-state outbreak of Listeriosis that occurred from August 1998 to February, 1999, had its origin at a Bill Mar Foods meat plant in Zeeland. (Listeriosis is caused by the foodborne bacterium *Listeria monocytogenes* – commonly call Listeria – that can cause serious illness and death to pregnant women, newborns, older adults, and persons with weakened immune systems.) Health officials identified the vehicle for transmission of the Listeria bacterium as hot dogs and deli meats produced at the plant under numerous brand names. The exact source of the contamination has not been determined. A total of 21 deaths and 100 illnesses nationwide have been linked to the contaminated meats. In December 1998, 35 million pounds of hot dogs and deli meats were voluntarily recalled by the manufacturer – the largest meat recall in U.S. history. Once the recall was instituted, the number of illnesses caused by the outbreak decreased dramatically. The Zeeland plant was allowed to resume meat production in March 1999 after more stringent food safety procedures were implemented.

Source: Detroit Department of Health and Wellness Promotion

Impact and Analysis

A public health emergency can have significant impacts on the availability of first responders, healthcare personnel, and other emergency operations staff. These professionals can be easily exposed to pathogens or individuals carrying a virus, especially if there is not sufficient personal protective equipment (PPE) available or PPE protocols in place. Local hospitals and care facilities may experience a rapid increase in patients seeking care, potentially overwhelming capabilities.

Public health emergencies tend to have widespread impacts on many populations, but some residents are more at risk of complications than others. At-risk populations may include:

- Adults 65 years and older
- Pregnant women and women up to 2 weeks from the end of pregnancy
- People with chronic medical conditions (i.e. asthma, heart failure, chronic lung disease, obesity, etc.)
- People with compromised immune systems (i.e. diabetes, HIV, cancer, etc.)

Some communicable diseases may also pose a greater risk to children under 2 years old or people receiving certain medications or therapies. It is important to note that there are significant racial and ethnic disparities in the potential impact of a public health emergency. Inequities in the social determinants of health put some groups at increased risk of getting sick or dying, as was the case during the global COVID-19 pandemic.[11] Some factors influencing this risk include:

- **Healthcare access and utilization:** those without access to adequate insurance, or those with limited access due to a lack of transportation, child care, the ability to take time off work, or language and cultural barriers.
- **Occupation:** people in "essential work settings" such as healthcare facilities, emergency operations, farms, factories, grocery stores, and public transportation will be in close contact with the public during a public health emergency. Additionally, individuals with limited paid sick days may feel pressured to come to work even if they are symptomatic or live with some showing symptoms.
- **Education, income, and wealth gaps:** people with limited job options, due to lower school completion rates or barriers to college, have less flexibility to leave jobs that put them at greater risk of exposure. Individuals with lower incomes cannot afford to miss work and/or do not have adequate savings.
- **Housing:** people living in more crowded housing may find it more difficult to avoid close contact or exposure. Additionally, people with lower incomes are at risk of eviction, shared housing, or homelessness.

[11] https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html

The greatest risk to critical infrastructure is the availability of personnel to properly maintain and operate infrastructure. The staff themselves may become ill or need to attend to family members or others who are ill. Additionally, jurisdictions and companies responsible for managing critical infrastructure will need to have adequate protocols in place to protect workers from exposure while at work.

Detroit and other cities across the nation have increasingly fragile health care systems because of a concentration of patients who have limited resources. However, according to a 2018 survey conducted by the University of Michigan, only 8.7%of Detroit residents lack health insurance. Nearly a third of residents receive health care insurance from their employers or through school. Another third of the population is insured by a government program, most by Medicare. Nearly 10% of insured residents use a health exchange or purchase directly from an insurance provider. More than half of insured Detroit residents visit a doctor's office, while 10.3% utilize a health center clinic, 6.8% utilize urgent care clinics, and 6.1% utilize a hospital outpatient department when seeking health care. Alarmingly, one in five Detroiters (17.2%) report that they typically go to the hospital emergency room when they feel sick. This choice for emergency room service is more common among those who do not have health insurance.

Yet despite how the majority of Detroit residents have health insurance, many continue face barriers to accessing health care. Close to 30% of Detroit residents report facing some barrier to receiving health care back in 2018. The top two barriers to receive care include problems related to insurance or affordability issues. Other impediments to care include fear of doctors, language barriers, and encountering unfair treatment based on race, age, gender, or some other form of prejudice opinion by their health care provider.

All barriers to health care cause disruption of service to individuals seeking medical assistance which can ultimately exacerbate the issue at hand. Therefore, to reduce the impact of public health emergencies, such as communicable disease outbreaks, the City of Detroit created the Public Health Emergency Preparedness/City Readiness Initiative (PHEP/CRI) program. The goal of this program is to provide the residents of Detroit with community preparedness, emergency public information and warning, medical reserve corps recruitment, medical countermeasure administration, and dispensing of medication.

2-9. CIVIL DISTURBANCE (#8)

Hazard Description

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; 7) a celebration of an important victory by a sports team; or 8) a prison uprising resulting from perceived injustices by inmates regarding facility rules, operating policies and/or living conditions. Prison uprisings may also result from insurrections started by rival groups or gangs within the facility.

Significant Civil Disturbances in Detroit

As a heavily populated city, Detroit has experienced several significant civil disturbances over the past 78 years. The following provides a brief description of these events. At the time of the 2021 plan update no additional incidents were noted.

Date	Incident	Summary of Impacts
1943	Riot	On June 20-21, 1943, a series of small, racially motivated skirmishes in Detroit resulted in a riot involving upwards of 100,000 people near downtown Detroit. The riot quickly overwhelmed city and state police, so Federal troops in armored cars were brought in at Governor Harry Kelly's request to help restore order. The riot was quelled after more than 36 hours, but not before it claimed 34 lives and caused over 700 injuries. More than 1,800 arrests were made.
1967	Riot	One of the most destructive riots ever in the United States occurred in Detroit from July 23-30, 1967. This uprising resulted in the greatest loss of life and the largest destruction of property of any of the national riots of the 1960s. Looting, burning, and sniping reached a scale unknown to that point in a U.S. city in the twentieth century, matched only by the 1863 New York City draft riots. The violence erupted when police raided an illegal after-hours drinking club (a "blind pig"), arresting numerous patrons and the bartender. Shortly thereafter, a crowd that had gathered began to loot nearby stores. Within an hour, the looting had spread to a 16-block area, with many stores having been plundered and set afire. Police estimate that over 5,000 persons were actively involved in the rioting, which quickly engulfed large sections of the city - as much as six to seven miles out from the initial flash point. Over 150 fires consumed a 15-block area and burned uncontrolled when firefighters were forced to withdraw after being pelted by objects. In response to the rioting,

Date	Incident	Summary of Impacts
		Governor Romney declared a state of public emergency, mobilized nearly 8,000 National Guardsman and several hundred Michigan State Police troopers to assist in restoring order, and requested supplemental Federal military assistance. Nearly 5,000 Army paratroopers were dispatched to Detroit to assist the National Guard and state and local police units. All totaled, over 13,000 military troops, guardsmen and police worked to quell the disturbance. Over 7,000 people had been arrested for their participation in the incident, 43 people had been killed, and over 1,000 had been injured. Five thousand had been left homeless. Over $50 million in damage had been incurred due to the fires and looting.
Various	Labor Disputes	In the 1960s and early 1970s, strikes between the United Auto Workers Union and the major automobile manufacturing companies headquartered in the state (General Motors, Ford, Chrysler and American Motors) occasionally led to clashes with police. These strikes primarily affected Detroit, Flint and Lansing.
1980's and 1990's	Sports Championship Riots	The success of Detroit's professional sports teams in the 1980s and early 1990s was unfortunately marred by violence and rioting that garnered significant national attention. After the Detroit Tigers won the 1984 World Series, the ensuing celebration turned ugly when cars were overturned and burned, and nearby homes and businesses damaged. In 1990, after the Detroit Pistons won their second NBA Championship, the "celebration" following the victory resulted in eight deaths and numerous injuries. These two incidents were widely covered by the national media and tarnished Detroit's image at a time when it should have been able to enjoy in its sports success peacefully. Detroit's record for controlling sports riots has improved dramatically since the 1990's. When the Pistons won the NBA Championship in 2004, the city remained calm, and violence was kept to a minimum.

Impact and Analysis

Although destructive civil disturbances have been rare in Detroit, the potential always exists for an incident to occur. Although deaths caused by civil disturbances have been minimal since the 1990's, the potential threat to human life has been demonstrated.

Unfortunately, civil disturbances are most often a "lose-lose" proposition for everyone concerned. Rarely, if ever, does the group perpetrating the disturbance ever fully achieve their anticipated aim – whether it be to achieve some type of "victory" for a particular cause, end a certain type of governmental law, program, or practice, or gain some type of financial "reward". In fact, it is often the aggrieved that are the real losers in the end. History has shown that communities, like Detroit, that experience a large-scale civil disturbance rarely ever fully recover from the damage, destruction, business and service losses, and negative notoriety from the incident. Decades after these

incidents occur, the impacted communities are still struggling to get back to where they were before the disturbance. New development efforts are usually very difficult. If private investment does return to the impacted area, it is often slow to come and usually requires some type of accompanying governmental assistance program or initiative as an incentive.

The local governmental units are also losers, as they are left to pick up the pieces in the aftermath – cleaning up the area, re-establishing services, repairing or replacing damaged public facilities and infrastructure, and trying to restore some level of citizen and private investor confidence in the community. Those are often daunting tasks, and rarely are the ones that the community can handle by itself without significant Federal and state assistance. For these reasons, preventive steps intended to respond to legitimate grievances can help to alleviate the potential for damage caused by civil disturbances.

As for prison uprisings, studies have shown that overcrowding is one of the major causes, especially in the hot weather months during the summer. Overcrowding often requires the implementation of tighter controls within the prison facilities, and these controls are often unpopular with the prison population. Prison facilities within the City of Detroit must address prison uprising issues in their emergency preparedness efforts in the event they are called upon to assist the Michigan Department of Corrections in responding to an incident.

2-10. PUBLIC TRANSPORTATION ACCIDENTS (#9)

Hazard Description: Air Transportation Accidents

There are four circumstances that may result in an air transportation accident: (1) an airliner colliding with another aircraft in the air; (2) an airliner crashing while in the cruise phase of a flight due to mechanical problems, sabotage, or other cause; (3) an airliner crashing while in the takeoff or landing phases of a flight; or (4) two or more airliners colliding with one another on the ground during staging or taxi operations. When responding to any of these types of incidents, emergency personnel may be confronted with several problems, including:

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

In addition to providing these services to Detroit City Airport, emergency personnel from Detroit may provide assistance during such incidents at Detroit Metropolitan Airport in Romulus. According to the National Transportation Safety Board (NTSB), 47 accidents occurred at Detroit City Airport between 1984 and 2021. This includes one fatality in 1985, and three fatalities during one incident in 1991.

Hazard Description: Land Transportation Accidents

A land transportation accident in Detroit could involve a commercial intercity passenger bus, a local public transit bus, a school bus, or an intercity passenger train. Although these modes of land transportation have a good safety record, accidents do occur. Typically, bus accidents result when the bus slips off a roadway in inclement weather or collides with another vehicle. In Detroit, the school district operates nearly 900 bus routes daily during the school year. Intercity passenger train accidents usually involve a collision with a vehicle attempting to cross the tracks before the train arrives at the crossing. Unless the train accident results in a major derailment, serious injuries are usually kept to a minimum. Bus accidents can be quite serious, especially if the bus has tipped over. Serious injuries are a real possibility in these types of situations. A recent addition to the city is the QLINE, previously known as the M-1 Rail streetcar system. Since coming on line there several reported accidents with pedestrian motor vehicles; however, to date there have been no fatalities reported.

Below is a list of reported public transportation accidents from 1985-2021.

Passenger Transportation Accidents in Detroit		
Date	Type of Accident	Summary of Impacts
March 2019	QLINE and SUV	According to QLINE spokesman Dan Lijana, the crash happened at Woodward and Lothrop, near East Grand Boulevard. He said early indications are that the accident occurred because of an SUV making an illegal left turn. The crash also slowed service for the QLINE light rail system as police responded to the scene. No injuries have been reported.
February 2018	QLINE and Car	Detroit's QLINE streetcar was momentarily out of service due to an accident Monday after a car parked too close to the tracks because of the snow -- a practice that's been causing significant delays this week. QLINE spokesman Dan Lijana said the streetcar struck a vehicle's side mirror while traveling northbound on Woodward at Willis Street. The service delay lasted for about 30 minutes, as they waited for a tow truck to arrive and assess the situation. There were no injuries and minor damage to the QLINE streetcar, Lijana said.
November 2017	QLINE and Bus	The QLine in downtown Detroit was shut down for several hours Monday after a collision involving a bus, car, and the QLine that injured three people. Police said three people were injured in the crash and all injuries are considered not life threatening. It's unknown which vehicle the three people were in when they were hurt. QLine service was shut down as police investigated and worked to clear the accident. It was cleared around 4:15 Monday.
July 2017	QLINE and SUV	After two months of operation, a QLine streetcar was involved in its first accident Monday afternoon, a minor wreck that occurred when a silver, four-door Jeep turned in front of it. No one was injured in the 3:15 p.m. collision. The streetcar, one of five running at the time, was taken to the railway garage and was back in operation within 30 minutes, said QLine spokesman Dan Lijana. It sustained slight damage to its front. The accident occurred at Woodward Avenue and Ferry Street, when the Jeep turned east onto Ferry, clipping

Passenger Transportation Accidents in Detroit		
Date	Type of Accident	Summary of Impacts
		the streetcar in the process. The Jeep took damage to its passenger side.
May 2004	City Bus	A Detroit Department of Transportation hit a Cadillac driven by an 83-year old woman while she was attempting to make a turn. The car careened out of control and struck two women who were walking along the sidewalk. One of the pedestrians was killed and the other sustained serious injuries. Neither the woman in the Cadillac nor the 12 people on the bus were injured.
January 2004	City Bus	A Detroit city bus driver passed out while driving the vehicle, lost control, and hit another a SMART bus. Upon impact, the Detroit bus jumped a curb, ran over a bus stop bench, and hit a utility pole. Four passengers on the Detroit bus were injured and taken to the hospital. Three of the four passengers were treated for minor injuries and later released. A 91-year old woman who bumped her head in the crash was held at the hospital overnight and released the next day.
January 2001	City Bus	A Detroit couple was hospitalized, but 45 children avoided serious injury when their bus skidded on ice and rolled into a mini-van. The accident left the driver in critical condition, and his wife in stable condition.
March 2000	School Bus	A 10-year old girl was killed after being dragged by a school bus for 35 feet. Police believe the sleeve of her coat may have been caught in the door of the bus. After being taken to the hospital, the girl died the next day.
November 1997	School Bus	A car plowed into a bus, sending 55 children to local hospitals. The speeding driver of the car died when his car burst into flames. The bus was headed to an elementary school in Detroit.
November 1997	School Bus	Five Detroit children and a bus driver were hospitalized for minor injuries after a car slammed into their bus, which tipped over. The students were heading home after a half-day of school at a local elementary school.
July 1991	Commercial Aircraft	A Learjet taking off from Detroit City Airport crashed into some trees approximately 200 feet beyond the runway, killing 2 crew members and one passenger.
November 1985	Commercial Aircraft	The pilot of a Cessna air taxi was killed when his aircraft struck some trees while attempting a landing at City Airport.

Source: National Transportation Safety Board, Detroit Free Press

Hazard Description: Water Transportation Accidents

A water transportation accident involving the truck ferry that travels from Detroit to Windsor could have life safety consequences. The ferry crosses the Detroit River on a schedule basis in 20 minutes. In a typical year, the truck ferry makes hundreds of

trips across the river. Although the vessels have an excellent safety record and must pass rigorous Coast Guard inspections, the potential for an accident is always present.

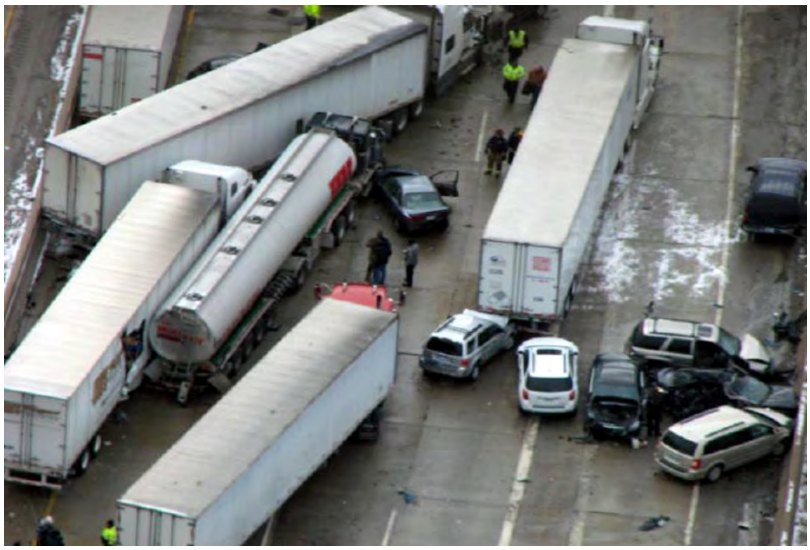
Impact and Analysis

Air Transportation Accidents

Statistics from the NTSB and the airline industry show that the majority (over 75%) of airplane crashes and accidents occur during the takeoff or landing phases of a flight. As a result, developed areas adjacent to major airports and in airport flight paths are vulnerable to this hazard. If Detroit is successful in attracting more airlines and passengers to Detroit City Airport, the number of takeoffs and landings will increase, thus increasing the probability of a crash or accident. The challenge for will be to remove obstructions that stand in close proximity to the airport, such as trees, and that could result in accidents during takeoffs and landings. The City will continue to develop exercises and procedures, attend training and purchasing equipment to respond to a mass casualty incident.

Land Transportation Accidents

Several carriers provide passenger, charter, commuter, and special bus service to the residents of Detroit. Detroit is also the home of an intercity rail passenger system. Although these modes of transportation have an excellent safety record, the combination of large numbers of passengers, unpredictable weather conditions, potential mechanical problems, and human error leaves open the risk of a transportation incident involving multiple casualties. Because of the number of passengers served by land transportation systems, Detroit will continue to build its capabilities for a possible land transportation incident that involves multiple casualties.



Source: CBS Detroit, Multi vehicle accidenI-75 Rouge River Bridge 2013

Water Transportation Accidents

Detroit is serviced by one truck ferry that travels between Detroit and Windsor, Ontario. This service has a good safety record, having never suffered a serious

accident that resulted in loss of life or property. Nonetheless, given the number of trips that are made across the Detroit River each year, the possibility of a water transportation accident is always a possibility. Furthermore, should such an accident occur, the often-turbulent river, coupled with the size of the vehicles being transported, could pose tremendous obstacles to carrying out an effective water rescue and recovery operation.

The U.S. Coast Guard, local law enforcement marine safety units, and the ferry operator would provide primary rescue response to a ferry accident. These agencies are highly trained and skilled in water rescue operations, but their resources may not be sufficient or their efforts timely enough to save lives and the vehicles involved. Even with on-board lifesaving equipment, some loss of life would likely be inevitable, especially in inclement weather or with rough waters on the river.

Financial Impact

On average, the City of Detroit experienced 92 public transportation accidents per year at a cost of $6.68 million per year from 1994-2005. This represents a serious drain on the City's resources that could be mitigated through accident prevention strategies. New statistical data was not available. As of the 2021 plan update additional comprehensive annual data was unavailable for plan incorporation.

2-11. PETROLEUM AND NATURAL GAS PIPELINE ACCIDENTS (#10)

Hazard Description

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

According to the U.S Energy Information Administration, the Antrim Field in the northern portion of the Lower Peninsula contains most of Michigan's natural gas reserves, and the state holds about 0.3% of U.S. total proved reserves. Michigan's natural gas production declined annually from its 1997 peak of nearly 312 billion cubic feet to slightly less than 84 billion cubic feet in 2019.

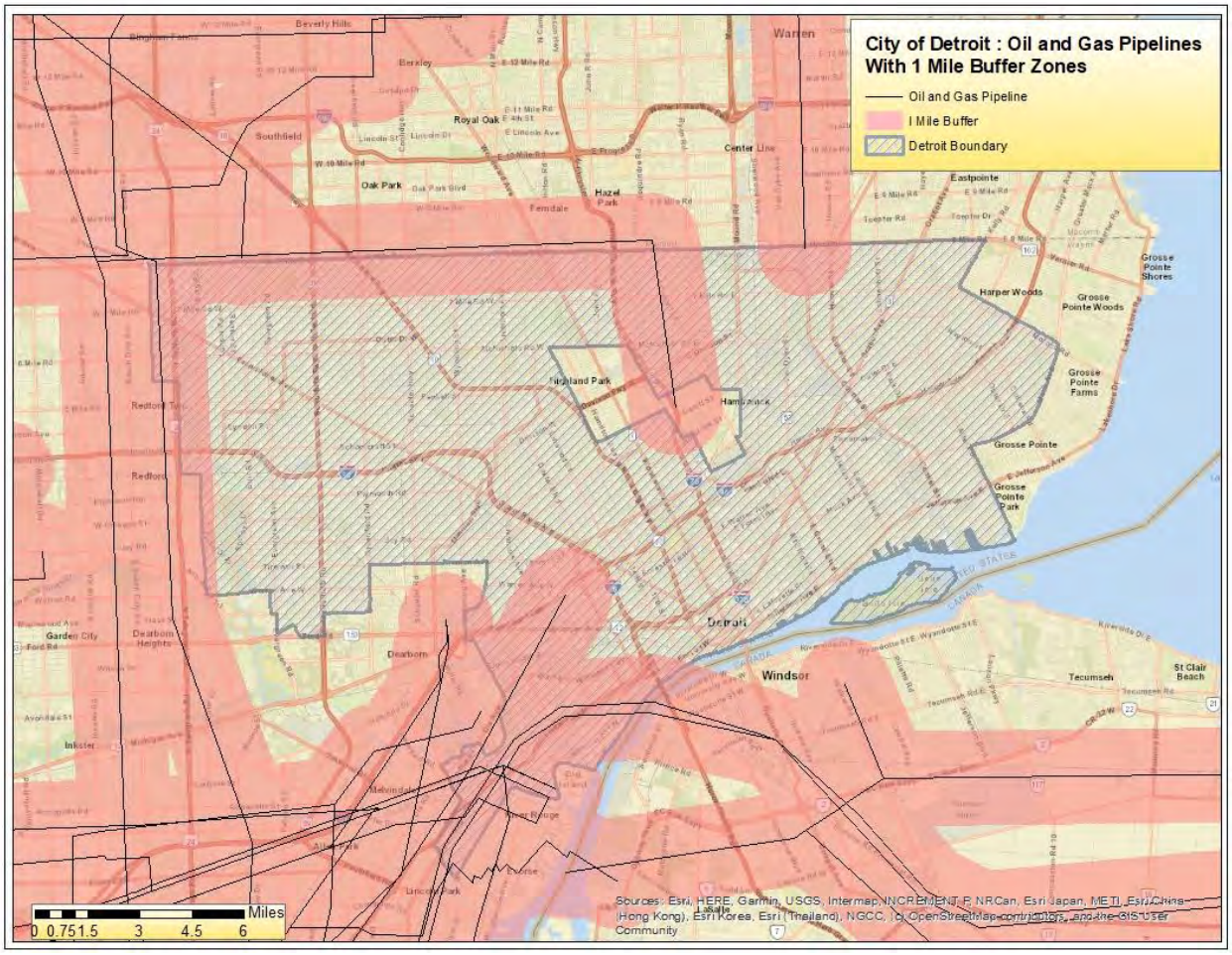
Several interstate pipelines cross Michigan and there are also five U.S.-Canadian natural gas pipeline border crossings, but the state does not have any natural gas market hubs. Natural gas enters Michigan from Ohio, Indiana, and Wisconsin. While a small amount of natural gas also arrives by pipeline from Canada, the bulk of the natural gas flowing across the border goes into Canada, most of it at St. Clair, located northeast of Detroit. Smaller volumes of natural gas also intermittently enter Canada at the Detroit, Sault Sainte Marie, and Marysville border crossings. More natural gas enters the state than is consumed there and most of the excess is exported to Canada.

Some of the natural gas that Michigan receives or produces is injected into underground natural gas storage fields. Michigan has the largest underground natural gas storage capacity in the nation at nearly 1.1 trillion cubic feet, which is almost one-eighth of the U.S. total. The state has 44 natural gas storage fields, the second-largest number after Pennsylvania. During high demand periods, typically between November and April, natural gas is withdrawn from storage to meet increased demand for space heating. Much smaller volumes of natural gas are withdrawn from storage in summer when natural gas-fueled power generation increases to meet cooling demand.

In 2019, Michigan's total natural gas consumption was 12 times greater than the state's natural gas production. The residential sector, where more than three-fourths of Michigan households use natural gas as their primary source for home heating, is the largest natural gas consumer, accounting for about one-third of the state's natural gas use. Michigan routinely ranks among the top five states in residential use of natural gas and in the top 10 for total natural gas consumption by all sectors combined. The electric power sector is the second-largest consumer of natural gas in the state and has been since 2016, making up three-tenths of gas consumption. Natural gas use by the state's electric power sector reached a record high in 2020. The commercial sector and the industrial sector each account for slightly less than one-fifth of the state natural gas consumption.

Michigan is both a major consumer and producer of natural gas and petroleum products. According to the Michigan Public Service Commission (MPSC), approximately 25% of the natural gas consumed in Michigan is produced within the state. Five interstate pipeline companies that have access to the major natural gas producing regions in North America import the remaining 75%. Michigan cycles more natural gas through its storage system than any other state. Michigan ranks 17th in the nation in the production of natural gas and 6th in consumption at 921 billion cubic feet. In a report generated by the U.S. Energy Information Administration, Michigan ranks 11th among the states in total petroleum consumption. Four-fifths of the state's petroleum use is in the transportation sector, and motor gasoline accounts for almost two-thirds of Michigan's total petroleum consumption. These figures underscore the fact that vast quantities of petroleum and natural gas are extracted from, transported through, and stored in the state, making many areas vulnerable to petroleum and natural gas emergencies. Michigan's gas and petroleum networks are highly developed and extensive, representing every sector of the two industries – from wells and production facilities, to cross-country transmission pipelines that bring the products to market, to storage facilities, and finally to local distribution systems.

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



Oil and Gas Pipelines
Source: Oil and Gas Pipelines, Homeland Security and Critical Infrastructure (HSIP/HFILD) dataset

Pipeline Accidents in Detroit and Southeast Michigan

Petroleum and natural gas pipeline accidents occur with regularity, but they usually have a limited impact and are quickly and adequately handled by pipeline company emergency crews and local and state responders. According to figures released by the U.S. Department of Transportation's Office of Pipeline Safety, in 1998 (the latest year for which complete data are available) Michigan gas companies had to repair 9,300 leaking underground gas lines. That figure is double the 4,400 reported breaks in 1991. It is estimated that three-quarters of gas line breaks are caused by excavation damage. Many more gas line breaks go unreported, according to regulators from the MPSC. Michigan has had numerous petroleum or natural gas pipeline accidents in recent years that resulted in injury, loss of life, or significant property damage. loss of life, or significant property damage.

The following table provides a list of pipeline accidents that have occurred in Detroit and Southeast Michigan, Data from 2011-2020 was obtained via Fractracker Alliance at www.fractracker.org.

Pipeline Accidents in Detroit from 2011-2020		
Date	Location	Summary of Impacts
1/14/20	Detroit	On January 4, 2020, DTE gas dispatch received a call from 911 at 19:33 of an explosion at 14404 & 14406 evergreen street in Detroit, Michigan. This is a residence that is considered a 2-family flat (one structure with two residences). DTE gas first responders arrived on-site at 19:55 to investigate and terminate gas service. There were 6 individuals taking to the hospital, one with burns and 5 with smoke inhalation. Total property damage $ 30,220
12/27/18	Detroit	DTE gas' dispatch was informed of DTE electric contractor bored thru 4 inch - 50lb steel main (1way feed) hit in the middle of the main on belle isle knocking out the gas for the entire belle island. Total property damage $147,409
9/27/17	Detroit	Natural gas leak, for the DTS company. Detroit fire and arson has completed its investigation. The cause of the explosion and fire remains unknown. Total property damage $ 27,864
1/19/17	Detroit	A contractor installing telecommunications cable by directional drilling struck and punctured a 12-inch cast iron main operating at 10 PSIG approx. 280 feet west of East Grand Blvd. Investigation revealed the main to have been correctly marked. Total property damage $ 164,180
7/16/16	Detroit	On July 6, 2016 at 18:11 DTE gas was notified from 911 of an explosion at 101 W. Margaret in Detroit, MI. The DTE gas service technician arrived onsite at 18:32. When the services technician arrived, he reported that the fire had spread an adjacent homes. DTE gas coordinated with first responders to contain the incident by disconnecting the gas services at the gas main. A natural gas leak investigation was conducted and no natural gas leaks were detected. There was one injury to the occupant. Total property damage $61,697
6/10/16	Detroit	On June 10, 2016 at 17:01 DTE gas was notified from 911 that a vehicle hit a commercial building at 6800 Gratiot in Detroit, MI. The DTE gas service technician arrived onsite at 17:36 and it was confirmed that a vehicle had hit the vacant commercial building damaging the outside gas meter. This resulted in a release of natural gas. DTE gas coordinated with first responders to contain the incident. Leaking gas did ignite, and there was one injury to the driver. Total property damage $ 79,654
9/2/14	Detroit	During the process of abandoning the service line for 15253 Evanston, a DTE gas backhoe operator struck the 11/2-inch steel service line with the backhoe bucket and cracked the threads at a coupling near the main causing a natural gas leak. Total property damage $775

Pipeline Accidents in Detroit from 2011-2020		
Date	Location	Summary of Impacts
3/27/14	Detroit	At 20:07, on Thursday, March 27, 2014, DTE gas company (DTE gas) responded to a report of an explosion involving a residence at 19717 Fairport street in Detroit, Wayne County, MI. At 20:26, DTE service technician arrived at the site and confirmed the explosion and reported the gas meter was on fire. There were no fatalities; however four adults and two small children were seriously injured in the explosion. Total property damage $ 33,348
10/4/11	Detroit	On October 4, 2011, a gas leak repair order for the address of 456 Moran in Grosse Pointe Farms, Wayne County, MI was assigned to a two person crew. The crew consisted of a distribution general fitter and a service technician. The crew excavated an exposed a 6-inch cast iron distribution main. Total property damage $ 7,700 1 fatality reported
12/20/01	Southfield	A 12-inch high pressure natural gas main ruptured near a commercial strip in Southfield on the evening of December 20, 2001, injuring one person and forcing the evacuation of several businesses in the area. The explosion was apparently caused by a leak in the pipeline.
12/18/01	Waterford	An apparent early morning natural gas explosion destroyed a Waterford home on December 18, 2001 and injured two family members. The blast hurled one of the injured more than 60 feet across the street.
3/18/01	Warren	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.
9/7/00	St. Clair	A September 7, 2000 propane explosion destroyed a house in downtown St. Clair and killed an elderly occupant and a repairman working on the house. A second repairman was thrown across the street by the explosion and sustained injuries. The explosion damaged neighboring homes, but no other injuries were reported.
8/8/00	Redford	On August 8, 2000 a Redford Township couple was killed and their home destroyed by a natural gas explosion caused by a broken connection leading to the kitchen range.
8/7/00	Canton Township	A Canton Township home was destroyed in an August 7, 2000 natural gas explosion caused by a broken pipe that fed natural gas to the furnace. Two homeowners were hospitalized for injuries sustained in the blast, which also caused significant fire damage to the two neighboring homes.
2/11/00	Detroit	A natural gas explosion at a Detroit home on February 11, 2000 blew out one wall and scattered bricks onto a neighboring home. No one was home at the time of the explosion and no injuries were reported.
1/13/00	Madison Heights	A natural gas explosion destroyed a Madison Heights home on the morning of January 13, 2000, shortly after a utility

Pipeline Accidents in Detroit from 2011-2020		
Date	Location	Summary of Impacts
		service person had visited the home to check on a report of a possible natural gas leak. The service person corrected what was believed to be the problem and then left the home. Less than three hours later, the home was completely destroyed by the blast. No one was home at the time of the explosion and no injuries were reported.
5/20/92	Rochester	On May 20, 1992 a natural gas explosion occurred in a two-story commercial building in Rochester, 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.

Source: Michigan Hazard Mitigation Plan

The below table provides a 20 year statewide annual report of pipeline incidents as provided by the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA).

PHMSA Pipeline Incidents in Michigan (2001-2020)				
Calendar Year	Number	Fatalities	Injuries	Total Cost As Reported
2001	9	0	3	$870,000
2002	11	0	4	$3,429,729
2003	17	0	4	$1,915,256
2004	9	0	0	$1,184,145
2005	11	0	2	$5,029,915
2006	13	1	0	$4,376,919
2007	13	0	0	$490,442
2008	12	2	4	$3,568,977
2009	9	0	2	$2,112,749
2010	14	2	2	$846,756,725
2011	14	1	0	$40,513,230
2012	9	0	0	$2,358,064
2013	13	3	1	$2,032,775
2014	24	0	9	$11,594,023
2015	19	1	4	$12,101,717
2016	15	0	4	$8,145,161
2017	19	0	2	$9,737,365
2018	21	1	1	$4,171,479
2019	17	0	2	$19,496,201
2020	19	0	6	$10,676,144
Total	**288**	**11**	**50**	**$990,561,016**

Impact and Analysis

Petroleum and natural gas pipelines cross the entire state, from wellheads to storage sites to distribution to consumers. Major compressor stations that receive and redistribute natural gas are located at key points along the pipelines. These stations monitor and maintain pressure levels within the pipelines. In the event of a pipeline rupture, the compressor stations shut down to stop the flow of product. Many smaller compressor stations are located across the state to complete the distribution process to consumers. The state's major natural gas storage facilities are in the central part of the Lower Peninsula. Natural gas is piped into those storage facilities from Michigan wells, and from large transmission pipelines that originate in Canada, the southwestern United States, and the Gulf of Mexico area.

Petroleum pipelines carrying crude oil, fuel oil, propane, butane, gasoline and other petroleum products have their heaviest concentrations in central Lower Michigan and between Detroit and Toledo. Many of the refineries, terminals, and storage areas are in urban areas where the potential for extensive damage and threat to lives and property is greatest. The largest concentration of these facilities is found in the Detroit metropolitan area. According to recorded incidents from 1992-2021, a pipeline incident has occurred once every 1.6 years, many of the reported events are associated with individual feeder lines and private meters.

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

2-12. DROUGHT (#11)

Hazard Description

Drought is a normal part of the climate of Michigan and of virtually all other climates around the world – including areas with high and low average rainfall. Drought differs from normal arid 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 expected over an extended period, 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.

Drought differs from other natural hazards in several ways. First, it is difficult to determine the exact beginning and end of a drought, since its effects may accumulate slowly and linger even after the event is generally thought of as being over. Second, the lack of a clear-cut definition of drought often makes it difficult to determine whether one exists, and if it does, its degree of severity. Third, drought impacts are often less obvious than other natural hazards, and they are typically spread over a much larger geographic area. Fourth, due primarily to the aforementioned reasons, most communities do not have in place any contingency plans for addressing drought. This lack of pre-planning can greatly hinder a community's response capability when a drought does occur.

Droughts conditions in the Great Lakes may cause many severe impacts on the city of Detroit, including: 1) water shortages for human consumption, industrial, and business uses, power generation, recreation and navigation; 2) decline of water quality in lakes, streams and other natural bodies of water; 3) declines in tourism for water-related activities associated with the Detroit River and other local bodies of water; 4) declines in land values due to physical damage from the drought conditions and/or decreased economic or functional use of the property; 5) reduced tax revenue due to income losses in retail, tourism and other economic sectors; and 6) possible loss of human life due to food shortages, extreme heat, fire, and other problems such as diminished sewage flows, decreased water for firefighting, and increased pollutant concentrations in surface water.

Extent and Intensity

The severity of a drought depends on many factors, including the moisture deficiency, duration of drought, and the size of the affected area. The United States Drought Monitor (USDM) classifies drought by intensity, with D1 as the least intense level, and D4 the most intense.

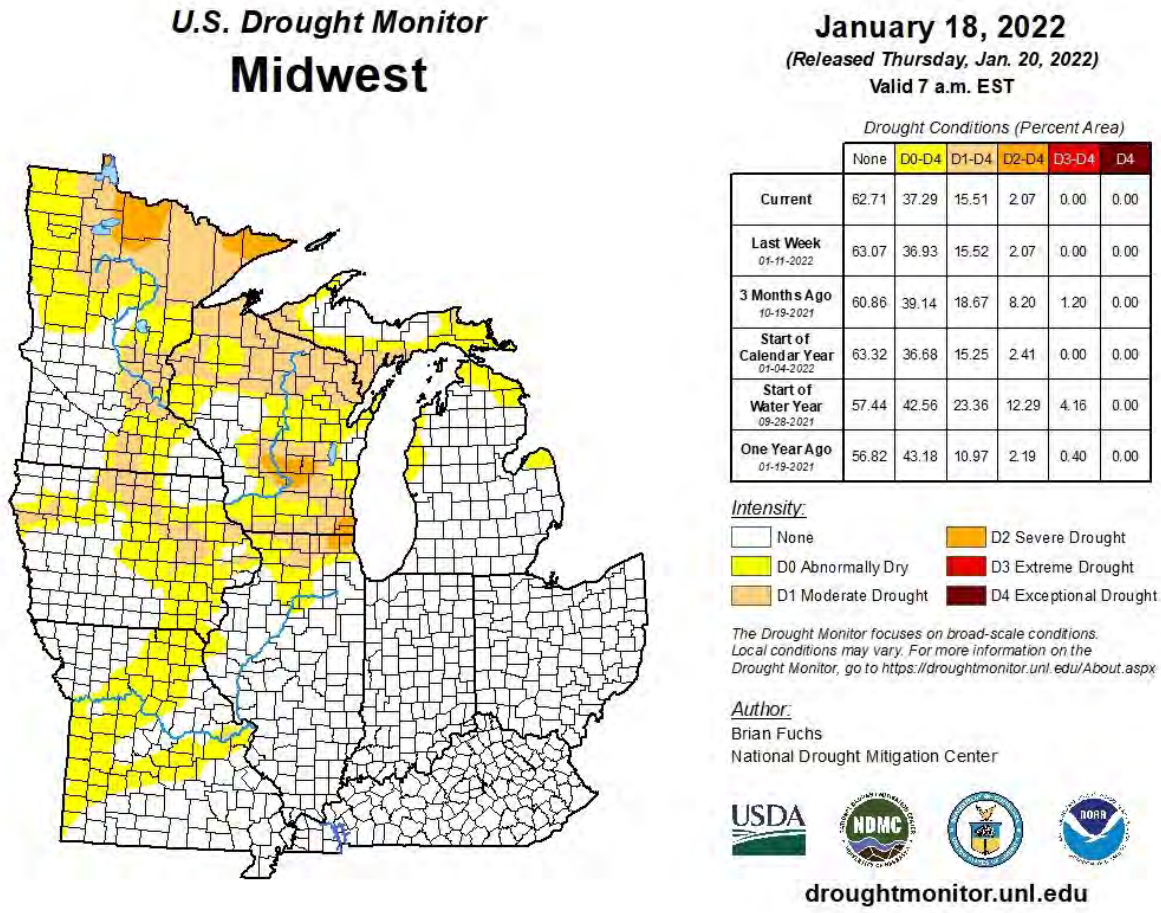
The figure below illustrates the details and key indicators behind these classifications.

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: U.S. Drought Monitor

Significant Drought Events in Detroit

Between 1951 and 1980, precipitation in the City of Detroit was well distributed throughout the year, and while drought occurred periodically, the Palmer Drought Index indicates that drought conditions reached extreme severity only 2% of the time during these years. Also, the long-term Palmer Drought Severity Index forecasts an unusual moist spell in the Detroit area. Although drought conditions are abnormal in Detroit, droughts during the 1930's, 1976-77, 1987-89, and 1998-2001, resulted in economic, environmental and social impacts as described above, including water usage restrictions.



Source: U.S. Drought Monitor Midwest Region

Impact and Analysis

The entire state is subject to the impacts of drought. However, some areas are more vulnerable to certain drought-related impacts than others. Large, urbanized areas, such as Detroit, are more vulnerable to water shortages and business disruptions due to the sheer number of water users that are competing for the limited water resources. In those areas, water management strategies typically must be implemented to deal with the water shortage problems. This being said, NCEI reports only two drought events (July 2001 and September 2002) in the Detroit area from January 1950 through September 2021, or one every 35.5 years. No deaths from drought were recorded during this time period, and property damage was limited to agricultural areas in Wayne County outside the city limits.

Despite the unlikelihood of a drought impacting the city, public health and safety concerns are numerous - everything from maintaining adequate water supply for firefighting to addressing the needs of the elderly, children, ill or impoverished individuals suffering from heat-related stress and illness. The latter is particularly problematic for densely urbanized, inner-city areas, like Detroit, because heat-related

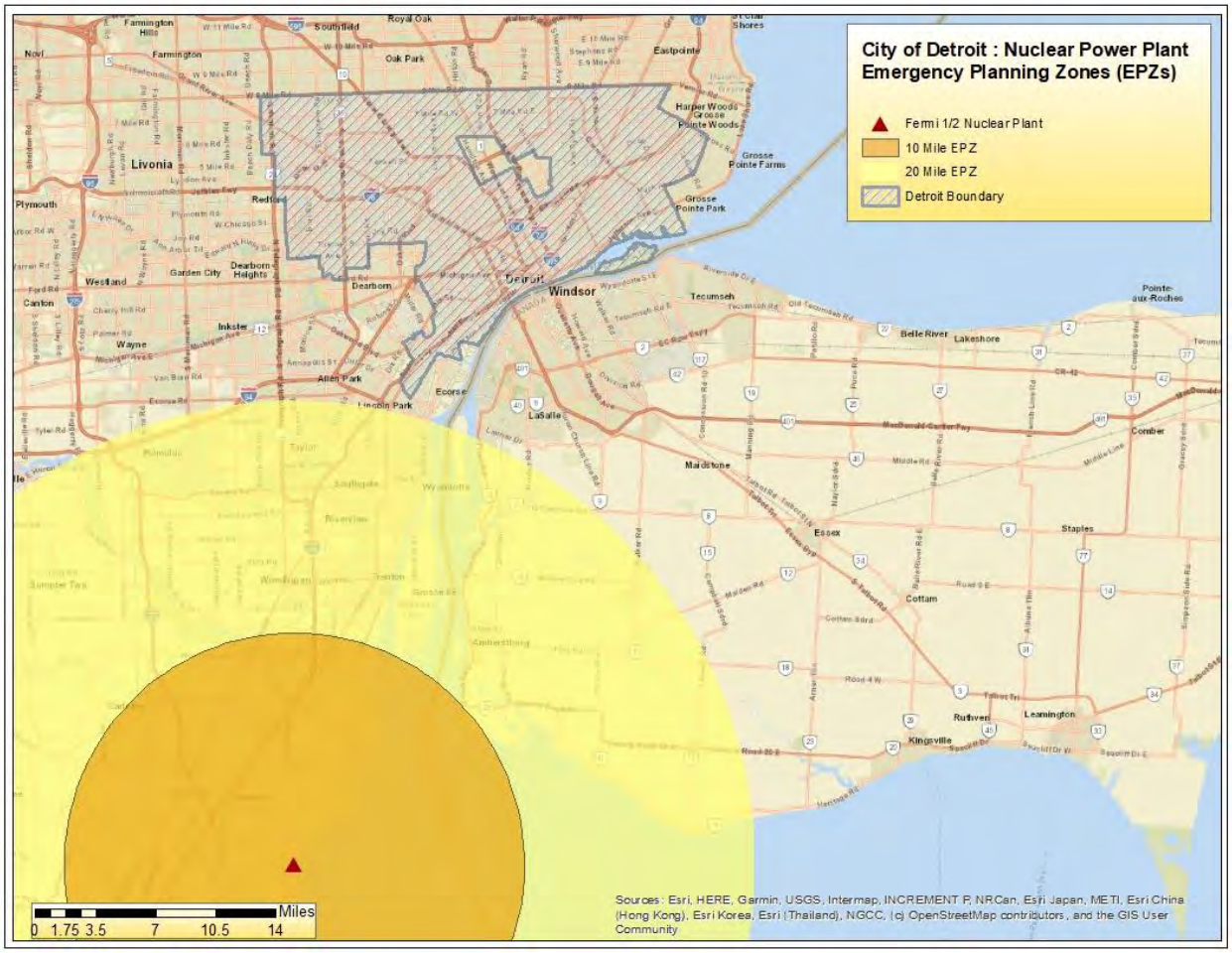
deaths occur much more frequently in those areas than in suburban and rural areas. See the section on Extreme Summer Weather for more detailed information. Due to unique variations in the drought threat, Detroit should develop and maintain drought contingency plans that focus on water supply and use management, heat-related illnesses, and continuation of industrial and business operations.

As drought is a low-profile hazard, it does not receive as much attention as it probably should from the emergency management community, governmental agencies, or the public in general. As a result, drought contingency planning is typically a lower priority activity than is planning for other types of natural hazards. Due to the lack of pre-planning, historic responses to drought have been ad hoc and typically involve the creation of special task forces or interagency groups to address drought-related issues as they arise. Once the crisis is over, little is typically done in terms of time or resource commitment in order to ease the impacts of the next drought. Part of the problem stems from the fact that drought contingency planning faces many obstacles, including: 1) lack of a single definition of drought that works in all regions of the country; 2) lack of unified, consistent policies on natural resource management (including water) among states and regions in the U.S.; 3) lack of a lead, coordinating agency for drought mitigation and planning; 4) lack of “dramatic”, high-profile impacts (i.e., property damage, casualties, debris, etc.) – which lessens the severity of drought in the minds of community decision-makers and the public; 5) the in-frequent nature of drought makes it difficult to garner support for planning and mitigation actions; and 6) the widely-held perception that, because the problem is so enormous in scope and magnitude, there is little that can be done to prevent drought or lessen its impacts.

2-13. NUCLEAR POWER PLANT ACCIDENT (#12)

Hazard Description

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 contamination 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. Response to a nuclear power plant accident requires specialized personnel who have been trained to handle radioactive materials safely, who have specialized equipment to detect and monitor radiation, and who are trained in personal radiation exposure control.



Nuclear Power Plant with Emergency Planning Zones
Source: Nuclear Power Plants, Homeland Security and Critical Infrastructure (HSIP/HFILD) dataset

Nuclear Power Plant Accidents near Detroit

On October 5, 1966, a serious incident occurred at Detroit Edison's new Enrico Fermi Atomic Power Plant near Monroe (commonly called Fermi-1). Fermi-1 was an experimental breeder reactor designed to demonstrate the feasibility of liquid fast-metal breeder reactor technology. On October 5, a metal flow guide inside the reactor broke off and blocked the flow of sodium coolant in the space below the reactor core. As a result, approximately one percent (1%) of the fuel melted. The fuel damage caused the release of some radiation into the reactor containment building; however, no off-site release occurred. The plant was eventually repaired and operated for a short period until it was permanently shut down in 1972.

This incident affected Detroit because of the potential for the release of radioactive materials. Although Detroit was not within the 10-mile radius Primary Emergency Planning Zone (EPZ) for Fermi-1, Detroit was located within the Secondary EPZ, consisting of a 50-mile radius around the plant. The Secondary EPZ exists for planning considerations that prevent the introduction of radioactive contamination into the food chain. As mentioned above, this was not a problem in the 1966 event, but the potential did exist.

Even less significant events have occurred at Fermi-2 and are reported on the Nuclear Regulatory Commission web site. For example, the utility issued an alert on March 21, 2001, because of a small fire on an emergency diesel generator bearing cover that lasted less than one minute. No other events of any description were reported for that year, no additional incidents were reported as of 2021.

Impact and Analysis

Due to the precautions developed by the nuclear power industry and surrounding communities, Detroit's history suggests that a significant accident occurs once every 40 years. No deaths or property damage have ever been recorded from a nuclear power plant accident in the Detroit area.

Emergency preparedness is required by the City of Detroit because of its proximity to the Enrico Fermi-2 plant near Monroe and the Davis-Beese Nuclear Power Station near Toledo, Ohio. Nuclear Regulatory Commission licensed facilities have various classes of emergencies, in order of increasing severity. These include the following:

- **Notification of Unusual Event**: Under this category, events are in process or have occurred indicating potential degradation in the level of safety of the plant. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
- **Alert:** If an alert is declared, events are in process or have occurred that involve an actual or potential substantial degradation in the level of safety of the plant. Any releases of radioactive material from the plant are expected to be limited

to a small fraction of Environmental Protection Agency (EPA) protective action guidelines.

- **Site Area Emergency**: A site emergency involves events in process or that have occurred that result in actual or likely major failures of plant functions needed for protection of the public. Any releases of radioactive material are not expected to exceed EPA protective action guidelines, except near the site boundary.
- **General Emergency**: A general emergency involves actual or imminent substantial core damage or melting of reactor fuel with the potential loss of containment integrity. Radioactive releases during a general emergency can reasonably be expected to exceed EPA protection action guidelines for more than the immediate site area.

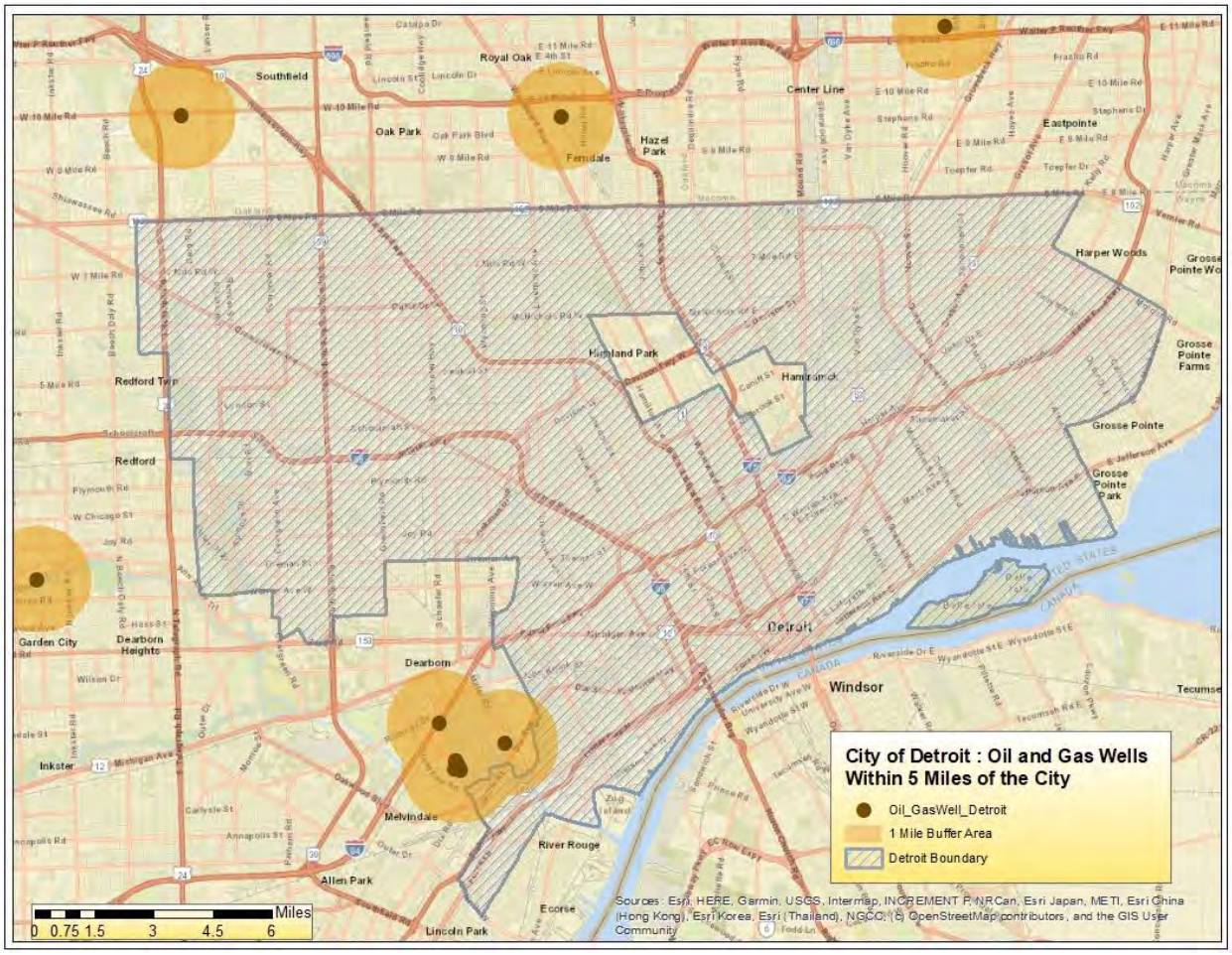
The City of Detroit must work with federal, state, and regional governments and utility personnel to ensure that the impact on the safety and wellbeing of the city's residents and the environment will be minimal in the event of a nuclear power plant accident. This coordination must include development and continual testing of emergency plans, training of response personnel, and development and dissemination of emergency public information.

2-14. OIL AND NATURAL GAS WELL ACCIDENTS (#13)

Hazard Description

Oil and natural gas are produced from fields scattered across 63 counties in the Lower Peninsula. Since 1925, approximately 60,000 oil and natural gas wells have been drilled in Michigan. Despite the industry's fine safety record, the threat of accidental releases, fires and explosions still exists. In addition to these hazards, many of Michigan's oil and gas wells contain extremely poisonous hydrogen sulfide (H2S) gas. Hydrogen sulfide is a naturally occurring gas mixed with natural gas or dissolved in the oil or brine and released upon exposure to atmospheric conditions According to Michigan Department of Environment, Great Lakes, and Energy, of the 10,652 producible oil wells in Michigan; 1,360 wells had H2S levels exceeding 300 ppm.

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



Oil and Gas Well Sites
Source: Oil and Gas Wells, Homeland Security and Critical Infrastructure dataset

According to the Homeland Security and Critical Infrastructure (HSIP/HFILD) dataset and associated mapping analysis there are 14 oil and natural gas wells located within 5 miles of the city of Detroit. Of these, 9 wells are within the 1-mile buffer area that intersects with southwest portions of the city.

Oil and Gas Well Accidents in Detroit and Michigan

The state of Michigan's Hazard Mitigation Plan suggests that Detroit has a low probability of experiencing any oil and gas well accidents because of the low number of oil and gas fields within the City's jurisdiction. However, such wells do exist within Wayne County, and an accident could have a negative impact on Detroit residents. To date, Michigan has not experienced any oil or gas well accidents that resulted in a loss of life to members of the public or that caused significant property damage. However, several recent and significant accidents have occurred that required an emergency response by the drilling company, as well as state and local officials. This includes one incident that occurred near Detroit. 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. For these types of incidents, Detroit must work closely with company officials and surrounding jurisdictions to ensure compatibility of procedures for a safe and efficient response.

Impact and Analysis

Over the years, Michigan has experienced periodic upward and downward trends in oil and natural gas production as new reservoirs were discovered and older ones became depleted. However, oil production has been declining at 5-8% per year since 1990. Natural gas production peaked in 1998 and has also begun to indicate a decline in production.

Most of Michigan's oil and natural gas wells are located in the western counties bordering on Lake Michigan, and in the central part of the Lower Peninsula. A thin band of fields also runs from Calhoun County to St. Clair County in the southern Lower Peninsula, and across the northern Lower Peninsula from Manistee County to Presque Isle County.

Michigan reaps tremendous economic and social benefits from oil and natural gas production. As with all industrial and commercial activities, those benefits come with some risks as well. Despite the best efforts of the Environmental, Great Lakes, and Energy Geological Survey Division, and the drilling companies to minimize oil and natural gas well accidents, it is inevitable that such accidents will occur from time to time. When they do, the City of Detroit must be prepared to respond to the accident, institute necessary protective actions, and coordinate with state officials and the drilling company emergency crews to effectively manage and recover from the accident. That can best be accomplished through collaborative planning, training, and exercising of emergency procedures with all potentially involved parties.

2-15. EARTHQUAKES (#14)

Hazard Description

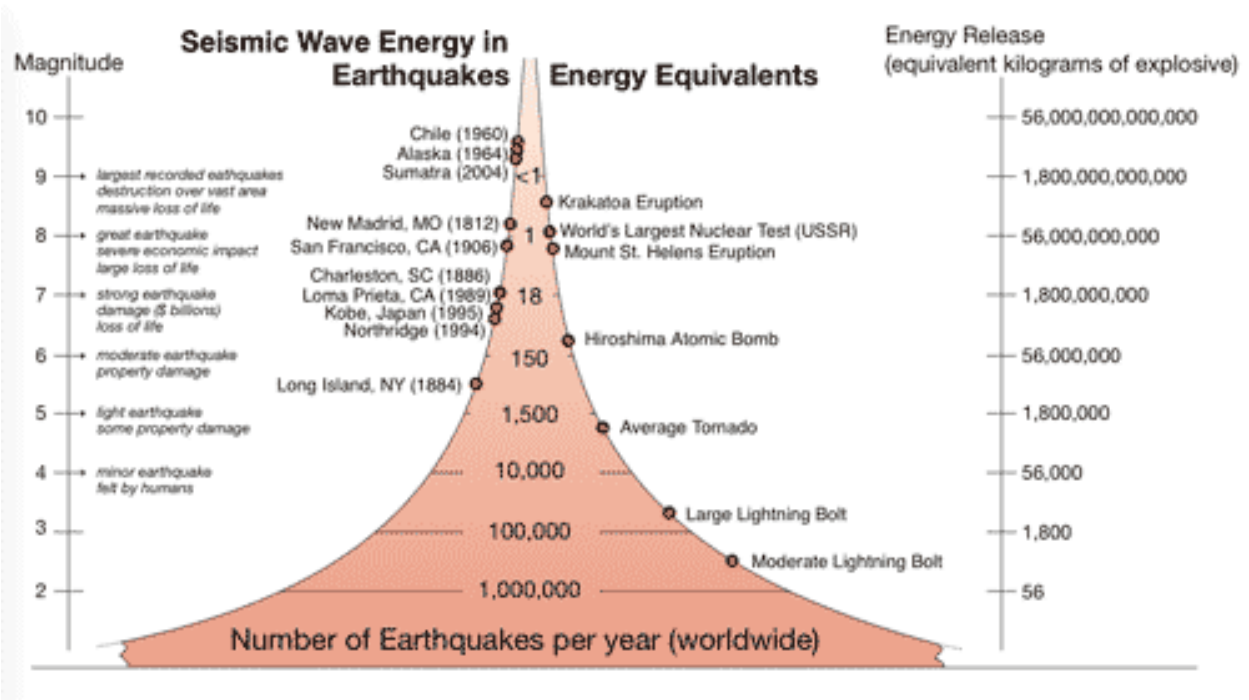
Earthquakes range in intensity from slight tremors to great shocks. They may last from a few seconds to several minutes or come as a series of tremors over a period of several days. The energy of an earthquake is released in seismic waves. Earthquakes usually occur without warning. In some instances, advance warnings of unusual geophysical events may be issued. However, scientists cannot yet predict exactly when or where an earthquake will occur. Earthquakes tend to strike repeatedly along fault lines, which are formed where large plates of the earth's crust below the surface constantly push and move against one another. Risk maps have been produced which show areas where an earthquake is more likely to occur.

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.

Extent and Intensity

There are several ways to measure the severity of an earthquake event, including magnitude, energy release, and shaking intensity.

- **Magnitude** is the physical size of an earthquake, and is expressed on a logarithmic scale, meaning each number increase in magnitude is a tenfold increase (i.e., a 6.3 earthquake has a 10x greater magnitude than a 5.3 earthquake). The Richter Scale is a commonly referenced scale for measuring magnitude but is not actually used by seismologists today.
- **Energy Release** is the amount of energy radiated by an earthquake and creating potential damage to buildings and structures, averaged over the entire event. The figure on the following page illustrates the magnitude and energy release of earthquake events, organized by their frequency.
- **Intensity** is the measurement of shaking from an earthquake event at a particular geographic location. The intensity is dependent on the distance from the fault rupture area, as well as geologic factors of the ground beneath you. Intensity is generally measured using the Modified Mercalli Intensity Scale in the United States, described in the figure on the following page.

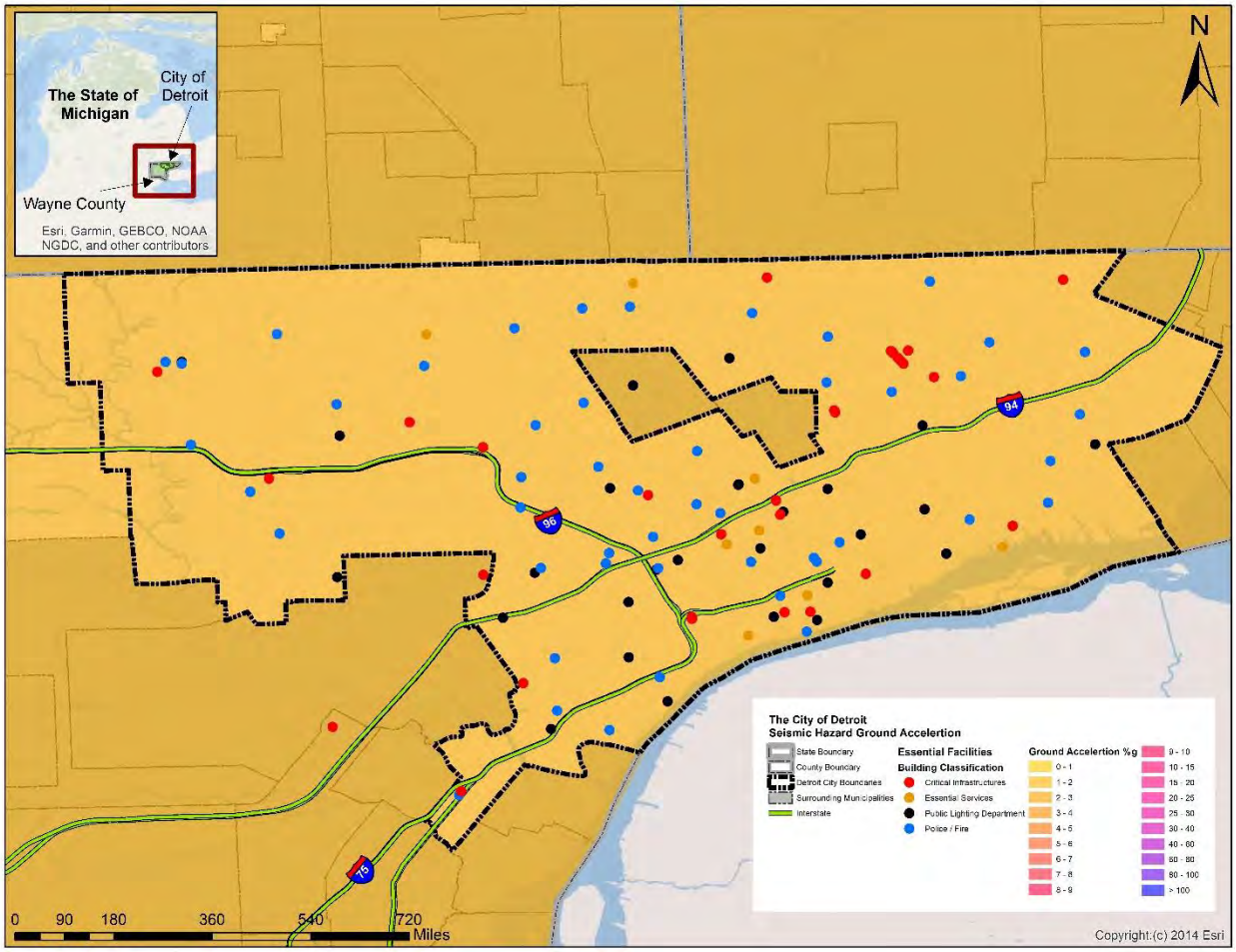


Seismic Magnitude and Energy Release

CIIM Intensity	People's Reaction	Furnishings	Built Environment	Natural Environment
I	Not felt			Changes in level and clarity of well water are occasionally associated with great earthquakes at distances beyond which the earthquakes felt by people.
II	Felt by a few.	Delicately suspended objects may swing.		
III	Felt by several; vibration like passing of truck.	Hanging objects may swing appreciably.		
IV	Felt by many; sensation like heavy body striking building.	Dishes rattle.	Walls creak; window rattle.	
V	Felt by nearly all; frightens a few.	Pictures swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of cracked plaster and cracked windows with the community.	Trees and bushes shaken noticeably.
VI	Frightens many; people move unsteadily.	Many objects fall from shelves.	A few instances of fallen plaster, broken windows, and damaged chimneys within the community.	Some fall of tree limbs and tops, isolated rockfalls and landslides, and isolated liquefaction.
VII	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly built or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread wiht increasing intensity.
VIII	Many find it difficult to stand.	Very heavy furniture moves conspicuously.	Damage slight in buildings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	Some terrible distress to the general.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X				

Modified Mercalli Intensity Scale

The map below illustrates the seismic zone for the City of Detroit based on ground acceleration (%g).



Detroit Seismic Zone Map

Earthquakes in Detroit

No severely destructive earthquake has ever been documented in Detroit or Michigan. However, several mildly damaging earthquakes have been felt since the early 1800s. The exact number is difficult to determine, as scientific opinion on the matter varies. With most of these earthquakes, damage (if any) was limited to cracked plaster, broken dishes, damaged chimneys, and broken windows. Although as recent as 2018 there were two earthquake events measuring 3.4 on the Richter scale within 10 miles of Detroit, no damages were reported. The most recent significant earthquake experienced in Detroit occurred on September 25, 1998. The earthquake's epicenter was located in northwest Pennsylvania, and it registered 5.2 on the Richter Scale, the largest magnitude of any earthquake in recent decades. The intensity of the quake diminished by the time it reached Detroit, where it measured between 2 and 3 on the Richter Scale. No injuries were reported as a result of the earthquake, but it did shake floors and furniture. In recent years, attention has focused on the New Madrid Seismic Zone, which extends from Cairo, Illinois through New Madrid, Missouri to Marked Tree, Arkansas. The New Madrid Seismic Zone is significant because scientists

predict that a catastrophic earthquake will occur within the zone sometime during the next few decades. Detroit may be somewhat impacted by such an earthquake (see Analysis and Impact), as well as by other earthquakes that are also centered outside Michigan.

Impact and Analysis

Fortunately, Michigan is not located in an area subject to major earthquake activity. Although there are fault lines in the bedrock of Michigan, they are now considered relatively stable. However, these fault lines are poorly mapped. According to the U.S. Geological Survey, Detroit is in an area in which there is a low probability of earthquake occurrences. Since 1950, Detroit has experienced an earthquake once every 8 years. No deaths from earthquakes have been recorded in the City, and no property or economic damage has resulted. However, distant earthquakes that occur in the New Madrid Seismic Zone and upstate New York may affect Detroit in the future. The New Madrid Seismic Zone poses the most significant threat. Based on recent scientific studies, portions of southern Michigan, not including Detroit, could be expected to receive minor damage if such an earthquake were to occur (see map below).

The greatest impact on the City would likely come from damage to natural gas and petroleum pipelines. If the earthquake occurs in the winter, the City could be severely impacted by fuel shortages. Damage would probably be negligible in well-designed and constructed buildings. However, poorly designed, and constructed buildings could suffer considerable damage under the right circumstances.

SECTION 3. GOALS

The Detroit Hazard Mitigation Plan Steering Committee reviewed the 2015 goals for this planning effort at a meeting on May 20, 2021. The goals were discussed and revised based on current community mitigation priorities, to be consistent with current City planning efforts, and in consideration of the impact of each natural hazard that impacts Detroit. At the May meeting, the Committee reviewed the process for the development of the goals and voted to update those goals to reflect new priorities in local mitigation.

3-1. GOAL SETTING

In setting goals for the hazard mitigation planning process, Steering Committee members discussed goals from existing City plans, as well as those provided in the Hazard Mitigation Plan for the state of Michigan and other local planning jurisdictions. Working together in a virtual environment with facilitation from HSEMD and the contractors, committee members recommended the following goals:

2021 Mitigation Plan Goals

- Goal 1: Protect the public health and safety
- Goal 2: Protect critical facilities and public infrastructure
- Goal 3: Minimize damage to public and private property.
- Goal 4: Increase public awareness of natural hazards including warning notification participation and self-help measures.
- Goal 5: Incorporate attainable climate resiliency alternatives into City planning and mitigation strategies.

The 2015 Goals 1 and 2 are maintained in the 2021 plan; 2015 Goal 4 was elevated in priority to Goal 3; 2015 Goals 4 and 5 were combined in Goal 4 for 2021; and a new Goal 5 was created to address climate resiliency for the 2021 plan. The 2015 Goals are provided here for reference:

2015 Mitigation Plan Goals

- Goal 1: Protect the public health and safety
- Goal 2: Protect critical facilities and public infrastructure
- Goal 3: Provide adequate warning to residents in affected areas
- Goal 4: Minimize damage to public and private property
- Goal 5: Increase public awareness of natural hazards and self-help measures

3-2. CONSISTENCY

These goals are consistent with current planning efforts by the City, as described in the Master Plan of Policies for Detroit. According to the Master Plan, each of 17 different elements includes various goals. Those elements and accompanying goals that are compatible with the goals of the hazard mitigation planning process are described below.

Element	Goals
City Design	Improve the City's vacant spaces
Economy	Increase the availability and effectiveness of business education and training; and, improve cooperation between businesses and residents.
Education and Libraries	Provide educational programs for adults; and, Improve learning facilities.
Environment and Energy	Increase the health and vitality of the regional ecosystem; ensure environmentally healthy neighborhoods; increase the accessibility of open space and naturel habitat; improve air quality; and, particularly in areas of the city which are non-compliant with government air quality standards.
Health and Social Services	Increase awareness and accessibility of public health care programs.
Industrial Centers	Enhance the economic potential of industrial centers; and, improve environmental conditions in and around industrial centers.
Infrastructure	Provide security and emergency response in regards to critical infrastructure.
Public Safety	Eliminate environmental threats to community health and safety; increase awareness and participation in fire prevention activities; and, develop a coordinated emergency response network.
Retail and Local Services	Increase the safety of commercial areas.
Transportation and Mobility	Increase the environmental sustainability of transportation systems; and enhance the safety of transportation systems.

Source: City of Detroit, Master Plan of Policies Revision, May 2021

The goals are also consistent with the hazard analysis completed in Section 2. The most serious natural hazard impacting Detroit is flooding. As the Risk Assessment discussed in Section 2 indicates, flooding causes a significant loss of life as well as property and economic damage. All of the goals address this potential harm to the City. The second most serious hazard that threatens Detroit is infrastructure failure. Again, Goal #2 is directed towards protecting critical facilities and public infrastructure.

The goals of the hazard mitigation planning process are also compatible with survey results obtained from members of the public who completed an online questionnaire. City residents, employees, and business representatives were asked to indicate what mitigation actions they have taken to protect themselves and their property from natural hazards. The responses are provided below.

Protective Measure	% of Respondents Affirming
Have an emergency preparedness plan	26.1
Have flood insurance	15.3
Have a 72-hour disaster supply kit	25.6
Visited local government web site(s) for emergency preparedness information	31.8
Have an evacuation plan	21.6
Have a weather radio	26.7
Signed up for emergency alerts for the City of Detroit	49.4

Survey: https://survey.alchemer.com/s3/6342345/City-of-Detroit-Community-Preparedness-Survey

The Detroit Hazard Mitigation Plan Steering Committee has addressed these mitigation methods in their hazard mitigation planning goals. In addition, the Planning and Development Department will ensure that these approaches are incorporated into future planning, zoning, and development decisions.

3-3. CAPABILITY ASSESSMENT

Essential to the mitigation strategy is the City of Detroit's capability to implement these goals and activities. Successful implementation will depend on the authority to advance mitigation efforts, organizational capability, and available funding and other resource allocation. FEMA requires the evaluation of existing hazard management policies, programs, and capabilities that exist and could be used to implement the mitigation strategy.

3-3.1. Relevant Authorities

Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-707, was signed into law November 23, 1988. This act amended the Disaster Relief Act of 1974. The Stafford Act constitutes the statutory authority for most Federal disaster response activities especially as they pertain to FEMA and FEMA programs.

The Disaster Mitigation Act of 2000 (DMA 2000) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). The current Robert T. Stafford Disaster Relief and Emergency Assistance Act was recently amended in 2013 as PL 93-288, 42 U.S.C. 5121 and emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This act also establishes

minimum requirements for “mitigation plans” which are necessary if jurisdictions wish to be eligible for certain federal mitigation grant programs.

Detroit City Code Chapter 14 establishes the Department of Homeland Security and Emergency Management, which is responsible for organizing the response and recovery operations for the city. The department is organized in accordance with the Michigan Emergency Management Act. Additionally, Code Section 14-1-4 notes that all City departments and agencies may be assigned emergency management duties by the Mayor.

Detroit City Code Chapter 50 (Zoning) includes the definition and additional standards for floodplains and other hazard areas. These standards provide city government the authority to manage, restrict, and delineate development within hazard areas in order to mitigate property damage and other disaster impacts.

3-3.2. Organizational Capacity

There are several City of Detroit departments and programs that help reduce losses from hazardous events and have the capacity for contributing to the implementation of the measures. The capabilities of these departments are described below.

- **Buildings, Safety Engineering, and Environmental Department:** This department enforces construction, property maintenance, environmental compliance, and zoning codes. Enforcement of these codes and standards can significantly reduce risk to buildings and property.
- **Demolition Department:** This department manages the largest demolition program in the country, focusing on removing vacant buildings across Detroit. This department supports mitigation of property damage and urban-area hazards by acquiring and removing dangerous residential properties, as well as preserving homes that need improvements.
- **Fire Department:** Fire and emergency services personnel support preparedness and hazard mitigation through regular drills, training, and exercises. Additionally, the department can provide inspections to reduce risk for property and engage in planning efforts for major events.
- **General Services Department:** This department is responsible for the City’s vehicle fleet, forestry services, vacant lot maintenance, city-owned building maintenance, and parks and recreation. This department plays a significant role in reducing risk for city-owned properties and land.
- **Health Department:** This department provides essential public health programs and resources and can adopt codes and policies intended to protect the health of city residents.
- **Homeland Security & Emergency Management:** This department coordinates with local, regional, state, and federal agencies to prevent, protect against, mitigate, respond to, and recover from natural and human-caused emergencies and disasters. This department is responsible for updates to all-hazards emergency plans, including the HMP. Additionally, this department

supports mitigation through public education campaigns to increase personal and community preparedness.

- **Planning and Development Department:** This department can help direct future development away from certain areas where a hazard could damage structures through long-range planning efforts. The Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development.
- **Police Department:** Law enforcement personnel support preparedness and hazard mitigation through regular drills, training, and exercises. Additionally, the department engages in planning efforts for major events.
- **Public Works Department:** This department manages much of the critical infrastructure in Detroit, in addition to ensuring public safety through debris removal, recycling, snow and ice removal, road resurfacing and repairs, and regular maintenance activities. This department can mitigate dangerous conditions and ensure preparedness in advance of natural hazard events, as well as improve the quality and resiliency of city services and infrastructure.
- **Water and Sewerage Department:** This department is responsible for delivering clean water and collecting sanitary sewage and stormwater across the city. The department manages a considerable network of critical infrastructure, often aging, that may require risk reduction, infrastructure improvements and mitigation projects.

Additionally, the City works closely with coordinating agencies and community groups to advance hazard mitigation, including:

- **Detroit Local Emergency Planning Committee:** This public-private partnership works to increase compliance with hazardous materials reporting and plan submission requirements, and the Community Right-to-Know Act. This group offers education and information on safe storage and risk reduction strategies to residents, businesses, and industries.
- **DTE Energy:** This agency is a Detroit-based energy provider for residents and critical infrastructure within the city. DTE Energy partners with the City of Detroit to ensure continuous energy provision and to reduce the risk to energy and power infrastructure. During large-scale power outages, DTE Energy coordinates with the city to prioritize restoration to the most critical facilities to mitigate risk to health and essential operations.
- **Great Lakes Water Authority:** This agency is the water and wastewater provider for southeast Michigan, including the City of Detroit. The agency is responsible for risk reduction and hazard mitigation for this critical infrastructure and partners with the City of Detroit to ensure continuous and high-quality water provision.

3-3.3. Hazard Mitigation Funding

There are several current and potential grant programs that help jurisdictions implement hazard mitigation measures. The Federal Emergency Management Agency (FEMA) administers many of the grant programs listed below. FEMA is not the only source of funding for mitigation assistance. There are other agencies involved

in funding projects that can also serve to reduce risks from disasters and emergency events. These agencies include but are not limited to the Department of Homeland Security, the US Army Corps of Engineers, the Environmental Protection Agency, and the US Department of Agriculture. Many of the potential sources of funds that can be used for mitigating hazards are identified below.

The following grant programs are made available through the Stafford Act:

Building Resilient Infrastructure and Communities (BRIC): FEMA has developed the Building Resilient Infrastructure and Communities (BRIC) program through the Disaster Recovery Reform Act to address National Public Infrastructure Pre-Disaster Hazard Mitigation. BRIC replaced the Pre-Disaster Mitigation (PDM) program. BRIC supports states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

Hazard Mitigation Grant Program (HMGP): FEMA's Hazard Mitigation Grant Program (HMGP) was created in November 1988 under the authority of the Stafford Act, Section 404. The HMGP assists states and local governments to implement long-term hazard mitigation measures following a Presidential major disaster declaration. Initially, the federal cost share for projects is 75% of a project's total eligible costs. Objectives of HMGP include:

- Preventing loss of lives and property due to disasters;
- Implementing state and local hazard mitigation plans;
- Enabling mitigation measures to be implemented during immediate recovery from a disaster; and
- Providing funding for previously identified mitigation measures that benefit the area.

Public Assistance (PA): The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to aid states, Native American tribes, local governments, and certain nonprofit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President. Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration.

The following grant programs are available under the National Flood Insurance Act.

Flood Mitigation Assistance Program: The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other

National Flood Insurance Program (NFIP) insurable structures. All FMA Program grants are offered on a cost-share basis requiring 25% non-federal match. This specifically includes:

- Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
- Encouraging long-term, comprehensive hazard mitigation planning; and
- Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities and permitting; and complementing other federal and state mitigation programs with similar, long-term mitigation goals.

Repetitive Flood Claims (RFC): The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Up to $10 million is available annually for FEMA to provide RFC funds to assist States and communities reduce flood damages to insured properties that have had one or more claims submitted to the National Flood Insurance Program (NFIP).

Severe Repetitive Loss (SRL): The Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP). SRL properties are residential properties that have:

- At least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any ten-year period, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any ten-year period.

Aspects of the SRL program are as follows:

- Purpose: To reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the National Flood Insurance Fund (NFIF).
- Eligible flood mitigation project activities: Floodproofing (historical properties only), Relocation; Elevation; Acquisition; Mitigation reconstruction (demolition rebuild); and Minor physical localized flood control projects.
- Federal / Non-Federal cost share: 75 / 25 %; up to 90 % Federal cost-share funding for projects approved in States, Territories, and Federally recognized Indian tribes with FEMA-approved Standard or Enhanced Mitigation Plans or Indian tribal plans that include a strategy for mitigating existing and future SRL properties.

Other federal grant programs include:

U.S. Army Corps of Engineers: Eligible projects include levee rehabilitation and repair of flood control works damaged by floods. Technical engineering assistance is also available.

USDA - Natural Resources Conservation Service Wetlands Reserve Program: This program offers landowners the opportunity to receive payments for restoring and protecting wetlands on their property. Landowners are provided cost-share funds to restore wetlands.

Wildlife Habitat Incentives Program: This program is a voluntary program for people who want to develop and improve wildlife habitat primarily on private lands. It provides both technical assistance and cost-share payments to help establish and improve fish and wildlife habitat.

U.S. Small Business Administration Loan Program: Through its Office of Disaster Assistance (ODA), the SBA is responsible for providing affordable, timely and accessible financial assistance to homeowners, renters and businesses following a disaster. Financial assistance is available in the form of low-interest, long-term loans. SBA's disaster loans are the primary form of federal assistance for the repair and rebuilding of non-farm, private sector disaster losses. For this reason, the disaster loan program is the only form of SBA assistance not limited to small businesses.

3-4. REFERENCES

1. Local Mitigation Planning Handbook, FEMA, March 2013
2. *Local Hazard Mitigation Planning Workbook*, Michigan State Police, Emergency Management Division, February 2003.
3. Michigan Hazard Mitigation Plan, April 2019.
4. *Master Plan of Policies*, City of Detroit, Department of Planning and Development, May 2021, Revision.
5. Detroit Hazard Mitigation Plan Steering Committee; Meeting conducted on May 20, 2021

SECTION 4. ACTION ITEMS

Actions items are a listing of activities or mitigation strategies the City of Detroit can implement to reduce risk from the threats posed by natural hazards. Each action item is directly related to a specific hazard or set of hazards, and to one or more goals described in Section 3 of this plan. The hazards and goals are summarized below.

4-1. NATURAL HAZARDS AND GOALS

7 Most Significant Hazards (Ranked in Order of Importance)	Goals
1. Flooding 2. Infrastructure Failure – Energy Emergency 3. Structural Fires 4. Extreme Winter Weather 5. Extreme Summer Weather 6. Hazardous Materials Releases 7. Public Health Emergencies 8. Civil Disturbance 9. Public Transportation Accidents 10. Petroleum and Natural Gas Pipeline Accidents 11. Drought 12. Nuclear Power Plan Accidents 13. Oil and Natural Gas Well Accidents 14. Earthquake	**Goal 1**: Protect the Public Health and Safety **Goal 2**: Protect Critical Facilities and Public Infrastructure **Goal 3**: Minimize Damage to Public and Private Property **Goal 4**: Increase Public Awareness of Natural Hazards Including Warning Notification Participation and Self-Help Measures **Goal 5**: Incorporate Attainable Climate Resiliency Alternatives into City Planning and Mitigation Strategies

During a Mitigation Strategies Workshop on June 22, 2021, members of the Detroit Hazard Mitigation Plan Steering Committee reviewed existing and developed new actions items for the hazards identified in Section 2 as the most critical to the City of Detroit. Committee members then determined how each action item addressed the five goals of the Hazard Mitigation Plan. Next, committee members prioritized each action item using the following criteria: (1) economic feasibility; (2) technical feasibility; (3) social equity/fairness; and (4) environmental impact. For each of these criteria, the Steering Committee assigned a number 3, 2 or 1, with 3 representing low cost, high technical feasibility, high social fairness, and low environmental impact. On the other hand, a rating of 1 reflects high implementation costs, low technical feasibility, socially unfair, and high environmental impact. A rating of 2 represents moderate costs, feasibility, fairness, and environmental impact. Using this system, the Action Items with the highest ranking have the greatest priority. Finally, the Steering Committee determined the organization responsible for coordinating implementation of the action item and the timeline for completion. The timeline for completion is expressed as Short-Term (ST) timeframe of 1-5 years, Long-Term (LT) greater than 5 years or Ongoing (ON). In some cases, an action item may be accomplished in the short or long-term but will have ongoing components. The results are described below.

4-2. FLOODING

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Require site emergency plans for those in flood plain	1,2,3,4,5	3	3	3	3	12	ON	**COMPLETE**
Educate the public about the need for flood insurance	1,4,5	2	3	3	3	11	ON	Residents in the floodplain have been advised of their required need to purchase flood insurance. Detroit has suffered four (4) significant flood events in the last seven (7) years, which makes this a more urgent Public Education campaign. **ONGOING**
Install a seawall	1,2,4	1	3	3	3	10	LT	The city issued citations to residents whose seawalls were in disrepair. Some residents living off the waterfront have repaired their seawall and the city invested in tiger dams and sandbags to help mitigate flooding on the lower eastside of the city, which includes the city's floodplain area. The city continues to allocate funding and seek additional funding for projects to mitigate flooding. **INCOMPLETE**

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Purchase backflow prevention valves	1,2,4	1	3	3	3	10	LT	Some residents have invested in backflow prevention valves. The city's Water Dept. is currently working on a potential Hazard Mitigation project proposal for grant funding to support the purchase of backflow valves for residents in the floodplain area. **INCOMPLETE**
Elevate electrical equipment in basements	1,2,4,5	1	3	2	3	9	LT	Some residents have elevated electrical equipment in their basements to mitigate future damage. More Public Education is needed in the area of mitigation planning. **INCOMPLETE**
Installation of backflow preventers and sump pumps to prevent backflow from sanitary/combined systems into basements during rainfalls.	1,2,3,4,5	2	2	3	3	10	ST	NEW
Public education on flood mitigation measures and sewer level services.	1,2,3,4,5	1	3	3	3	10	ST	NEW
Raise major basement appliances and disconnect down spots to avoid flood damage.	1,2,3,4,5	2	3	3	3	11	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Inspect priority sewers to remove sediment and debris to ensure maximum transport capacity.	1,2,3,5	1	3	3	3	10	ST	NEW
Study, design and construction for power redundancy to maintain firm pumping capacity at key pumping stations.	1,2,3	2	3	3	3	11	ST	NEW
Install vortexes, rainwater control and restrictive covers to limit stormwater entering the combined system.	1,2,3	1	3	3	3	10	ST	NEW
Interconnection between Northwest Interceptor and Oakwood Retention Treatment Basin to reduce grade line by isolating downstream portion of the Northwest Interceptor from the Water Resources Recovery Facility and diverting flow to the Oakwood Pumping Station.	1,2,3	1	2	3	3	9	ST	NEW
Connection of Meldrum combined sewer to Leib Combined Sewer Overflow (CSO) Treatment Facility to reduce grade line by diverting to the Leib CSO Facility to increase utilization and close an untreated CSO outfall with facility improvements.	1,2,3	2	3	3	3	11	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Install Detroit River interceptor regulator expansion or rehabilitation or gates to reduce grade line by allowing greater flow into interceptor during smaller rain events and provide remote operable gates.	1,2,3	2	3	3	3	11	ST	NEW
Sewer separation projects to remove flow and reduce grade line at the following locations: Fischer, East English Village, Near-eastside separation, Purtian, Fenkell, Lyndon, Schoolcraft and W. Chicago.	1,2,3,5	2	3	3	3	11	LT	NEW
Study and develop regional plan for green stormwater infrastructure.	1,2,3,4,5	1	3	3	3	10	ST	NEW
Study to provide eastside and westside storage tunnels with pump stations to the river or dewatering back to the collection system after a rain event.	1,2,3,5	2	3	3	3	11	LT	NEW
Develop design, and build an operational strategy to optimize the utilization of interconnected piping and operation between both pumping stations and the Connor Creek RTB	1,2,3	2	3	3	3	11	LT	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Oakwood District Intercommunity Relief Sewer Modification at Oakwood District through implementation of the WWMP recommended relief connection from the Northwest Interceptor to the Oakwood Pump Station divert flow.	1,2,3	1	3	3	3	10	LT	NEW
Provide inspection, light cleaning and debris removal for east side sewers (Conner to Rivard) post storm for damage assessment.	1,2,3	2	3	3	3	11	ST	NEW
Design and conduct a study to examine and refine flood mitigation strategies including increased inspections, storage, strategic sewer separation, and other potential strategies to significantly reduce wide-spread basement and street flooding	1,2,3,4,5	2	3	3	3	11	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Develop and implement a management plan that will continue to evaluate the impacts of stream debris on CSO discharges, hydraulic gradient, and flooding, and if necessary, remove log jams and other debris and obstructions from the Rouge River.	1,2,3	2	3	3	3	11	ST	NEW
Conveyance System Infrastructure Improvements to assess the structure and functionality of 1) Outfalls with Regulator Gates 2) Outfalls with Diversion Dams/Backwater Gates 3) Valve Remote Gates 4) In-System Storage Devices	1,2,3	2	3	3	3	11	ST	NEW
Implement wastewater and water improvement initiatives identified in the Water and Wastewater Asset Management Plans.	1,2,3	2	3	3	3	11	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Conduct residential and government building flood assessments to determine the source of flooding specific to each property. Evaluate building systems and community characteristics to develop flood risk and mitigation options. Conduct field inspections and identify opportunities to reduce flood risk.	1,2,3	2	2	2	2	8	ST	NEW
Implement resilience systems at City buildings to mitigate damages from flooding such as elevating equipment, battery backed up pump systems, solar, building batteries and generators. Reduce energy needs and ensure power supply for critical loads in municipal buildings	1,2,3,5	2	2	2	2	8	LT	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Increase System Resiliency Through Hardening of Electrical Supplies. Evaluate external power supplies for critical system components. Consider constructing additional independent power sources, including on-site generators as needed, to increase system reliability. GLWA anticipates evaluating, designing and resolving redundant power issues at 3 large and 3 smaller wastewater facilities.	1,2,3	1	3	3	3	10	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Freud & Conner Creek Pump Station Improvements Study the overall performance of Connor Creek and Freud sewage pumping stations Develop design, and build an operational strategy to optimize the utilization of interconnected piping and operation between both pumping stations and the Connor Creek RTB Provide basis of design and final design for the operational strategy Provide construction and construction assistance during construction of the emerging project.	1,2,3	1	3	3	3	10	LT	NEW
Oakwood District Intercommunity Relief Sewer Modification at Oakwood District Implement the WWMP recommended relief connection from the Northwest Interceptor to the Oakwood Pump Station divert flow.	1,2,3	1	3	3	3	10	LT	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
East Side Sewer Inspection, Light Cleaning Post Storm and Debris Removal Inspection, light cleaning and debris removal for east side sewers (Conner to Rivard) post storm for damage assessment.	1,2,3	1	3	3	3	10	ST	NEW
GLWA Study for flood mitigation Design and conduct a study to examine and refine flood mitigation strategies including increased inspections, storage, strategic sewer separation, and other potential strategies to significantly reduce wide-spread basement and street flooding	1,2,3,4,5	1	3	3	3	10	ST	NEW
Clear Logjams on the Rouge River Use the WWMP as a guide to develop and implement a management plan that will continue to evaluate the impacts of stream debris on CSO discharges, hydraulic gradient, and flooding, and if necessary, remove log jams and other debris and obstructions from the Rouge River.	1,2,3	1	2	3	3	9	ST	NEW

Flooding Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Conveyance System Infrastructure Improvements Assess the structure and functionality of 1) Outfalls with Regulator Gates 2) Outfalls with Diversion Dams/Backwater Gates 3) Valve Remote Gates 4) In-System Storage Devices	1,2,3	1	2	3	3	9	ST	NEW
Implement Asset Management Plans Implement wastewater and water improvement initiatives identified in the Water and Wastewater Asset Management Plans.	1,2,3	1	2	3	3	9	ST	NEW

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: City Engineering Department of Water and Sewerage (Primary Agency); General Services Department; Public Works; Public Lighting; Water and Sewerage; Buildings, Safety Engineering and Environmental; Office of Homeland Security & Emergency Management; and private property owners. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development. The City of Detroit will also coordinate with Great Lakes Water Authority.

Detroit Free Press

4-3. INFRASTRUCTURE FAILURE - ENERGY EMERGENCIES

Energy Emergency Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Encourage residents to develop a family disaster plan, including a Disaster Supply Kit.	1,3,4,5	3	3	3	3	12	ON	Detroit continues to offer four scheduled CERT trainings, per year and a component of the training offered to residents is dedicated to disaster planning and creating an emergency supply kit. **ONGOING**
Increase public awareness and use of MISS DIG.	1,2,3,4,5	2	3	3	3	11	ON	The Development Resource Center within Buildings Safety & Engineering and Environmental Dept. has MISS Dig flyers available for the public. **ONGOING**
Tree trimming programs to protect wires from falling branches	1,2,4,5	2	3	3	3	11	LT	Utility and cable companies, and city forces conduct tree trimming maintenance in the street berms and alleys to safeguard utility lines. **ONGOING**
Use of rolling blackouts in electrical system during peak demand	1,2,3,4,5	2	3	3	3	11	ON	**COMPLETED**

Energy Emergency Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Create redundancies in utility and communication systems	1,2,3,4	1	3	3	3	10	ON LT	**COMPLETED**
Provide additional independent power sources, including on-site generators as needed, to increase system reliability.	1,2,4	1	3	3	2	9	ST	DHSEM has spent $1.1M in grant funding in recent years for back-up generators for police precincts and fire stations. These grants were in addition to general fund dollars spent on back-up generators for critical facilities. **ONGOING**
Replacement/renovation of aging equipment and structures	1,2,4	1	2	2	2	7	LT	City equipment, vehicles and structures are replaced or maintained, according to a Capital Improvement schedule. **ONGOING**
Increase System Resiliency Through Harden Electrical Supplies	1,2,3	1	3	3	3	10	ST	NEW
Develop resilience hubs at recreation centers and other public facilities that have solar, battery backup, and generator power so that public can use these in time of emergency.	1,2,3	1	2	2	2	7	ST	NEW

Energy Emergency Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Launch a coordinated preparedness campaign with City departments, emergency management agencies and preparedness organizations - that encourages residents to take actions that improve their ability to protect themselves and our community in advance of a crisis.	1,2,3	1	3	3	3	10	ST	NEW

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above **General Services Department** (Primary Agency); Water and Sewerage; Buildings, Safety Engineering and Environmental Department; Office of Homeland Security & Emergency Management; and city departments. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development. The City of Detroit will also coordinate with Great Lakes Water Authority.

4-4. STRUCTURAL FIRES

Structural Fire Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Require Emergency Action Plans for businesses with high thresholds of hazardous materials and encourage residents to develop family Emergency Plans	1,2,3,4,5	3	3	3	3	12	ST ON	All local businesses with a pre-determined threshold of hazardous materials (302 Sites) are required to submit an annual Emergency Response Plan to the Detroit Local Emergency Planning Team, which is facilitated by Detroit Homeland Security & Emergency Management (DHSEM). A component of the CERT training offered to residents and businesses is dedicated to Emergency Action Plans. **ONGOING**
Educate public on fire safety through training and PSA's	1,2,3,4,5	2	3	3	3	11	ON	Detroit Fire Dept.'s community outreach team delivers ongoing fire safety training to the public and a campaign is promoted in the media and printed press annually in October, Fire Safety Month. **ONGOING**
Update codes and ordinances related to fire prevention and provide more enforcement	1,2,4	2	3	3	3	11	LT	**COMPLETED**

Structural Fire Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Reduce the number of abandoned structures	1,2,4,5	3	3	3	3	12	LT	Detroit is home to the nation's largest and safest demolition program. Since 2014, it has taken down over 20,000 vacant buildings in Detroit neighborhoods. In 2020, voters approved Proposal N for Neighborhoods, a $250M comprehensive plan to address vacant houses in Detroit through preservation or demolition. As a result, the Demolition Department is tasked with demolishing an additional 8,000 blighted homes and preserving 6,000 blighted homes for future renovation and sale. **ONGOING**

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: Fire Department (Primary Agency), Office of Homeland Security & Emergency Management; Detroit Local Emergency Planning Committee; and Demolition Department. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development.

4-5. EXTREME WINTER WEATHER

Winter Weather Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Increased coverage and use of NOAA Weather Radio, PSA's and advisories	1,3,4,5	2	3	3	3	11	ST	**COMPLETED**
Producing and distributing family emergency preparedness information	1,3,4,5	2	3	3	3	11	ON	Detroit continues to offer four scheduled CERT trainings, per year and arrange special trainings, as requested by local businesses or groups. In the COVID-19 environment, Detroit offered the first virtual CERT training course in the state, possibly in the country. **ONGOING**
Tree trimming and maintenance to prevent limb breakage and safeguard utility lines	1,2,4,5	2	3	3	3	11	ON	Utility and cable companies, and city forces conduct tree trimming maintenance in the street berms and alleys to safeguard utility lines. **ONGOING**
Establishing heating shelters for vulnerable populations	1,3,5	2	3	3	3	11	ST ON	**COMPLETED**
Proper building/site design and code enforcement relating to snow loads, roof slope, snow removal and storage	1,2,4,5	2	3	3	3	11	LT ON	**COMPLETED**

Winter Weather Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Maintain adequate road and debris clearing capabilities	1,2,5	1	3	3	3	10	ON	Dept. of Public Works, Street Maintenance Div. is responsible for maintaining a regular schedule of street cleaning. This division also establishes a seasonal road resurfacing schedule. **ONGOING**
Insulate city infrastructure	1,2,4	1	3	3	3	10	LT	Detroit General Services Dept. has insulated 39 city facilities since 2015. **ONGOING**
Pre-planning for debris management staging and storage areas	1,2,4,5	3	3	2	2	10	ST	**COMPLETED**
Bury utility lines	1,2,4	1	3	2	2	8	LT	DTE Energy has buried power lines in the Appoline/Bagley area. They have a pilot scheduled for the Osborn area (area is tentative and subject to change). Land bank homes sold to new developers will be required to install underground service lines. **ONGOING**

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: **Department of Public Works** (Primary Agency); Office of Homeland Security & Emergency Management; General Services Department, and DTE Energy. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development.

Winter storm hits Detroit in January 2014, with 6 inches of snow.
Detroit Free Press

4-6. EXTREME SUMMER WEATHER

Summer Weather Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Design plans for delivery of water	1,2,5	3	3	3	3	12	ST	**COMPLETE**
Increase awareness of availability of cooling centers	1,3,5	2	3	3	3	11	ST ON	**COMPLETE**
Store and supply water	1,5	2	3	3	3	11	ON	**COMPLETE**
Purchase and distribute NOAA radios	1,3,5	2	3	3	3	11	ST	The last distribution of NOAA radios occurred in the early 2000s. **INCOMPLETE**
Develop plans to transport seniors and vulnerable citizens to cooling centers	1,3,5	3	3	3	2	11	ST	**COMPLETE**
Upgrade warning sirens	1,3,5	2	3	3	3	11	ON	Between 2012 and 2013, the city went from 18 analog sirens to 56 digital warning sirens, which completed the plan to install sirens, covering 95%-98% of the city. The remaining areas are unoccupied (abandoned) blocks in the city. Siren maintenance and upgrades are **ONGOING**

Summer Weather Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Provide generators for public housing and critical facilities	1,2,4,5	1	3	3	2	9	ST	The city has backup generators for its most critical infrastructure and DTE Energy has been very supportive in providing generators for senior facilities, hospitals, government buildings, and other critical sites when requested. **ONGOING**
Develop heat mitigation strategies to reduce high-heat areas based on Detroit's urban heat island data collected in 2020 with the following elements: • Inter-sectoral coordination • Heat–health early warning and alert systems • Communications and public outreach • Reduction in indoor heat exposure • Special care for vulnerable people • Preparedness of the health and social care system • Long-term urban planning • Real-time surveillance • Evaluation	1,2,3,4,5	3	3	3	3	12	LT	NEW
Provide air conditioners to low income, highly vulnerable residents	1	2	2	2	2	8	ST	NEW

Summer Weather Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Support neighborhood-based communication networks that enable residents to check on vulnerable residents in the case of power outage, high heat or other climate emergencies that endanger vulnerable residents, especially shut-in seniors or others with medical conditions that limit their mobility	1,4	2	2	2	2	8	ST	NEW

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: **General Services Department** (Primary Agency); Office of and Homeland Security & Emergency Management; and DTE Energy. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development

Source: CBS Detroit

4-7. HAZARDOUS MATERIALS RELEASES

Public Transportation Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Conduct a traffic study to identify alternate evacuation routes associated with HAZMAT Release events	1,2,3	2	2	2	3	9	ON	NEW
Develop public education materials associated with Shelter in Place policies and procedures for HAZMAT Release events	1,2,3	3	3	3	3	12	ST	NEW

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: **Detroit Fire Department** (Primary Agency); and Office of Homeland Security & Emergency Management; and Detroit Police Department.

4-8. PUBLIC HEALTH EMERGENCIES

Public Health Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Encourage residents to become immunized	1,3,5	2	3	3	3	11	ON	This is a Public Education campaign in the city's Health Dept. **ONGOING**
Increase awareness of causes, symptoms, and protective actions for communicable diseases	1,3,5	2	3	3	3	11	ON	This is a Public Education campaign in the city's Health Dept. **ONGOING**
Maintain monitoring of diseases	1,3,5	1	3	3	3	10	ON	This is a responsibility of the city's Health Dept. **ONGOING**
Prevent contact with contaminated sites or waters	1,3,5	2	2	3	3	10	LT ON	Contaminated sites are investigated immediately upon notice to the city. The site or area is isolated with barricading and remediation is implemented with local, State and federal resources. In 2017, the city created a Water Emergency Response Plan, which includes Boil Water Alerts when there is an unsafe condition concerning the water. **ONGOING**
Improve ventilation in areas prone to overcrowding	1	1	2	2	3	8	LT	The city's General Services Dept. has completed 39 facility ventilation improvement projects since 2015. **ONGOING**
Provide back-up generators for water and waste treatment	1,2,4	1	2	3	2	8	ST	Following the June 2021 flood event, a plan was developed to notify DTE Energy when back-up power is needed at the water pumping stations. The city continues to allocate funding and seek additional funding for projects to mitigate flooding, including the purchase of generators. **INCOMPLETE**

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above **Health Department** (Primary Agency); General Services Department; Great Lakes Water Authority; and Department of Water and Sewerage. The Planning and Development Department will ensure that hazard mitigation considerations are included in land use planning, zoning, and development.

4-9. CIVIL DISTURBANCE

Civil Disturbance Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Require site emergency plans.	1,2,3,4	3	3	3	3	12	ON	All local businesses with a pre-determined threshold of hazardous materials (302 Sites) are required to submit an annual Emergency Response Plan to the Detroit Local Emergency Planning Team, which is facilitated by DHSEM. The Detroit Fire Dept. has a Response Plan for each of these sites. **ONGOING**
Educate the public about fire safety	1,4	2	3	3	3	11	ON	Detroit Fire Dept.'s community outreach team delivers ongoing fire safety training to the public and a campaign is promoted in the media and printed press annually in October, Fire Safety Month. **ONGOING**
Coordinate with local broadcast media to ensure timely and accurate Emergency Alert System activation	1,2,3,4	3	3	3	3	12	LT	**COMPLETE**
Review mutual aid agreements.	1,2,4	1	3	3	3	10	ST ON	Detroit is a partner in the Michigan Emergency Management Assistance Compact. The regional Mutual Aid Agreement has not been reviewed since its execution in 2007. **INCOMPLETE**

Civil Disturbance Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Review and follow resource procurement procedure	1,2,4	1	3	2	3	9	LT ON	**COMPLETE**

Coordinating Agencies: Each of the following agencies will be responsible for implementing the action steps listed above: **Detroit Police Department** (Primary Agency); and Office of Homeland Security & Emergency Management; and Detroit Fire Department.

4-10. PUBLIC TRANSPORTATION ACCIDENTS

Public Transportation Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Review and revise organizational policies on public transportation operations during severe weather events such as flash-flooding, snow, and ice.	1,2,3	3	2	3	3	11	ON	**NEW**
Conduct a traffic study to identify improved bus flow and reduce risk. Such improvements may include dedicated bus lanes, bus stop lay-bys, and safer bus stop locations.	1,2,3	3	2	2	3	10	ON	**NEW**
Seek grant opportunities to improve electronic safety and security systems on buses.	1,2,3	2	3	3	3	11	ST	**NEW**

4-10. DROUGHT

Drought Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Design plans for delivery of water	1,2,5	3	3	3	3	12	ST	**COMPLETE**
Store and supply water	1,5	2	3	3	3	11	ON	**COMPLETE**
Develop residential and commercials water conservation policies for designated drought periods	1,2,5	3	2	3	3	11	ST	**NEW**
Improve and increase water supply storage capacities across the City.	1,5	2	2	3	2	9	ST	**NEW**
Seek grant funding to harden water distribution lines in areas with aging infrastructure.	1,2,3	3	2	3	3	11	ON	**NEW**

4-11. NUCLEAR POWER PLANT ACCIDENTS

Nuclear Power Plant Accidents Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Work with the public health department and hospital systems to develop radiation sickness treatment plans.	1,4	3	2	3	3	11	ST	**NEW**
Coordinate with Enrico Fermi II Nuclear Power Plant to provide public education materials and outreach programs to residents in the 10 and 20 miles emergency planning zones.	1,2,4	3	3	2	3	11	ST	**NEW**

4-12. EARTHQUAKE

Earthquake Action Items	Goals Met	Criteria Ranking				Score	Time Line	Status
		Economic	Technical	Social	Environmental			
Seek grant funding to harden water distribution lines in areas with aging infrastructure.	1,2,3	3	2	3	3	11	ON	**NEW**
Seek continued funding opportunities and support to maintain the Community Emergency Response Team (CERT) program and train its members in urban search and humanitarian aid support.	1,4	3	3	3	3	12	ON	**NEW**
Develop alternative Points of Distribution supply routes and locations to address continuity needs if primary routes and locations are compromised.	1	3	2	2	3	10	ST	**NEW**

4-13. REFERENCES

1. *Michigan Hazard Mitigation Plan*, Michigan State Police, Emergency Management Division, December 2019.
2. *Hazard Mitigation Grant Program Project Eligibility*, Michigan State Police, Emergency Management Division.
3. *Pre-Disaster Mitigation Program Project Eligibility*, Michigan State Police, Emergency Management Division.
4. The Emergency Manager, Unit 3: Mitigation; Federal Emergency Management Agency.
5. *Detroit Hazard Mitigation Plan Steering Committee*; Meetings conducted on April 28, 2021, May 20, 2021 and June 22, 2021.

SECTION 5. PLAN MAINTENANCE PROCEDURES

The Disaster Mitigation Act of 2000 requires a formal plan maintenance process for hazard mitigation plans. This HMP will enact the following procedures and activities to ensure that it remains an active and applicable document. The activities described below will be the responsibility of the City of Detroit, Office of Homeland Security & Emergency Management (DHSEM).

5-1. MONITORING, EVALUATING AND UPDATING THE PLAN

Office of Homeland Security & Emergency Management, with the cooperation of other City of Detroit stakeholder departments, will undertake a review of the Plan as adopted. This review will take place no later than two years after formal adoption by the Detroit City Council.

During the review, the departmental stakeholders, through the efforts of the Office of Homeland Security & Emergency Management, will pay particular attention to sites and specific areas that are vulnerable to natural hazards, identifying any newly identified or developing vulnerabilities. The Office of Homeland Security & Emergency Management will lead the discussion with the other departmental stakeholders on reprioritizing mitigation actions and adding new actions based on changes in local policy, hazard vulnerabilities, and mitigation needs. Steering Committee members will also review mitigation strategies listed in the Plan and provide status updates as to whether action items were started, completed, or deferred. Any information related to the effectiveness of completed actions may also be captured.

During Plan reviews, the Office of Homeland Security & Emergency Management will be responsible for:

- Coordination of stakeholder meetings
- Ensuring the continuation of public input
- Adding updates to the formally adopted documents
- Coordinating adoption of changes made necessary by local, state, or federal agencies

To accomplish the activities mentioned above, the Office of Homeland Security & Emergency Management will appoint a Steering Committee consisting of at least one representative from each stakeholder department within the City of Detroit. The Director of the Department, or his or her designee, will deem these Steering Committee members appropriate to provide input on plan evaluation. This Steering Committee may also include consultants, state, and/or federal representatives with hazard mitigation expertise.

The primary focus of the Steering Committee will be to determine if the Plan's goals are attainable based on assessed risks to identified hazards and the viability of related mitigation actions. In addition, the Steering Committee will:

- Monitor changes in state or federal policies that may impact the Plan

- Evaluate the Plan to determine relevance in code changes and priorities made by the City of Detroit
- Ensure that the Plan is addressing current or expected conditions
- Review the Risk Assessment section of the Plan to determine if information should be updated given additional data
- Evaluate progress of Plan implementation and integration
- Determine the adequacy of resources for implementation of the Plan
- Assess actual progress of the Plan's mitigation strategies versus expectations
- Review the Plan for appropriateness of problem identification and suggested remedies
- Review the list of critical facilities and amend as necessary
- Monitor the entire process to ensure mechanisms are in place for continuing public involvement

If the initial review does not result in a formal update of the Plan, the Office of Homeland Security & Emergency Management will prepare a status report outlining successes and recommendations for the next review. This will include comments made by the Steering Committee and during public comment sessions. These comments will be noted in the appropriate appendix in future Plan updates. Per federal requirements described in 44 CFR 201.3(d)(2), the City will, at a minimum, review and update the hazard mitigation plan every 5 years from the date of plan approval to continue eligibility is certain mitigation programs.[12]

The Office of Homeland Security & Emergency Management will be responsible for coordinating a formal review and update of the HMP every five years after adoption. A formal review may also be requested at other times by the Detroit City Council to meet the overall planning needs of the city.

5-2. IMPLEMENTATION AND INTEGRATION THROUGH EXISTING PLANS

Whenever practical, the mitigation strategies outlined in the Plan will be incorporated into existing programs and activities. These include but are not limited to:

- City of Detroit Building Code
- Detroit Master Plan of Policies
- State of Michigan Building Code
- Detroit Climate Strategy
- Local and Regional All-Hazards Plans
- Local and Regional Emergency Response Plans
- Other plans and programs that will help the city of Detroit achieve the goals and objectives of the Plan

[12] 44 CFR 201.3(d)(2) Code of Federal Regulations, Federal Emergency Management Agency, Department of Homeland Security, Mitigation Planning, Responsibilities, Local Governments

Representatives from the above-mentioned sectors would be called upon on an as needed basis to facilitate coordination and attainment of Plan goals.

5-3. PLAN AVAILABILITY AND CONTINUING PUBLIC INVOLVEMENT

Upon adoption by the Detroit City Council, copies of the Plan will be catalogued and made available at the Office of Homeland Security & Emergency Management's main office. Plan abstracts that have been sanitized by the Office of Homeland Security & Emergency Management will be made available to participating stakeholder departments, and available to the public upon request.

In an effort to maintain continuous public involvement, the Office of Homeland Security & Emergency Management will maintain a speaker's bureau. This bureau will include subject matter experts deemed appropriate by the Department. The services of this bureau will be made available to local organizations and service clubs. The speakers will discuss key points of the Plan; provide periodic updates and continue stimulating public comments as to Plan viability.

APPENDIX A: DETROIT EMERGENCY MANAGEMENT COUNCIL

The Detroit Emergency Management Council (DEMC) is composed of emergency management representatives from the City's departments. The Detroit Department of Homeland Security chairs the DEMC. Members of the DEMC provided guidance to the plan developers in a series of meetings conducted between April 28, 2021, and June 2021. A list of participating members and meeting dates are provided below.

City of Detroit Steering Committee 2021 HMPU		
Name	Agency	Position/Title
Donna J. Northern	DHSEM	Emergency Management Coordinator
Priscilla Morris	Detroit Public Schools Community District	Program Associate for Finance & Risk Management
Claude Milhouse	DFD/DHSEM	DHSEM Fire Dept. Liaison, Retired DFD Sgt.
Paul Jones	Detroit Health Dept., Emergency Preparedness	Emergency Preparedness Coordinator
Sean Larkins	EMS	Chief of EMS
Mike McCarty	Innovation and Technology	Public Safety IT Deputy Director
Chris Kopicko	DHSEM	Public Information Officer
Robert Brown	DHSEM	Sr. Emergency Management Specialist
Scharron Rambus	DDOT	Scheduler
Anil Gosine	Detroit Water and Sewerage Dept.	Manager
David Bowser	Community Health Program	Director
Jack Fennessey	DPD-Innovation and Technology	Public Safety IT Manager
Douglas Gniewek	Detroit Public Schools Community District, Risk Management	Sr. Executive Director of Risk Management
Jaime Junior	Office of Disability Affairs	Community Coordinator
Crystal Rogers	Building Safety, Engineering & Environmental Dept.	Environmental Affairs General Manager
Jason Watt	Detroit City Airport	Director
Geena Schofield	DDOT	Scheduling Manager
Tyrone Clifton	Detroit Building Authority	Director
Raymond A. Scott	Building Safety, Engineering & Environmental Dept	Deputy Director
Chief Darrick Muhammad	Wayne County Community College District	Chief of Security
Ronnie Jordan	Detroit Water and Sewerage Dept.	Inspector
Sam Smalley	Detroit Water and Sewerage Dept.	Chief Operating Officer
Walter Davis	Great Lakes Water Authority	Director of Emergency Preparedness
Matt Stanley	Integrated Solutions Consulting	Consultant
Jacob Halley	Integrated Solutions Consulting	Consultant

DEMC Meeting Dates and Agendas

Date	Purpose
April 28, 2021	Kick-Off meeting, discussed mitigation planning overview and data collection
May 20, 2021	Community profile and HIRA review
June 22, 2022	Steering Committee/Stakeholder workshops. Morning and afternoon sessions, discussed hazard vulnerabilities, confirmed community profile, updated mitigation strategies and action items.

Kick-Off Meeting Agenda

April 28, 2021 | 12:00 – 1:00 PM (CDT)

- Introductions
  - City of Detroit and Invited Guests
  - Integrated Solutions Consulting
- 2021 Plan Update Process
  - Approach and Methodology
  - Core, Steering Committee, and Public Meetings
  - Public Outreach and Interaction
- Roles and Expectations
  - OEM Roles
  - Stakeholder Roles
  - ISC Roles
- Public & Stakeholder Involvement
  - Cultural Sensitivities – multi-language requirements
  - Means of Outreach to Connect with All Community Members
  - Internal and External Stakeholders
  - Neighboring Jurisdictions and Interests
- Project Timeline
  - Meeting Schedule
  - Draft Schedule
  - Public Comment Periods
  - State and FEMA Review, NEW GUIDANCE?
  - Local Adoption
- Data Requests
  - Current HMP *(Word doc)*
  - Recommended Improvements from Previous PRT
  - Community Growth/Future Development
  - Hazard History
  - Completed Mitigation Actions
  - Identified New Mitigation Actions (Infrastructure Spending and Pandemic)
- Housekeeping
  - Document Management (cloud site/storage)
  - Reporting Schedule, Procedure, Requirements
  - Communication Practices and Preferences
  - Invoice Procedures

- Next Steps
  - PWP Review and Approval
  - HIRA Methodology Review and Approval
  - Steering Committee Meeting – date, location (virtual/in-person), invitees and invitations

Meeting Agenda
May 20, 2021 | 12:00 – 1:00 PM (CDT)

- Attendance/Introductions
  - ISC project personnel
  - City of Detroit project personnel
- Presentation
  - Meeting and Workshop Schedule
  - Plan Update Step 1: Community Profile
  - Plan Update Step 2: Hazard Identification
  - Plan Update Step 3: Explain Impacts
  - Risk Assessment
  - Hazard Mapping & Vulnerabilities
  - Community Survey
  - Mitigation Goals
- Next Steps

Meeting Agenda: Stakeholder Workshop
June 22, 2021 | Session 1: 9:00 AM - 11:30 AM | Session 2: 1:30 PM – 4:00 PM

Meeting Purpose: The purpose of this meeting is to engage and collect information from the individual stakeholders of the City of Detroit.

- Introductions
- Mitigation Overview
- Hazards
- Hazard Summary Worksheet
- Mitigation Goals
- Mitigation Strategies
- Review Ongoing Mitigation Actions/Projects
- Identify New Mitigation Actions

APPENDIX B: PUBLIC INVOLVEMENT

The City of Detroit department of Homeland Security and Emergency Management used several methods to inform the public about the update of the HMP, including a community survey and two public meetings.

Community Survey
The department posted a notice on its social media sites (Facebook, Twitter, and Nixle) to make the public aware of the hazard mitigation survey and asked for participation. The websites received a great response from the public. The complete survey is available as **Appendix E.**

Within the survey, city residents had an opportunity to identify whether each participant indicated whether each of these hazards had harmed or impacted themselves or their families within the past 5 years. Response options included "Yes," "No," "Don't Know," or Didn't Answer."

Participants were also asked, "do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk in terms of Impact. Low Risk = Low impact on threat to life and property damage Medium Risk = Medium impact on threat to life and property damage High Risk = High impact on threat to life and property damage". A snapshot of responses to this question is available below.

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Structural Fires	51	35.2%	54	37.2%	39	26.9%	1	0.7%	145
Public Health Emergencies	27	18.2%	64	43.2%	56	37.8%	1	0.7%	148
Extreme Winter Weather	16	10.7%	62	41.6%	70	47.0%	1	0.7%	149
Earthquake	104	70.3%	23	15.5%	12	8.1%	9	6.1%	148
Flooding	19	12.8%	40	26.8%	89	59.7%	1	0.7%	149
Infrastructure Failure-Energy Emergency	12	8.1%	45	30.4%	89	60.1%	2	1.4%	148
Extreme Summer Weather	29	19.7%	59	40.1%	57	38.8%	2	1.4%	147
Public Transportation Accidents	85	57.8%	34	23.1%	16	10.9%	12	8.2%	147
Hazardous Materials Releases/Oil and Natural Gas Well Accidents	56	37.8%	49	33.1%	39	26.4%	4	2.7%	148
Civil Disturbance	46	31.1%	65	43.9%	36	24.3%	1	0.7%	148
Drought	87	58.8%	43	29.1%	11	7.4%	7	4.7%	148
Nuclear Power Plant Accidents	73	49.7%	36	24.5%	28	19.0%	10	6.8%	147

The Community Survey was distributed through various social media platforms. An example from the City of Detroit Facebook page is included below.

City of Detroit Government
September 10 at 11:00 AM ·

📣 We want to hear from you! 📣
Take the Community Preparedness Survey! It's about 10 minutes and your feedback will be used to update the City of Detroit's Hazard Mitigation Plan.
Take the survey here: detroitmi.gov/dhsem

Survey closes September 30!

We sincerely appreciate your input as we work together to reduce or prevent loss of life and property in the event of a disaster.

Updated every 5 years, the City of Detroit Hazard Mitigation Plan not only prepares the city to reduce or prevent the tragic loss of life or property, but a current plan is required in order to receive potential funding from the federal Hazard Mitigation Grant Program. These grants can be used to help pay for the hazard mitigation efforts identified in the plan.

Public Meetings

The City of Detroit department of Homeland Security and Emergency Management also held public meetings on October 4 and 5, 2021. The meetings were publicized in the local newspapers (The Michigan Chronicle, and The Detroit Legal News).

Each meeting included a presentation highlighting the history and importance of the HMP. There was an explanation of hazards and hazard mitigation. There were examples of hazards identified within the HMP with pictures attached. The presentation also included a question-and-answer period afterward. Participants were encouraged to provide any input for the HMP. Meeting notes are provided later in the Appendix.

The City of Detroit
Public Meetings
Hazard Mitigation Plan Update

MONDAY, OCTOBER 4, 2021
6:00 PM - 7:30 PM
Stoudamire Wellness Hub
4401 Conner St.
Detroit, MI 48215

TUESDAY, OCTOBER 5, 2021
6:00 PM - 7:30 PM
Patton Community Center
2301 Woodmere St.
Detroit, MI 48209

Information about the public meetings was distributed through various platforms. An example press release and distribution emails describing the meetings are included below.

PRESS RELEASE

RELEASE DATE: September 29, 2021
MEDIA CONTACT: Chris Kopicko, Detroit Homeland Security & Emergency Management
(313) 418-9534

City of Detroit to host Public Meetings Oct. 4 and 5 Seeking Community Input on the City's Hazard Preparedness Needs

The Detroit Office of Homeland Security & Emergency Management will host two Public Meetings seeking residents' input on the greatest hazard preparedness needs in Detroit. Resident input is vital to updating the City of Detroit Hazard Mitigation Plan. The public is invited to attend one of the following meetings:

MONDAY, OCTOBER 4, 2021
6:00 PM - 7:30 PM
Stoudamire Wellness Hub
4401 Conner St.
Detroit, MI 48215

TUESDAY, OCTOBER 5, 2021
6:00 PM - 7:30 PM
Patton Community Center
2301 Woodmere St.
Detroit, MI 48209

The Hazard Mitigation Plan is updated every five years. Public input is a critical component of the process to review and update the plan as we work together to reduce or prevent loss of life and property in the event of a disaster.

An updated Hazard Mitigation Plan is also required in order to receive potential funding from the federal Hazard Mitigation Grant Program. These grants can be used to help pay for the hazard mitigation efforts identified in the plan.

To: Raquel Castaneda-Lopez <castaneda-lopezr@detroitmi.gov>
Cc: Donna Northern <NORTHERND@detroitmi.gov>
Subject: Community Input on City of Detroit Community Preparedness Survey

Good morning Councilmember Castañeda Lopez,

There's a community preparedness survey on the City of Detroit Emergency Management website that we'd like to encourage residents to take. It will be used to update the City of Detroit Hazard Mitigation Plan. An updated plan is required to be eligible for possible federal hazard mitigation grants. Can you please send the attached graphic to a list of your constituents, encouraging residents to take the brief survey? Community input is critical to increasing community preparedness and safety. We'd like it to go out as soon as it may be possible because there's a limited timeframe for residents to complete the survey.
Can you please confirm if may be able to forward this important preparedness information? FEMA would like to know all of the ways in which we are promoting this survey to residents. Let me know if you have any questions.

Thank you for your assistance!

Christopher Kopicko
Public Information Manager
Detroit Homeland Security & Emergency Management
(O) 313-224-3758
(C) 313-418-9534

From: Chris Kopicko <KOPICKOC@detroitmi.gov>
Sent: Wednesday, September 29, 2021 11:39 AM
To: Raquel Castaneda-Lopez <castaneda-lopezr@detroitmi.gov>; Laura Sanchez <sanchezl@detroitmi.gov>; Thomas Rogers <rogersth@detroitmi.gov>; Keyontay Humphries <Keyontay.Humphries@detroitmi.gov>
Cc: Donna Northern <NORTHERND@detroitmi.gov>
Subject: RE: Dates for Public Meetings next week for input on city's hazardous preparedness needs

Can you please share the information below with your constituents? The online survey ends tomorrow; these public meetings early next week will be the last opportunity for public input before the Hazard Mitigation Plan is updated. Thank you!

The Detroit Office of Homeland Security & Emergency Management will be hosting two Public Meetings seeking residents' input on the greatest hazard preparedness needs in Detroit. Resident input is vital to updating the City of Detroit Hazard Mitigation Plan. The public is invited to attend one of the two meetings that will be held at the following locations:

MONDAY, OCTOBER 4, 2021
6:00 PM - 7:30 PM
Stoudamire Wellness Hub
4401 Conner St.
Detroit, MI 48215

TUESDAY, OCTOBER 5, 2021
6:00 PM - 7:30 PM
Patton Community Center
2301 Woodmere St.
Detroit, MI 48209

Detroit Mitigation Plan Community Meeting Notes
October 4 and 5, 2021

ISC and DHSEM conducted Hazard Mitigation Plan Update public meetings on October 4 and 5, 2021. The meetings were held at the following locations; key take-aways are provided as possible mitigation actions:

October 4, 2021, Stoudamire Wellness Hub, 4401 Conner St. Detroit, MI 48215

- Catch basins aren't being cleaned. The City should review existing programs for cleaning drains. They are constantly blocked
- The City should seek a better process to get information out to the public regarding eligibility for Individual Assistance

October 5, 2021, Patton Community Center, 2301 Woodmere St. Detroit, MI 48209

- The City may look into tax breaks for homeowners who have flood insurance
- The City can improve of tree trimming in public ways to reduce power outages
- The City may develop a program to clean public lots of debris and materials that wash into catch basins
- The City may look into grants that will subsidize the purchase and installation of sump pumps

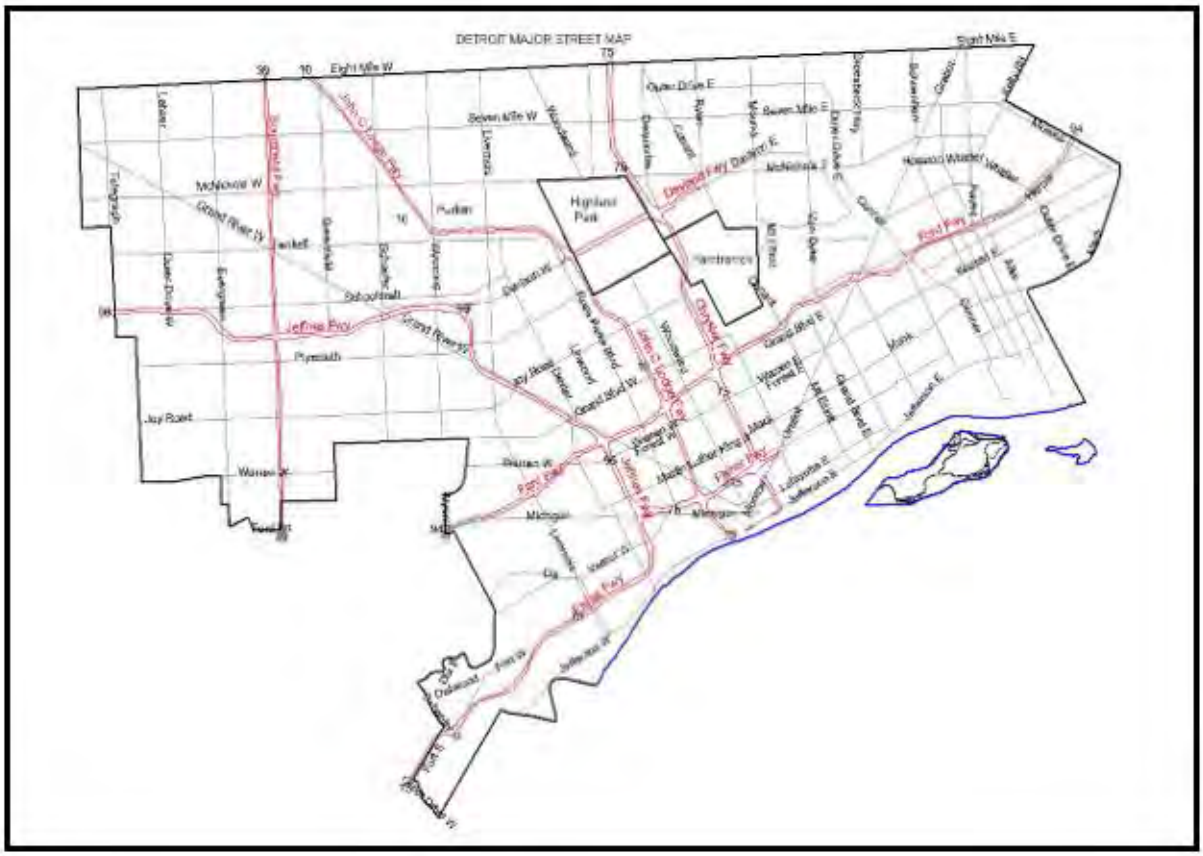
- There may be some concern of bridge instability due to underlying conditions at Marathon Oil
- The City could look into increasing drainage capacity to reduce backflow issues.

APPENDIX C: MAPS AND CRITICAL FACILITIES

Appendix C contains the following maps and information:

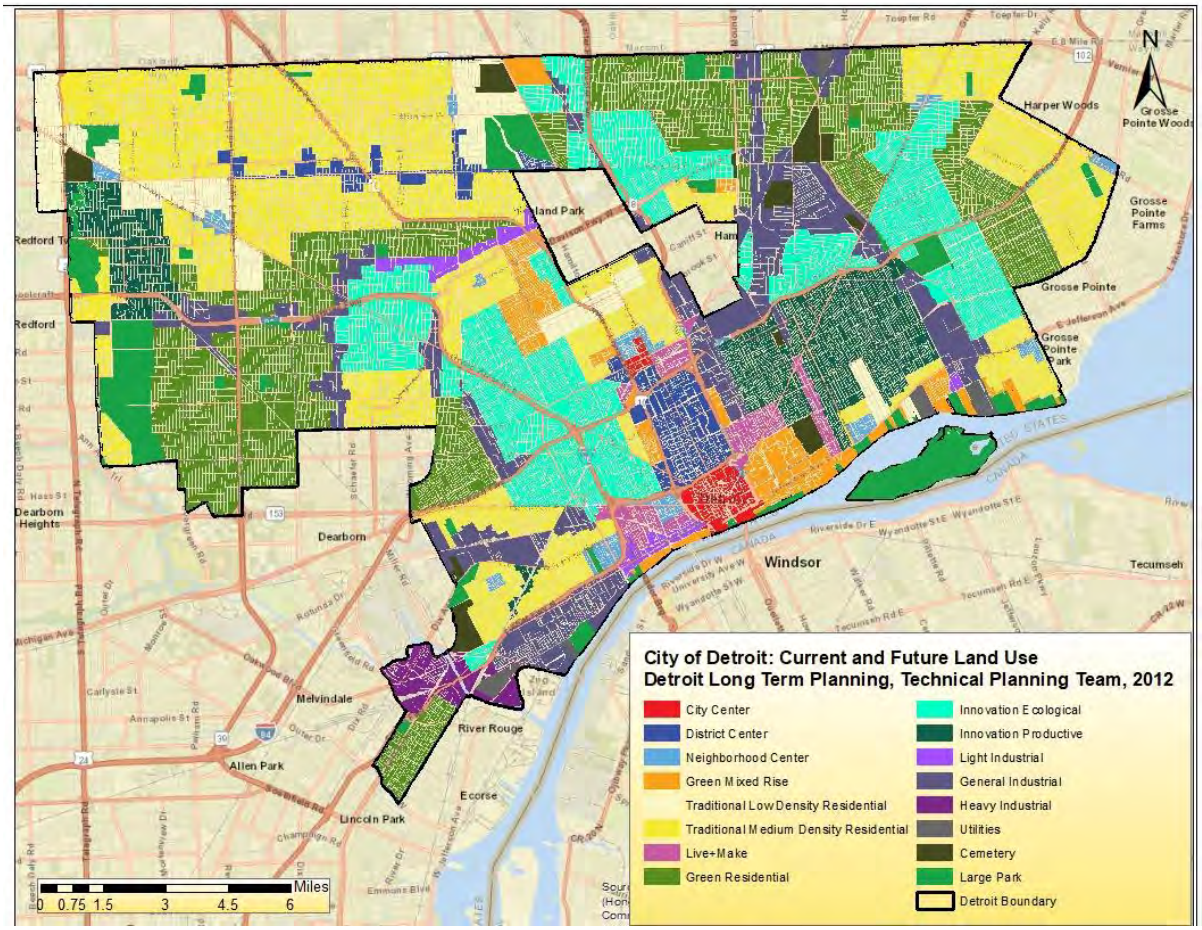
- Major Streets (Map)
- Land Use (Map)
- Detroit Hospitals (Listing)
- Detroit Public Schools Community District (Map and Listing)
- Buildings in Downtown (Map)
- Critical Facilities (Public Assembly, Government, Office Buildings, Commercial, Utilities, Industrial, Hotels)
- Critical Facilities Within Hazard Areas
- SARA Title III Facilities

Map of Major Streets in the City of Detroit



Source: City of Detroit, Department of Information Technology

Map of Current and Future Land Use City of Detroit



Source: City of Detroit, Long Term Planning Technical Planning Team, 2012

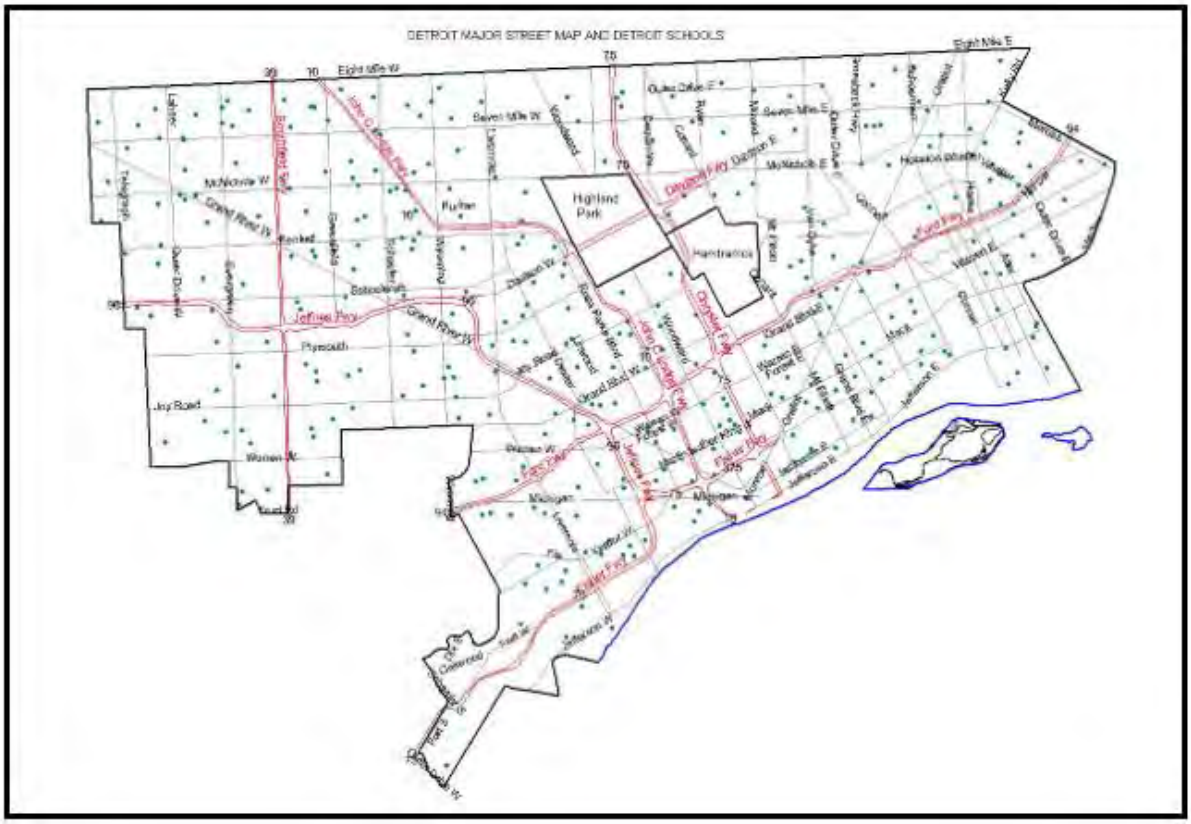
Listing of Hospitals in the City of Detroit

Hospital	Address	Phone
Children's Hospital of Michigan	3901 Beaubien St. Detroit, MI 48201	313-745-5437
Detroit Receiving Hospital and University Health Center	4201 St. Antoine St. Detroit, MI 48201	313-745-3000
Harper Hutzel University Hospital	3990 John R. Detroit, MI 48201	313-745-8040
Henry Ford Hospital	2799 W. Grand Blvd. Detroit, MI 48202	313-916-2600
Karmanos Cancer Center	4100 John R St. Detroit, MI 48201	800-527-6566
Kindred Hospital Detroit	4777 Outer Drive Detroit, MI 48234	313-369-5800
Rehabilitation Institute of Michigan	261 Mack Ave Detroit, MI 48201	313-745-1203

Samaritan Behavioral Center	5555 Conner Ave. Detroit, MI 48213	313-344-7730
Sinai-Grace Hospital	6071 W. Outer Drive Detroit, MI 48235	313-966-3300
St. John Hospital and Medical Center	22101 Moross St. Detroit, MI 48236	313-343-4000
Veterans Affairs Medical Center-John D. Dingell	4646 John R. Detroit, MI 48201	313-576-1000

Source: City of Detroit, Homeland Security

Map of Schools in the City of Detroit



Source: City of Detroit, Department of Information Technology

The following pages include a complete listing of schools in the Detroit Public Schools Community District.

Detroit Public Schools Community District List (School Year 2019-2020)

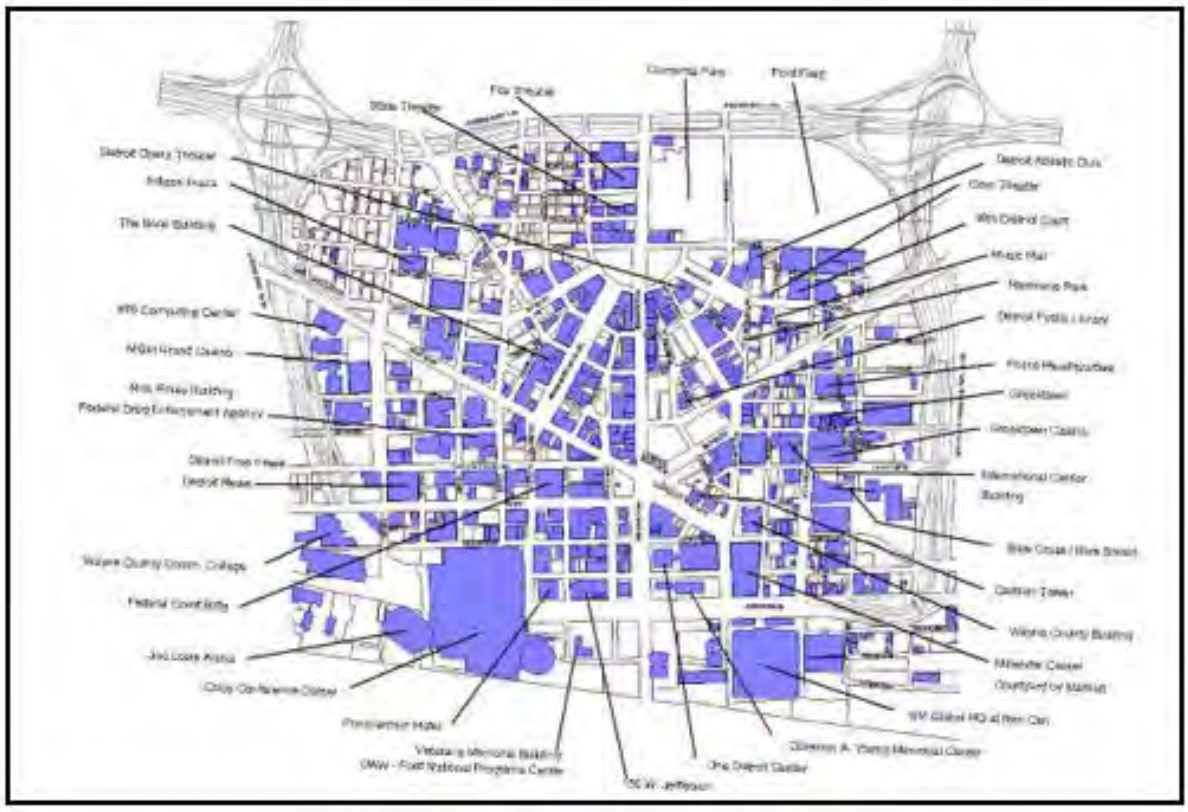
Building Name	School Level	County	City	Enrollment
A.L. Holmes Academy of Blended Learning	Elem-Middle School	Wayne	Detroit	445
Academy of the Americas at Logan	Elementary	Wayne	Not Specified	428
Academy of The Americas High School	Elem thru High School	Wayne	Detroit	662
Ann Arbor Trail Magnet School	Elem-Middle School	Wayne	Detroit	229
Bagley Elementary School of Journalism and Technology	Elem-Middle School	Wayne	Detroit	397
Barton Elementary School	Elementary	Wayne	Not Specified	165
Bates Academy	Elem-Middle School	Wayne	Detroit	759
Benjamin Carson High School of Science and Medicine	High School	Wayne	Detroit	344
Bennett Elementary School	Elementary	Wayne	Detroit	474
Blackwell Institute	Elem-Middle School	Wayne	Detroit	326
Bow Elementary-Middle School	Elem-Middle School	Wayne	Detroit	552
Breithaupt Career and Technical Center	High School	Wayne	Detroit	1
Brenda Scott Academy for Theatre Arts	Elem-Middle School	Wayne	Detroit	700
Brewer Academy	Elem-Middle School	Wayne	Detroit	548
Bunche Preparatory Academy	Elem-Middle School	Wayne	Detroit	503
Burns Elementary-Middle School	Elem-Middle School	Wayne	Detroit	361
Burton International Academy	Elem-Middle School	Wayne	Detroit	602
Carleton Elementary School	Elementary	Wayne	Detroit	374
Carstens Elementary-Middle School	Elem-Middle School	Wayne	Detroit	309
Carver STEM Academy	Elem-Middle School	Wayne	Detroit	425
Cass Technical High School	High School	Wayne	Detroit	2,357
Central High School	High School	Wayne	Detroit	269
Charles R. Drew Transition Center	Other	Wayne	Detroit	496
Charles Wright Academy of Arts and Science	Elementary	Wayne	Detroit	525
Chrysler Elementary School	Elementary	Wayne	Detroit	128
Clippert Academy	Elem-Middle School	Wayne	Detroit	479

Cody High School	High School	Wayne	Detroit	595
Coleman A. Young Elementary School	Elementary	Wayne	Detroit	485
Communication and Media Arts High School	High School	Wayne	Detroit	548
Cooke STEM Academy	Elem-Middle School	Wayne	Detroit	361
Davis Aerospace Technical High School at Golightly	High School	Wayne	Detroit	162
Davison Elementary-Middle School	Elem-Middle School	Wayne	Detroit	888
Denby High School	High School	Wayne	Detroit	539
Detroit Collegiate Preparatory High School at Northwestern	High School	Wayne	Detroit	425
Detroit International Academy for Young Women	Elem thru High School	Wayne	Detroit	204
Detroit Lions Academy	Middle School	Wayne	Detroit	113
Detroit School of Arts	High School	Wayne	Detroit	456
Diann Banks-Williamson Educational Center	High School	Wayne	Detroit	67
Dixon Elementary School	Elem-Middle School	Wayne	Detroit	510
Dossin Elementary-Middle School	Elem-Middle School	Wayne	Detroit	370
Durfee Elementary-Middle School	Elem-Middle School	Wayne	Detroit	585
Earhart Elementary-Middle School	Elem-Middle School	Wayne	Detroit	901
East English Village Preparatory Academy	High School	Wayne	Detroit	875
Edison Elementary School	Elementary	Wayne	Detroit	347
Edmonson Montessori	Elem-Middle School	Wayne	Not Specified	103
Edward "Duke" Ellington at Beckham	Elem-Middle School	Wayne	Detroit	590
Emerson Elementary-Middle School	Elem-Middle School	Wayne	Detroit	614
Fisher Magnet Lower Academy	Elementary	Wayne	Detroit	553
Fisher Magnet Upper Academy	Elem-Middle School	Wayne	Detroit	426
Foreign Language Immersion and Cultural Studies	Elem-Middle School	Wayne	Detroit	726
Frederick Douglass Academy for Young Men	Middle-High School	Wayne	Detroit	67
Gardner Elementary School	Elementary	Wayne	Detroit	268
Garvey Academy	Elem-Middle School	Wayne	Detroit	334

Golightly Education Center	Elem-Middle School	Wayne	Detroit	350
Gompers Elementary-Middle School	Elem-Middle School	Wayne	Detroit	844
Greenfield Union Elementary-Middle School	Elem-Middle School	Wayne	Detroit	269
Hamilton Academy	Elem-Middle School	Wayne	Detroit	231
Harms Elementary School	Elementary	Wayne	Detroit	343
Henderson Academy	Elem-Middle School	Wayne	Detroit	779
Henry Ford High School	High School	Wayne	Detroit	575
Hutchinson Elementary-Middle School	Elem-Middle School	Wayne	Detroit	287
J. E. Clark Preparatory Academy	Elem-Middle School	Wayne	Detroit	361
Jerry L. White Center	High School	Wayne	Detroit	196
John R. King Academic and Performing Arts Academy	Elem-Middle School	Wayne	Detroit	853
Keidan Special Education Center	Elem-Middle School	Wayne	Detroit	119
Legacy Academy	Middle-High School	Wayne	Not Specified	19
Ludington Magnet Middle School	Middle School	Wayne	Detroit	267
Mackenzie Elementary-Middle School	Elem-Middle School	Wayne	Detroit	904
Mann Learning Community	Elementary	Wayne	Detroit	375
Marion Law Academy	Elem-Middle School	Wayne	Detroit	390
Mark Twain Elementary-Middle School	Elem-Middle School	Wayne	Detroit	198
Marquette Elementary-Middle School	Elem-Middle School	Wayne	Detroit	468
Martin Luther King Jr. Senior High School	High School	Wayne	Detroit	1,077
Mary McLeod Bethune Elementary-Middle School	Elem-Middle School	Wayne	Detroit	672
Mason Academy	Elem-Middle School	Wayne	Detroit	424
Maybury Elementary School	Elementary	Wayne	Detroit	260
Moses Field Center	Elem-Middle School	Wayne	Detroit	74
Mumford High School	High School	Wayne	Detroit	1,032
Munger Elementary-Middle School	Elem-Middle School	Wayne	Detroit	975
Neinas Dual Language Learning Academy	Elem-Middle School	Wayne	Detroit	399
Nichols Elementary-Middle School	Elem-Middle School	Wayne	Detroit	290
Noble Elementary-Middle School	Elem-Middle School	Wayne	Detroit	544

Nolan Elementary-Middle School	Elem-Middle School	Wayne	Detroit	457
Osborn High School	High School	Wayne	Detroit	471
Palmer Park Preparatory Academy	Elem-Middle School	Wayne	Detroit	457
Pasteur Elementary School	Elem-Middle School	Wayne	Detroit	312
Paul Robeson Malcolm X Academy	Elem-Middle School	Wayne	Detroit	360
Pershing High School	High School	Wayne	Detroit	372
Priest Elementary-Middle School	Elem thru High School	Wayne	Detroit	759
Pulaski Elementary-Middle School	Elem-Middle School	Wayne	Detroit	482
Randolph Career and Technical Center	High School	Wayne	Detroit	4
Renaissance High School	High School	Wayne	Detroit	1,179
Roberto Clemente Learning Academy	Elementary	Wayne	Detroit	606
Ronald Brown Academy	Elem-Middle School	Wayne	Detroit	934
Sampson-Webber Leadership Academy	Elem-Middle School	Wayne	Detroit	331
Schulze Academy for Technology and Arts	Elem-Middle School	Wayne	Detroit	619
Southeastern High School	High School	Wayne	Detroit	210
Spain Elementary-Middle School	Elem-Middle School	Wayne	Detroit	350
The School at Marygrove	High School	Wayne	Not Specified	118
Thirkell Elementary-Middle School	Elem-Middle School	Wayne	Detroit	581
Thurgood Marshall Elementary School	Elem-Middle School	Wayne	Detroit	456
Turning Point Academy	Elem thru High School	Wayne	Detroit	36
Vernor Elementary School	Elem-Middle School	Wayne	Detroit	230
Wayne Elementary School	Elementary	Wayne	Detroit	302
West Side Academy of Information Technology and Cyber Security	High School	Wayne	Detroit	385
Western International High School	High School	Wayne	Detroit	1,964
Total Enrollment				50,895

Map of Downtown Buildings



Source: City of Detroit, Department of Information Technology

Listing of Critical Facilities in the City of Detroit (By Type)

The tables below provide a complete list of critical facilities, organized by type. The facility types include: Public Assembly, Government, Office Buildings, Commercial, Utilities, Industrial, and Hotels.

Public Assembly	Address	Public Assembly	Address
Huntington Place	1 Washington Blvd.	Comerica Park	2100 Woodward Ave.
Ford Field	2000 Brush St.	Fox Theatre	2211 Woodward Ave.
Gem and Century Theatres	333 Madison	Greektown Casino-Hotel	555 E. Lafayette
Joe Louis Arena	600 Civic Center	MGM Grand Casino	1777 3rd Street
Amazon	Woodward @ 8 Mile	MotorCity Casino	2901 Grand River
Music Hall Center for the Performing Arts	350 Madison	Max M. and Marjorie S. Fisher Music Center	3711 Woodward Ave.

Government	Address	Government	Address
Coleman A. Young Municipal Center	2 Woodward Ave.	DDOT Capital Park	State and Shelby
DDOT Coolidge Terminal	14044 Schaefer	DDOT	1900 W. Fort
DDOT HQ & Terminal	1301 E. Warren	GSD Storage Facility - Grandy	5031 Grandy
DPW Street Maintenance – Power House and Salt Dome	2633 Michigan	Russell Ferry – Fuel Station & Vehicle Maintenance / 2 Salt Domes	5800 Russell
Detroit Transportation Corp. Headquarters	1250 Park Place	Water Board	735 Randolph
Detroit-Windsor Tunnel	100 E. Jefferson	McNamara Bldg.	477 Michigan
Lincoln Hall of Justice Family Division - Juvenile	1025 Forest	Wayne Co. Medical Examiner	1300 E. Warren
Michigan Motor Transport Div.	5201 Rosa Parks	Federal Telecommunications Service	231 W. Lafayette
Federal Reserve Bank of Chicago – Detroit Branch	1600 E. Warren Avenue	Frank Murphy Hall of Justice	1441 St. Antoine
36th District Court	421 Madison	U.S. Post Office	1401 W. Fort
National Guard Armory 1st Battalion, 182nd Field Artillery Regiment	3030 McGraw	US Dept. Homeland Security	333 Mt. Elliot
US Homeland Security	2552 Jefferson	US Border Patrol	11700 East Jefferson Ave.
US Naval Recruiting	1155 Brewery Park	US Coast Guard	110 Mt. Elliot
State of Michigan	3044 W Grand Blvd	Rosa Parks Transit Center	1310 Cass Ave.

Office Buildings	Address	Office Buildings	Address
One Woodward Avenue	1 Woodward	Buhl Building	535 Griswold
Cadillac Towers	65 Cadillac Square	Ally Financial	500 Woodward
Rocket Mortgage/Quicken Loans	Campus Martius	First National	660 Woodward
Ford Building	615 Griswold	Guardian Bldg.	500 Griswold
General Motors	100-600 Renaissance Center	Millender Center	331 E. Jefferson
Penobscot	645 Griswold	WDIV-TV	550 W. Lafayette Blvd.
Nolan Transportation Group	1155 Brewery Park	Crain Communications	1155 Gratiot
Stroh River Place	300 River Place	UAW	8000 E. Jefferson Ave.
UAW/Miller Bldg.	8731 E. Jefferson	UAW-Chrysler Training Center	2211 E. Jefferson
UAW-Ford Training Center	151 W. Jefferson	UAW-GM Training Center	200 Walker

Commercial	Address	Commercial	Address
Detroit News Warehouse	W. Jefferson @ W. Grand	Detroit Free Press Agency	1801 W. Jefferson
Detroit City Airport	11201 Conner	Ambassador Bridge	3033 Porter St.

Utilities	Address	Utilities	Address
AT&T HQ – Antenna	444 Michigan Ave.	Detroit Plaza Co., AT&T Switch	7799 Whipple St.
Lycaste Transformer	200 Lycaste	DTE	2000 Second Avenue
DTE Substation	650 Howard	DTE Steam Plant	509 Madison
DTE Coolidge Station (Gas)	14270 Schaefer	DTE Substation	12671 Hartwell
DTE Substation	14540 W. Chicago	DTE Substation	14870 Meyers
DTE Service Center	6200 W. Warren	DTE Substation	7523 W. Chicago
DTE Substation	19033 W. 8 Mile	DTE Substation	15340 Puritan
DTE Substation	17200 Burgess	DTE Substation	15636 Harper
DTE Substation	14834 E. 8 Mile	DTE Substation	19966 Hoover
DTE Substation	11935 Gunston	DTE Substation	6425 Riopelle
DTE Substation	3712 Bellevue	DTE Substation	2500 E. Grand Blvd.
DTE Substation	285 Walker	DTE Power Station	2605 Ewald Circle
DTE Substation	955 Oakman	DTE Substation	11311 Linwood
DTE Substation	4025 Scotten	Detroit Public Lighting, West Substation	14150 Greenfield
DTE Substation	7523 W. Chicago	Mistersky Power Plant	5425 W. Jefferson
DPL Substation	3525 Beals	DPL Substation	3180 Ludden
DPL Substation	1373 Maple	DPL Substation	3126 Palmer
DPL Substation	716 Townsend	DPL Substation	9623 Harper
DPL Substation	9945 Conner	DPL Substation	2525 Ewald Circle
DPL Substation	2731 Joy Road	Detroit Water Plant	E. Jefferson @ Ashland
Tireman Combined Sewer Overflow (CSO)	16500 Tireman	Detroit Water and Sewer	Clairpoint @ Freund
7 Mile Combined Sewer Overflow (CSO)/Shiawassee	19272 Shiawassee	Detroit Water and Sewer	16898 Beaverland
Conner Creek Combined Sewer Overflow (CSO) Screening & Disinfection Facility	12244 E. Jefferson	Detroit Water Works Park	E. Jefferson @ Lillibridge
Detroit Water and Sewer	17145 Mack	Waterworks Parks - Water Treatment Plant	10100 E. Jefferson
Detroit Water and Sewer	7099 Whipple	Michigan Consolidated Gas	2000 2nd Ave.
Michigan Consolidated Gas	6500 E. Jefferson	Wolverine Pipeline	8075 Creekside Drive

Industrial	Address	Industrial	Address
Alco – NVC Company	580 St. Jean	Daimler-Chrysler	14250 Plymouth
Vitec Company	2627 Clark	Wayne Foundry and Stamping	3100 Hubbard
Piston Automotive	4015 Michigan	Ferstop Plastic	4086 Michigan
MPS Env. Tech.	2920 Scotten	Detroit Electro-Coating	2703 23rd
Global Moving and Storage	11850 E. Jefferson	Hackett Brass	45 St. Jean
Hackett Brass Foundry	1200 Lillibridge	Sunshine Fifth Corp.	609 St. Jean
Automotive Tooling Corp.	521 St. Jean	J. Rose Corp.	11231 Freud
GM Cadillac	2500 E. Grand Blvd.	Faygo Beverage	3579 Gratiot

Hotels	Address	Hotels	Address
Atheneum Suite	1000 Brush	Best Western	222 Michigan
Courtyard by Marriott	333 E. Jefferson	Crowne Plaza-Pontchartrain	2 Washington Blvd.
Marriott Renaissance Center	400 Renaissance Drive W	Mera	122 W. Elizabeth
Milner Hotel	1538 Centre	Park Avenue	2305 Park
Ramada Inn	400 Bagley	Town Apartments	1511 First
Wright	118 W. Columbia		

Source: Detroit Police Department

Listing of Critical Facilities Within Hazard Areas

Facilities Within Tornado Buffer Area			
Classification	Address	Latitude	Longitude
PLD	16861 TRINITY	42.3495	-83.0874
PLD	301 W JEFFERSON	42.37267	-83.0386
PLD	3879 BANGOR	42.34642	-83.0944
PLD	4829 LAWTON	42.3307	-83.1445
PLD	5024 LONYO	42.37404	-83.0677
PLD	532 CUSTER	42.36521	-83.0531
PLD	5425 W JEFFERSON	42.37415	-83.0676
PLD	5669 NEWBERRY	42.34541	-83.1341
PLD	6434 BEECHTON	42.39334	-83.0076
PLD	716 TOWNSEND	42.35337	-83.0605
		42.39911	-83.0037
POLICE/FIRE	1041 LAWNDALE	42.4173	-82.9547
POLICE/FIRE	111 W MONTCALM	42.40942	-82.9951
POLICE/FIRE	16825 TRINITY	42.3484	-83.1109
POLICE/FIRE	18140 JOY RD	42.35182	-83.1099
POLICE/FIRE	2300 S FORT	42.3469	-83.0939
POLICE/FIRE	2820 CENTRAL	42.36768	-83.0813
POLICE/FIRE	4700 W. FORT	42.39697	-82.9563
POLICE/FIRE	5029 MANISTIQUE	42.35708	-83.0955
POLICE/FIRE	6050 LINWOOD	42.36478	-83.0736
POLICE/FIRE	6324 W. CHICAGO	42.34691	-83.1321
POLICE/FIRE	9999 IRIS	42.35459	-83.0714
		42.38924	-82.9932
QUESTION	1301 3RD AVE	42.3682	-83.0776
QUESTION	5100 EAST NEVADA	42.3543	-83.0876
QUESTION	5630 REEDER	42.35738	-83.0821
QUESTION	5671 TRUMBULL	42.33672	-83.1382
ESSENTIAL SERVICE	18100 MEYERS	42.35914	-83.0609
ESSENTIAL SERVICE	5681 WABASH	42.37609	-83.0623
ESSENTIAL SERVICE	7401 CHRYSLER	42.37609	-83.0623
ESSENTIAL SERVICE	9240 DWIGHT	42.35459	-83.0714
CRITICAL INFRASTRUCTURE	12841 FRENCH RD	42.36431	-83.0541
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554

Facilities Within Tornado Buffer Area			
Classification	Address	Latitude	Longitude
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	8289 LYNCH RD	42.34469	-83.1509
CRITICAL INFRASTRUCTURE	836 BATES	42.37067	-83.0972
CRITICAL INFRASTRUCTURE	9962 E JEFFERSON	42.35787	-83.0733
	100 BETHUNE	42.40401	-82.966
	100 LAKEWOOD	42.40401	-82.966
	10100 W. TEN MILE/I-696 F	42.41878	-82.9426
	10750 GRAND RIVER	42.40368	-82.9992
	11131 KERCHEVAL	42.42069	-82.952
	11164 ROSSITER	42.37808	-83.0641
	1117 CLAY	42.37808	-83.0641
	1124 BURLINGAME	42.39679	-82.9895
	12020 E. SEVEN MILE	42.40007	-82.9842
	1245 LABROSSE	42.422	-82.965
	12800 DOLPHIN	42.42571	-82.9585
	14520 MEYERS	42.41756	-82.9718
	14711 LINWOOD	42.39757	-82.9557
	15277 BILTMORE	42.35897	-83.0479
	15502 BENTLER	42.35845	-83.0466
	1551 E. CANFIELD	42.35845	-83.0466
	18303 CHANDLER PARK	42.41755	-82.9211
	18303 CHANDLER PARK	42.41755	-82.9211
	19493 JOANN	42.36776	-83.0949
	234 PIQUETTE	42.36719	-83.0674
	2372 20TH ST	42.36514	-83.0994
	2625 FENKELL	42.37388	-83.0449
	2641 MICHIGAN AVE	42.3627	-83.1029
	2969 BURNS	42.3575	-83.1041
	31 WASHINGTON BLVD	42.36767	-83.0672
	3508 JUNCTION	42.37609	-83.0623
	3511 W JEFFERSON	42.37609	-83.0623
	407 S JUNCTION	42.35818	-83.0646
	4135 BLUEHILL	42.3309	-83.1188
	4409 SHERIDAN	42.37502	-83.07
	451 FREDERICK	42.33526	-83.1177
	452 DREXEL	42.38346	-82.9862

Facilities Within Tornado Buffer Area			
Classification	Address	Latitude	Longitude
	4595 FOURTH	42.34618	-83.0885
	4742 MELDRUM	42.32943	-83.1402
	4800 COLLINGWOOD	42.3846	-82.9876
	5000 30TH	42.37994	-83.0032
	5001 CHARLES, 48212	42.40871	-82.9289
	5020 CADIEUX/5103 GUILFOR	42.36682	-83.0394
	5200 MCKINLEY	42.38703	-82.991
	5246 HECLA	42.41342	-82.9192
	5400 E SEVEN MILE	42.33695	-83.1318
	5516 W. CHICAGO	42.34324	-83.1198
	5635 W FORT	42.39325	-82.9837
	577 S. POST	42.33842	-83.1401
	5947 GRANDY	42.39052	-83.0022
	5952 BURNS	42.3868	-83.0135
	600 CIVIC CENTER DR	42.36901	-83.0618
	6051 HASTINGS	42.34877	-83.1215
	6101 COMMONWEALTH	42.38407	-83.0199
	6203 W. VERNOR	42.35659	-83.1012
	6230 PLAINVIEW	42.38489	-83.0235
	639 W WILLIS	42.33672	-83.1382
	731 WOODWARD	42.37088	-83.0728
	7600 E JEFFERSON	42.38588	-83.031
	7629 CONCORD	42.3866	-83.023
	803 S SOLVAY	42.37547	-83.0845
	8301 JOHN C LODGE	42.36249	-83.1161
	8411 ALMONT	42.35739	-83.1308
	8700 BYRON	42.39378	-83.0156
	8931 MT. ELLIOTT	42.39411	-83.0265
	9101 HUBBELL	42.39168	-83.0108
	9215 MANDALE	42.38593	-83.0044
	9267 LAFAYETTE BLVD	42.39835	-83.0055
	9354 PRAIRIE	42.40003	-83.0116
	9368 TRAVERSE	42.40234	-83.0127
	9425 GRINNELL	42.40234	-83.0127
	9425 GRINNELL	42.40123	-83.01
	9721 CARDONI	42.42387	-82.9315
	9727 CAMLEY	42.40209	-83.0046
	9750 N. MARTINDALE	42.40348	-82.9958
	BRUSH, BRADY AND ALEXANDR	42.40608	-82.9298
	CANIFF & NAGEL	42.36607	-83.0724

Facilities Within Tornado Buffer Area			
Classification	Address	Latitude	Longitude
	CONANT & CANIFF	42.38897	-83.0429
	CONANT & HOLBROOK	42.39052	-83.0446
	CONNER & JEFFERSON	42.39294	-82.9832
	DEXTER & FENKELL	42.35814	-83.1095
	GLYNN COURT, HAMILTON TO	42.36231	-83.0945
	GRAND BLVD. & 14TH	42.36231	-83.0945
	GRAND BLVD. & 14TH	42.35686	-83.1096
	GRAND BLVD. & GRAND RIVER	42.36361	-83.091
	GRAND RIVER & BRETTON	42.35686	-83.1096
	GRAND RIVER & LIVERNOIS	42.3616	-83.1213
	GRAND RIVER & WYOMING	42.35998	-83.1173
	GRATIOT & 8 MI.	42.38429	-83.0111
	GRATIOT & CHENE	42.37273	-83.0187
	GRATIOT & E. GRAND BLVD.	42.40858	-82.9951
	GRATIOT & GUNSTON	42.39313	-83.0052
	GRATIOT & MCNICHOLS	42.40634	-82.9966
	GRATIOT & SEYMOUR	42.37882	-83.0147
	GRATIOT & VAN DYKE	42.37404	-83.0179
	GRIGGS AND ILENE	42.41644	-82.9366
	KERCHEVAL & BUTZEL CENTER	42.36292	-83.0591
	LIVERNOIS & MCNICHOLS	42.33111	-83.1203
	MORANG & KELLY	42.41699	-82.9108
	OUTER DRIVE & WCCC	42.35892	-83.1147
	ROUGE PARK	42.35888	-83.0488
	RUSSELL & GARFIELD	42.36225	-83.051
	SPIRIT PLAZA	42.35554	-83.0545
	ST. ANTOINE & CANFIELD	42.3587	-83.0565
	ST. ANTOINE & RECEIVING HOSPITAL	42.3599	-83.0574
	VAN DYKE & CLARK	42.37882	-83.0147
	W. VERNOR @ CLARK, 48209	42.40608	-82.9298
	WARREN & CADIEUX	42.41144	-82.9152
	WARREN & CANYON	42.35608	-83.0667
	WARREN & CASS	42.38929	-82.976
	WARREN & GD. RIVER	42.36091	-83.0546
	WARREN & I-75	42.36225	-83.051
	WARREN & SOUTHFIELD	42.3599	-83.0574
	WARREN & ST. ANTOINE	42.3599	-83.0574
	WARREN & ST. ANTOINE	42.3599	-83.0574

Facilities Within Tornado Buffer Area			
Classification	Address	Latitude	Longitude
	WARREN & ST. ANTOINE	42.35696	-83.0644
	WARREN & WOODWARD	42.35696	-83.0644
	WARREN & WOODWARD	42.35696	-83.0644
	WOODWARD & 7 MI	42.36655	-83.0709
	WOODWARD & EDISON	42.37717	-83.0779
	WOODWARD & FERRY	42.35474	-83.063
	WOODWARD & FOREST	42.35999	-83.0664
	WOODWARD & TROWBRIDGE	42.35696	-83.0644
	WOODWARD & WARREN	42.35696	-83.0644

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
		42.37248	-83.1468
PLD	1340 THIRD	42.33106	-83.0562
PLD	1340 THIRD	42.41526	-83.0706
PLD	13809 JOSEPH CAMPAU	42.34217	-83.0386
PLD	1385 MAPLE	42.39003	-83.1978
PLD	14150 GREENFIELD	42.40638	-83.102
PLD	14351 SECOND	42.34398	-83.1985
PLD	15650 W WARREN	42.41403	-83.2493
PLD	16861 TRINITY	42.3495	-83.0874
PLD	2539 EWALD CIRCLE	42.37296	-83.1095
PLD	2741 JOY RD	42.33001	-83.042
PLD	301 W JEFFERSON	42.37267	-83.0386
PLD	3126 E PALMER	42.35786	-83.0278
PLD	3174 LUDDEN	42.36606	-83.007
PLD	3725 PHILIP	42.33586	-83.1035
PLD	3879 BANGOR	42.34642	-83.0944
PLD	4829 LAWTON	42.3307	-83.1445
PLD	5024 LONYO	42.37404	-83.0677
PLD	532 CUSTER	42.36521	-83.0531
PLD	5405 RUSSELL	42.30346	-83.0908
PLD	5425 W JEFFERSON	42.37415	-83.0676
PLD	544 CUSTER	42.31787	-83.1035
PLD	5669 NEWBERRY	42.34541	-83.1341
PLD	6434 BEECHTON	42.39334	-83.0076
PLD	716 TOWNSEND	42.35337	-83.0605
PLD	75 E CANFIELD	42.29452	-83.1288
		42.39911	-83.0037
POLICE/FIRE	10101 KNODELL	42.40431	-83.0177
POLICE/FIRE	10200 ERWIN ST.	42.3799	-83.1134
POLICE/FIRE	10325 LINWOOD	42.30047	-83.1268
POLICE/FIRE	1041 LAWNDALE	42.4173	-82.9547
POLICE/FIRE	10801 WHITTIER	42.38501	-83.0811
POLICE/FIRE	111 KENILWORTH	42.33788	-83.0541
POLICE/FIRE	111 W MONTCALM	42.40942	-82.9951
POLICE/FIRE	11187 GRATIOT	42.37177	-83.2269
POLICE/FIRE	11450 WARWICK	42.40737	-83.0389
POLICE/FIRE	11740 E JEFFERSON	42.40072	-83.1182
POLICE/FIRE	1180 OAKMAN	42.37651	-83.1386
POLICE/FIRE	12000 LIVERNOIS	42.42046	-82.9858
POLICE/FIRE	12985 HOUSTON-WHITTIER	42.39345	-83.1338
POLICE/FIRE	13939 DEXTER	42.38702	-83.2463

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
POLICE/FIRE	1400 ERSKINE	42.43146	-83.1186
POLICE/FIRE	1441 WEST SEVEN MILE	42.40025	-83.1987
POLICE/FIRE	15127 GREENFIELD	42.41272	-83.1702
POLICE/FIRE	16543 MEYERS	42.41349	-83.2493
POLICE/FIRE	16825 TRINITY	42.3484	-83.1109
POLICE/FIRE	1697 W GRAND BLVD	42.4223	-83.0385
POLICE/FIRE	17475 MT ELLIOTT	42.42308	-83.2182
POLICE/FIRE	17800 CURTIS	42.35814	-83.2174
POLICE/FIRE	18140 JOY RD	42.35182	-83.1099
POLICE/FIRE	18601 RYAN	42.44024	-83.0053
POLICE/FIRE	19701 HOOVER	42.32621	-83.0454
POLICE/FIRE	20 ATWATER	42.41403	-83.2546
POLICE/FIRE	2200 CRANE	42.27301	-83.1588
POLICE/FIRE	2300 S FORT	42.3469	-83.0939
POLICE/FIRE	27900 CITY AIRPORT	42.31756	-83.1276
POLICE/FIRE	2820 CENTRAL	42.36768	-83.0813
POLICE/FIRE	2875 W. GRAND BLVD.	42.34901	-83.0422
POLICE/FIRE	3050 RUSSELL	42.35029	-83.0431
POLICE/FIRE	3396 VINEWOOD	42.43204	-83.1031
POLICE/FIRE	3500 CONNER	42.35529	-83.0347
POLICE/FIRE	3501 CHENE	42.34889	-83.0636
POLICE/FIRE	435 W ALEXANDRINE	42.31137	-83.0934
POLICE/FIRE	4700 W. FORT	42.31137	-83.0934
POLICE/FIRE	4700 W. FORT	42.39697	-82.9563
POLICE/FIRE	5029 MANISTIQUE	42.35708	-83.0955
POLICE/FIRE	6050 LINWOOD	42.36478	-83.0736
POLICE/FIRE	6100 SECOND	42.36664	-83.1388
POLICE/FIRE	6324 W. CHICAGO	42.34691	-83.1321
POLICE/FIRE	6535 LIVERNOIS	42.29419	-83.1098
POLICE/FIRE	7600 W JEFFERSON	42.37223	-83.1005
POLICE/FIRE	9999 IRIS	42.35459	-83.0714
		42.38924	-82.9932
QUESTION	115 ERSKINE	42.33019	-83.0582
QUESTION	1301 3RD AVE	42.3682	-83.0776
QUESTION	3737 E LAFAYETTE	42.4255	-83.0513
QUESTION	5100 EAST NEVADA	42.3543	-83.0876
QUESTION	5630 REEDER	42.35738	-83.0821
QUESTION	5671 TRUMBULL	42.33672	-83.1382
ESSENTIAL SERVICE	14044 SCHAEFER	42.4396	-83.1021
ESSENTIAL SERVICE	151 E STATE FAIR	42.32493	-83.0644
ESSENTIAL SERVICE	1600 W LAFAYETTE	42.42306	-83.1695

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
ESSENTIAL SERVICE	18100 MEYERS	42.35914	-83.0609
ESSENTIAL SERVICE	315 E WARREN	42.33807	-83.0452
ESSENTIAL SERVICE	421 MADISON ST.	42.33807	-83.0452
ESSENTIAL SERVICE	5681 WABASH	42.37609	-83.0623
ESSENTIAL SERVICE	7401 CHRYSLER	42.37609	-83.0623
ESSENTIAL SERVICE	9240 DWIGHT	42.35459	-83.0714
		42.34768	-83.056
CRITICAL INFRASTRUCTURE	11081 SHOEMAKER	42.41777	-83.0124
CRITICAL INFRASTRUCTURE	114 STIMSON	42.40909	-83.0039
CRITICAL INFRASTRUCTURE	11499 CONNER	42.41348	-83.0139
CRITICAL INFRASTRUCTURE	11900 FREUD	42.37601	-83.2208
CRITICAL INFRASTRUCTURE	12235 SOUTHFIELD	42.41422	-83.0146
CRITICAL INFRASTRUCTURE	12331 FRENCH RD	42.41528	-83.0156
CRITICAL INFRASTRUCTURE	12819 FRENCH RD	42.41549	-83.0158
CRITICAL INFRASTRUCTURE	12841 FRENCH RD	42.36431	-83.0541
CRITICAL INFRASTRUCTURE	1301 E WARREN	42.33253	-83.0526
CRITICAL INFRASTRUCTURE	1310 CASS AVE	42.3944	-83.175
CRITICAL INFRASTRUCTURE	13131 LYNDON	42.3944	-83.175
CRITICAL INFRASTRUCTURE	13131 LYNDON	42.3944	-83.175
CRITICAL INFRASTRUCTURE	13131 LYNDON	42.3944	-83.175
CRITICAL INFRASTRUCTURE	13131 LYNDON	42.41696	-83.0173
CRITICAL INFRASTRUCTURE	13211 FRENCH RD	42.41705	-83.0174
CRITICAL INFRASTRUCTURE	13221 FRENCH RD	42.41714	-83.0174
CRITICAL INFRASTRUCTURE	13227 FRENCH RD	42.41725	-83.0175
CRITICAL INFRASTRUCTURE	13241 FRENCH RD	42.41734	-83.0176
CRITICAL INFRASTRUCTURE	13249 FRENCH RD	42.41753	-83.0178

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
CRITICAL INFRASTRUCTURE	13265 FRENCH RD	42.41761	-83.0179
CRITICAL INFRASTRUCTURE	15616 W GRAND RIVER	42.41085	-83.2572
CRITICAL INFRASTRUCTURE	17161 MACK	42.29517	-83.2
CRITICAL INFRASTRUCTURE	194 S MORRELL	42.44083	-82.9618
CRITICAL INFRASTRUCTURE	2219 MELDRUM	42.27424	-83.1582
CRITICAL INFRASTRUCTURE	260 S MORRELL	42.33034	-83.0828
CRITICAL INFRASTRUCTURE	2633 MICHIGAN	42.33102	-83.0829
CRITICAL INFRASTRUCTURE	2641 MICHIGAN	42.34503	-83.0262
CRITICAL INFRASTRUCTURE	2751 ROBERT BRADY DR	42.44152	-83.0584
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	5800 RUSSELL	42.36895	-83.0554
CRITICAL INFRASTRUCTURE	6244 JOHN KRONK	42.39824	-83.0364
CRITICAL INFRASTRUCTURE	6331 KERCHEVAL	42.39757	-83.0361
CRITICAL INFRASTRUCTURE	6337 KERCHEVAL	42.3327	-83.0442
CRITICAL INFRASTRUCTURE	735 RANDOLPH	42.38623	-83.151
CRITICAL INFRASTRUCTURE	8289 LYNCH RD	42.34469	-83.1509
CRITICAL INFRASTRUCTURE	836 BATES	42.37067	-83.0972
CRITICAL INFRASTRUCTURE	9962 E JEFFERSON	42.35787	-83.0733
	1 CIVIC CENTER DR	42.27718	-83.142
	1 INSELRHUE DR. - BELLE ISLE	42.32658	-83.0492
	1 WASHINGTON BLVD	42.32658	-83.0492
	100 BETHUNE	42.40401	-82.966

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	100 LAKEWOOD	42.40401	-82.966
	10100 W. TEN MILE/I-696 F	42.41878	-82.9426
	10125 KING RICHARD STREET	42.42962	-83.1623
	10128 CLARITA	42.36525	-83.1596
	10147 W. CHICAGO	42.30264	-83.1202
	1017 SPRINGWELLS	42.4302	-83.165
	10235 W SEVEN MILE	42.3326	-83.0449
	1025 FARMER	42.32531	-83.0564
	1030 W JEFFERSON	42.43055	-83.1635
	10301 W SEVEN MILE	42.39612	-83.235
	10363 W. OUTER DRIVE	42.29832	-83.1323
	1040 WOODMERE	42.3952	-83.164
	10644 GRATIOT	42.37443	-83.1494
	10750 GRAND RIVER	42.40368	-82.9992
	10755 GRATIOT	42.40098	-83.1689
	11131 KERCHEVAL	42.42069	-82.952
	11164 ROSSITER	42.37808	-83.0641
	1117 CLAY	42.37808	-83.0641
	1117 CLAY	42.38855	-83.0972
	1119 BURLINGAME	42.4396	-83.0921
	1124 BURLINGAME	42.39679	-82.9895
	11290 HARPER	42.31817	-83.0937
	11491 WOODWARD	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919
	1151 TAYLOR	42.37736	-83.0919

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	1151 TAYLOR	42.37736	-83.0919
	11559 WOODWARD AVENUE	42.41004	-83.0036
	11622 CONNER	42.37314	-83.1824
	11623 SHIRLEY	42.40737	-83.0389
	11645 MOUND	42.41122	-82.9981
	11700 ST. PATRICK	42.37351	-83.2472
	11701 BURT RD	42.37468	-83.2228
	11771 GLENFIELD	42.4136	-83.014
	11831 FRENCH RD	42.42081	-83.0002
	11938 E. MCNICHOLS	42.26147	-83.1589
	12020 E. SEVEN MILE	42.40007	-82.9842
	12021 EVANSTON	42.37583	-83.1873
	12038 HUBBELL	42.33302	-83.0478
	1206-8 WOODWARD	42.37479	-83.2419
	12101 GREENVIEW	42.28405	-83.1432
	12235B SOUTHFIELD	42.45782	-83.2227
	12235B SOUTHFIELD	42.45782	-83.2227
	12235C SOUTHFIELD	42.30459	-83.3061
	12315A SOUTHFIELD	42.45782	-83.2227
	12315A SOUTHFIELD	42.45782	-83.2227
	12315B SOUTHFIELD	42.45782	-83.2227
	12416 INDIANA	42.34028	-83.039
	1245 ANTIETAM	42.34028	-83.039
	1245 ANTIETAM	42.32971	-83.0618
	1245 LABROSSE	42.422	-82.965
	12450 HAYES	42.39241	-83.1072
	1255 ANTIETAM	42.44098	-83.0917
	12550 AVONDALE, 48215	42.38215	-83.1373
	127 DAVENPORT	42.42421	-82.9784
	12700 W OUTER DRIVE	42.39165	-83.1144
	12701 14TH STREET	42.38038	-83.2748
	12701 DALE	42.37138	-83.169
	12800 KELLY	42.23942	-83.1791
	12831 FRANKFORT	42.38254	-83.2656
	12901 BEAVERLAND	42.37673	-83.1715
	12920 WADSWORTH	42.40727	-83.075
	13000 DEQUINDRE	42.33019	-83.0582
	13065 W OUTER DRIVE	42.42781	-82.9903
	13151 GREINER	42.41592	-83.0176
	13189 FRENCH	42.41403	-83.0526
	13280 CONANT	42.2905	-83.1506

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	13490 ST. LOUIS	42.38547	-83.1799
	13530 LESURE	42.33992	-83.0695
	1357 ELM	42.38656	-83.1725
	13630 STOUT	42.4177	-83.018
	13703 FRENCH RD	42.41779	-83.0181
	13709 FRENCH RD	42.41803	-83.0183
	13731 FRENCH RD	42.41814	-83.0184
	13745 FRENCH RD	42.41823	-83.0185
	13751 FRENCH RD	42.41841	-83.0187
	13767 FRENCH RD	42.4185	-83.0188
	13950 JOSEPH CAMPAU	42.41733	-83.0705
	13950 JOSEPH CAMPAU	42.39753	-83.1211
	13950 LASALLE	42.33649	-83.0325
	14010 KENTUCKY	42.38869	-83.2577
	14144 ROCKDALE	42.41392	-83.0833
	14196 EVERGREEN	42.32778	-83.0632
	14205 CLOVERDALE	42.37459	-83.1843
	14490 RIVERSIDE AVENUE, 4	42.39583	-83.1665
	14520 MEYERS	42.41756	-82.9718
	14540 LANNETTE	42.39498	-83.1985
	14585 GREENFIELD	42.39587	-83.1651
	14640 MEYERS, 48238	42.39659	-83.1358
	14655 DEXTER	42.44705	-82.9725
	14711 LINWOOD	42.39757	-82.9557
	1475 RANDOLPH	42.39777	-83.1691
	14800 MEYERS	42.39615	-83.2623
	14858 BURGESS	42.39624	-83.2655
	14879 BEAVERLAND	42.33732	-83.0341
	1489 E. LAFAYETTE	42.34436	-83.0266
	1499 CHENE	42.37185	-83.1008
	14TH & BLAINE	42.28847	-83.1373
	150 S. FORMAN	42.3329	-83.0495
	15000 MACKENZIE	42.37573	-83.0943
	151 W JEFFERSON	42.38691	-83.1945
	15277 BILTMORE	42.35897	-83.0479
	1536 PENNSYLVANIA	42.32542	-83.0633
	1536 W LAFAYETTE	42.40605	-83.1381
	15400 QUINCY	42.40318	-83.2516
	15502 BENTLER	42.35845	-83.0466
	1551 E. CANFIELD	42.35845	-83.0466
	1551 E. CANFIELD	42.44228	-82.9597

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	15600 E STATE FAIR	42.32555	-83.064
	15639 THATCHER	42.40507	-83.2745
	15760 ILIAD CT	42.35057	-83.0403
	1580 WILKINS	42.41442	-83.0841
	15851 ILIAD CT	42.34084	-83.0355
	1592 ANTIETAM	42.40734	-83.2729
	1600 WOODWARD	42.33682	-83.05
	1601 ANTIETAM & RUSSELL	42.3275	-83.0454
	161 W JEFFERSON	42.43335	-83.2743
	16214 RIDGE	42.41045	-83.2566
	16411 W. CHICAGO AVENUE	42.36947	-83.2089
	16540 W RIVERDALE DR	42.35079	-83.2078
	16601 FLORENCE	42.41085	-83.2572
	16630 LAHSER	42.41455	-83.1453
	16657 PRAIRIE	42.4171	-83.1709
	16674 APPOLINE	42.41021	-83.2706
	16789 W RIVERDALE DR	42.22784	-83.189
	1680 MICHIGAN	42.41426	-83.1753
	16800 CHEYENNE	42.36142	-83.2127
	16950 W RIVERDALE DR	42.33273	-83.0278
	1700 ATWATER	42.33818	-83.0318
	17001 WEAVER	42.41843	-83.1363
	17181 BELDEN	42.42237	-83.0022
	17235 CARDONI	42.41863	-83.2259
	17236 AVON	42.41262	-83.0814
	17273 WOODBINE	42.43938	-83.2156
	17300 FARGO	42.39749	-83.2146
	1754 BURLINGAME	42.42266	-83.0894
	17542 RUSSELL	42.42049	-83.1078
	17551 WOODWARD	42.42386	-83.0434
	17806 NORWOOD	42.42504	-83.0352
	17825 SHERWOOD	42.42431	-83.0674
	17TH, 18TH AND ROSE	42.42136	-83.2526
	18100 MEYERS	42.42306	-83.1695
	18160 ANGLIN	42.4239	-83.2252
	18201 GREENVIEW	42.42709	-83.092
	18294 GREENFIELD	42.42415	-83.1971
	18294 GREENFIELD	42.44048	-83.0563
	18303 CHANDLER PARK	42.41755	-82.9211
	18303 CHANDLER PARK	42.41755	-82.9211
	18303 CHANDLER PARK	42.42759	-83.0924

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	18350 HAWTHORNE	42.36906	-83.2198
	18350 WEAVER	42.375	-83.3087
	18400 CAPITOL	42.375	-83.3087
	18400 TEPPERT	42.42361	-83.2696
	18444 SYRACUSE	42.42522	-83.2574
	18460 LAHSER	42.42522	-83.2574
	18491 SYRACUSE	42.35115	-83.0391
	18501 HEALY	42.36492	-83.2215
	18501 W. CHICAGO AVENUE	42.42649	-83.243
	18600 GRAYFIELD	42.42619	-83.2682
	1883 WOODWARD AVENUE	42.42796	-83.274
	19 STEVE YZERMAN DR.	42.33287	-83.0274
	19021 WOODWARD	42.43069	-83.1177
	19021 WOODWARD	42.43069	-83.1177
	19101 WOODWARD	42.43529	-83.0481
	19227 COVENTRY	42.43438	-83.1033
	19255 SYRACUSE	42.43123	-83.2747
	19257 APPLETON	42.43289	-83.2135
	19314 VAN DYKE	42.43578	-83.0242
	19320 VAN DYKE	42.43616	-83.0564
	19339 HEALY	42.37683	-83.1004
	1935 ATKINSON	42.43585	-83.0826
	19361 VOTROBECK	42.36505	-83.2314
	19396 CHICAGO	42.43901	-83.2314
	19493 JOANN	42.36776	-83.0949
	1955 DELAWARE	42.35134	-83.2328
	19590 TIREMAN	42.35134	-83.2328
	19590 TIREMAN	42.44083	-82.9618
	19601 CRUSADE	42.4384	-83.0731
	19635 MITCHELL	42.43731	-83.1403
	19701 CANTERBURY	42.43695	-83.1539
	199 W JEFFERSON	42.44096	-83.0015
	19908 ANNOTT	42.34543	-83.0347
	1991 ANTIETAM	42.43833	-83.2082
	19976 OAKFIELD	42.43931	-83.2435
	2 WOODWARD AVENUE	42.32621	-83.0454
	20 ATWATER	42.44078	-83.1405
	20001 CANTERBURY	42.32927	-83.0728
	20101 MOUND	42.44144	-83.1586
	20250 WISCONSIN	42.44143	-83.1566
	20250 WISCONSIN	42.34748	-83.0552

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	203 MT ELLIOT	42.34748	-83.0552
	20380-90 TIREMAN	42.44196	-83.2003
	20394 GREENFIELD	42.44573	-83.0961
	2060 BLAINE	42.38336	-83.2437
	20601 W DAVISON	42.41943	-83.2444
	2070 BLAINE	42.40652	-83.2446
	2141 LIVERNOIS / 6370 W VERNOR	42.37172	-83.2499
	21415 PLYMOUTH	42.33766	-83.0251
	2151 E JEFFERSON	42.41403	-83.2546
	21800 JOY	42.36212	-83.2624
	21800 JOY	42.36212	-83.2624
	21800 W WARREN	42.33375	-83.0227
	2200 E ATWATER	42.35732	-83.2562
	224 PIQUETTE	42.27424	-83.1582
	22750 N RIVERDALE DR	42.33464	-83.0223
	2280 ATWATER	42.43583	-83.2727
	23060 FRISBEE	42.32993	-83.0802
	2314 18TH ST	42.33	-83.0803
	2318 18TH ST	42.33008	-83.0803
	234 PIQUETTE	42.36719	-83.0674
	23400 N RIVERDALE DR	42.33028	-83.0804
	2351 N LA SALLE GARDENS	42.33045	-83.0805
	23581 VERNE	42.33056	-83.0806
	23678 FLORENCE	42.3307	-83.0806
	23718 FLORENCE	42.32934	-83.0828
	2372 20TH ST	42.36514	-83.0994
	23801 PURITAN	42.33083	-83.0807
	2382 18TH ST	42.40891	-83.274
	2440 RUSSELL	42.43452	-83.2843
	24601 FRISBEE	42.37028	-83.1048
	25 WASHINGTON BLVD	42.32832	-83.0484
	251 ADELAIDE	42.33611	-83.0662
	2577 W GRAND BLVD	42.34376	-83.0492
	2600 BRUSH	42.4029	-83.1269
	2625 FENKELL	42.37388	-83.0449
	2631 BAGLEY	42.32499	-83.0787
	2631 BAGLEY	42.33034	-83.0828
	2633 MICHIGAN	42.33034	-83.0828
	2633 MICHIGAN	42.33034	-83.0828
	2633 MICHIGAN	42.33034	-83.0828

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	2633 MICHIGAN	42.33034	-83.0828
	2633 MICHIGAN	42.33034	-83.0828
	2633 MICHIGAN	42.33034	-83.0828
	2641 MICHIGAN AVE	42.3627	-83.1029
	2660 HOGARTH	42.37057	-83.1077
	27 WASHINGTON BLVD	42.37029	-83.109
	2700 GLADSTONE	42.44049	-83.0581
	2711 E. OUTER DRIVE	42.33691	-83.0208
	2711 WIGHT	42.24642	-83.2012
	2900 ROCHESTER	42.36699	-83.1089
	2969 BURNS	42.3575	-83.1041
	3 WASHINGTON BLVD	42.32853	-83.0443
	31 WASHINGTON BLVD	42.36767	-83.0672
	3314 BUCHANAN	42.35642	-83.0246
	3356 E. FERRY	42.30902	-83.0958
	3420 CHARLEVOIX	42.43281	-83.0684
	3501 CHENE	42.36071	-83.0263
	3506 GRATIOT	42.3301	-83.1103
	3508 JUNCTION	42.37609	-83.0623
	3511 W JEFFERSON	42.37609	-83.0623
	3650 JOHN C LODGE	42.31577	-83.2707
	3716 MCGRAW	42.38386	-83.1277
	3741 MT. ELLIOTT	42.33699	-83.0964
	3751 FIELD	42.36474	-83.0183
	3766 WIGHT	42.36634	-83.0265
	3812 MT ELLIOTT	42.36314	-83.0223
	3915 SECOND	42.34689	-83.0675
	3920 FOURTH	42.34699	-83.0676
	3970 MARLBOROUGH	42.31305	-83.0786
	401 MARQUETTE	42.3473	-83.0678
	402 SMITH	42.3475	-83.0679
	405 E BETHUNE	42.32396	-83.1412
	407 S JUNCTION	42.35818	-83.0646
	410 MONTCLAIR	42.34389	-83.0807
	4135 BLUEHILL	42.3309	-83.1188
	4190 BELLEVUE	42.29074	-83.1283
	4351 CONNER	42.39009	-82.9587
	4365 NEWPORT	42.39786	-82.9369
	4409 SHERIDAN	42.37502	-83.07
	444 SMITH	42.44403	-83.0578
	4444 E. EIGHT MILE	42.44403	-83.0578

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	4498 16TH	42.32824	-83.0511
	451 FREDERICK	42.33526	-83.1177
	452 DREXEL	42.38346	-82.9862
	4595 FOURTH	42.34618	-83.0885
	4742 MELDRUM	42.32943	-83.1402
	4795 LONYO	42.37384	-83.1324
	4800 COLLINGWOOD	42.3846	-82.9876
	5000 30TH	42.37994	-83.0032
	5000 ROHNS	42.41352	-83.052
	5001 CHARLES, 48212	42.40871	-82.9289
	5020 CADIEUX/5103 GUILFOR	42.36682	-83.0394
	5200 MCKINLEY	42.38703	-82.991
	5246 HECLA	42.41342	-82.9192
	539 THIRD	42.43323	-83.0487
	5400 E SEVEN MILE	42.33695	-83.1318
	550 GREYFRIARS	42.38528	-83.0871
	5516 W. CHICAGO	42.34324	-83.1198
	5635 W FORT	42.39325	-82.9837
	5741 FAUST AVENUE	42.29779	-83.1069
	577 S. POST	42.33842	-83.1401
	5947 GRANDY	42.39052	-83.0022
	5952 BURNS	42.3868	-83.0135
	5995 HURBUT	42.40618	-83.0408
	5997 - 6311 CANIFF	42.32519	-83.0514
	600 CIVIC CENTER DR	42.36901	-83.0618
	6051 HASTINGS	42.34877	-83.1215
	6101 COMMONWEALTH	42.38407	-83.0199
	6203 W. VERNOR	42.35659	-83.1012
	6209 LAWTON	42.33514	-83.2333
	6230 PLAINVIEW	42.38489	-83.0235
	6230 SHERIDAN	42.34932	-83.0664
	6301 W JEFFERSON	42.29813	-83.0945
	6301 W JEFFERSON	42.36636	-83.1396
	639 W WILLIS	42.33672	-83.1382
	6420 MCGRAW	42.33028	-83.0476
	645 GRISWOLD	42.33028	-83.0476
	645 GRISWOLD	42.33028	-83.0476
	645 GRISWOLD	42.33028	-83.0476
	6965 MCGRAW	42.42957	-83.2389
	7 MI & EVERGREEN	42.43508	-82.9777
	7 MI & GRATIOT	42.43508	-82.9777

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	7 MI & GRATIOT	42.43542	-82.9655
	7 MI & HAYES	42.43081	-83.1874
	7 MI & JAMES COUZENS	42.43125	-83.1707
	7 MI & MEYERS	42.43195	-83.1273
	7 MI & PONTCHARTRAIN	42.43397	-83.0243
	7 MI & VAN DYKE	42.43397	-83.0243
	7 MI & VAN DYKE	42.43135	-83.161
	7001 KERCHEVAL	42.3505	-83.0499
	7260 GRATIOT	42.35406	-83.1418
	7300 GRATIOT	42.33124	-83.0472
	731 WOODWARD	42.37088	-83.0728
	7341 CHALFONTE	42.34522	-83.2151
	7350 SOUTHFIELD RD.	42.43891	-83.1116
	744 E ADELINE	42.34608	-83.2142
	7600 E JEFFERSON	42.38588	-83.031
	7629 CONCORD	42.3866	-83.023
	77 E CANFIELD	42.36901	-83.0107
	7737 KERCHEVAL	42.31246	-83.1249
	7744 W VERNOR	42.38623	-83.151
	7751 W DAVISON	42.34879	-83.202
	7753 RUTHERFORD	42.34887	-83.2569
	8 MI & BEL AIR CENTER	42.44731	-83.0834
	8 MI & GLENN LODGE	42.44984	-82.9679
	8 MI & GRATIOT	42.44479	-83.2005
	8 MI & GREENFIELD	42.44699	-83.1029
	8 MI & JOHN R	42.45023	-82.9413
	8 MI & KELLY	42.44324	-83.2589
	8 MI & LAHSER	42.44608	-83.142
	8 MI & LIVERNOIS	42.4445	-83.2202
	8 MI & SOUTHFIELD	42.44845	-83.0248
	8 MI & VAN DYKE	42.44565	-83.1615
	8 MI & WYOMING	42.29493	-83.1092
	800 COTTRELL	42.28871	-83.1532
	800 W LARNED	42.33156	-83.0468
	803 S SOLVAY	42.37547	-83.0845
	8145 CHALFONTE	42.41926	-83.0208
	821 S SOLVAY	42.38623	-83.151
	8221 W DAVISON	42.41756	-83.0192
	8268 NUERNBERG	42.43251	-83.0195
	8277 JOHN LODGE	42.41756	-83.0189
	8301 JOHN C LODGE	42.36249	-83.1161

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	8351 MADOLA	42.41497	-83.0169
	8380 E. JEFFERSON	42.41541	-83.017
	8395 ALMONT	42.41464	-83.0168
	8401 E. FOREST	42.35435	-83.2114
	8405 CARLIN	42.41514	-83.0165
	8410 ALMONT	42.4155	-83.0167
	8411 ALMONT	42.35739	-83.1308
	8411 NORTHFIELD	42.41492	-83.0161
	8415 DUBAY	42.41519	-83.0164
	8431 ROSA PARKS BLVD	42.41025	-83.0149
	8499 LYFORD	42.41727	-83.155
	8500 PURITAN	42.41398	-83.0153
	8501 E CANFIELD	42.41029	-83.0148
	8501 LYFORD	42.4138	-83.0149
	8513 ELGIN	42.41277	-83.0139
	8550 MONTLIEU	42.41254	-83.0135
	8671 CARLIN	42.33188	-83.0583
	8699 HERITAGE PL/DUMBARTO	42.37522	-83.0905
	8700 BYRON	42.39378	-83.0156
	8741 EPWORTH	42.37577	-83.089
	8741 JOHN C LODGE	42.28741	-83.1218
	8826 ASHTON	42.36505	-83.1217
	8890 GRANDMONT	42.36008	-83.2099
	8901 VAN DYKE	42.29775	-83.1264
	8902 W. FORT	42.38164	-83.0803
	8927 GRANDMONT	42.39457	-83.0398
	8931 MT. ELLIOTT	42.39411	-83.0265
	900 MERRILL PLAISANCE	42.42215	-83.1137
	9009 ABINGTON AVE	42.37886	-83.091
	9027 JOHN C LODGE	42.33292	-83.0975
	903 W GRAND BLVD	42.36131	-83.1395
	9101 HUBBELL	42.39168	-83.0108
	9177 ROBSON	42.30525	-83.136
	9215 MANDALE	42.38593	-83.0044
	9227 CHAPIN	42.3633	-83.2654
	9250 DWIGHT	42.29854	-83.1322
	9267 LAFAYETTE BLVD	42.39835	-83.0055
	9300 ARMOUR	42.3645	-83.1427
	9354 PRAIRIE	42.40003	-83.0116
	9368 TRAVERSE	42.40234	-83.0127
	9425 GRINNELL	42.40234	-83.0127

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	9425 GRINNELL	42.40123	-83.01
	9447 GRINNELL	42.34818	-83.0697
	949 W. WILLIS	42.36724	-83.1796
	9510 DECATUR	42.3676	-83.1843
	9515 FREELAND	42.36771	-83.1326
	9516 W. GRAND RIVER	42.3922	-83.0727
	9641 CARDONI	42.36695	-83.1892
	9663 MARLOWE	42.38678	-83.0853
	9719 WOODWARD	42.39011	-83.0711
	9721 CARDONI	42.42387	-82.9315
	9727 CAMLEY	42.40209	-83.0046
	9733 GRINNELL	42.37124	-83.1268
	9750 N. MARTINDALE	42.40348	-82.9958
	9945 CONNER	42.3695	-83.1963
	9946 PREST	42.40346	-83.0179
	9980 ERWIN	42.37016	-83.1709
	9982 SORRENTO	42.37286	-83.1267
	BEAUBIEN AT CHILDREN'S HOSPITAL	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071
	BELLE ISLE	42.38827	-83.3071

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	BELLE ISLE	42.32896	-83.0618
	BRUSH, BRADY AND ALEXANDR	42.40608	-82.9298
	CADIEUX & WARREN	42.33177	-83.0462
	CADILLAC SQUARE	42.39646	-83.0689
	CANIFF & DEQUINDRE	42.39646	-83.0689
	CANIFF & DEQUINDRE	42.39981	-83.0598
	CANIFF & JOSEPH CAMPAU	42.39685	-83.0679
	CANIFF & NAGEL	42.36607	-83.0724
	CENTRAL, NORTH OF WARREN	42.34592	-83.0277
	CHENE & CHENE CT.	42.34138	-83.0249
	CHENE & LAFAYETTE	42.34294	-83.026
	CLAIRMOUNT TO HIGHLAND PA	42.43293	-83.0737
	CONANT & 7 MI.	42.40244	-83.0527
	CONANT & CANIFF	42.38897	-83.0429
	CONANT & HOLBROOK	42.39052	-83.0446
	CONNER & JEFFERSON	42.39294	-82.9832
	CONNER & WAVENEY	42.42399	-83.1704
	CURTIS & MEYERS	42.42534	-83.0825
	DEQUINDRE & NEVADA	42.38974	-83.1309
	DEXTER & DAVISON	42.38974	-83.1309
	DEXTER & DAVISON	42.40277	-83.1356
	DEXTER & FENKELL	42.35814	-83.1095
	EAST GRAND BLVD., GRATIOT	42.44753	-82.9435
	ELIZABETH AND FIFTH	42.42957	-83.2389
	EVERGREEN & 7 MI	42.44376	-83.2394
	EVERGREEN & 8 MI	42.32879	-83.2348
	FAIRGROUNDS TRANSIT CENTER	42.33254	-83.0446
	FARMER & BATES	42.40067	-83.2374
	FORD FREEWAY TO RAILROAD	42.27617	-83.1552
	GLYNN COURT, HAMILTON TO	42.36231	-83.0945
	GRAND BLVD. & 14TH	42.36231	-83.0945
	GRAND BLVD. & 14TH	42.35686	-83.1096
	GRAND BLVD. & GRAND RIVER	42.36361	-83.091
	GRAND BLVD. & ROSA PARKS	42.34094	-83.0701
	GRAND RIVER & ASH	42.34364	-83.0768
	GRAND RIVER & AVERY	42.4011	-83.2193
	GRAND RIVER & BRETTON	42.35686	-83.1096
	GRAND RIVER & GRAND BLVD.	42.39266	-83.1984

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	GRAND RIVER & GREENFIELD	42.39266	-83.1984
	GRAND RIVER & GREENFIELD	42.36531	-83.1305
	GRAND RIVER & JOY RD.	42.36867	-83.1388
	GRAND RIVER & LIVERNOIS	42.3616	-83.1213
	GRAND RIVER & QUINCY	42.38462	-83.1784
	GRAND RIVER & SCHAEFER	42.37668	-83.1587
	GRAND RIVER & WYOMING	42.35998	-83.1173
	GRAND RIVER AND VANCOUVER	42.43508	-82.9777
	GRATIOT & 7 MI	42.43508	-82.9777
	GRATIOT & 7 MI	42.43508	-82.9777
	GRATIOT & 7 MI	42.44984	-82.9679
	GRATIOT & 8 MI.	42.38429	-83.0111
	GRATIOT & BURNS	42.3525	-83.032
	GRATIOT & CHENE	42.37273	-83.0187
	GRATIOT & E. GRAND BLVD.	42.40858	-82.9951
	GRATIOT & GUNSTON	42.39313	-83.0052
	GRATIOT & HARPER	42.42693	-82.9831
	GRATIOT & MCNICHOLS	42.40634	-82.9966
	GRATIOT & OUTER DRIVE	42.34358	-83.0387
	GRATIOT & RUSSELL	42.34358	-83.0387
	GRATIOT & RUSSELL	42.42693	-82.9831
	GRATIOT & SEYMOUR	42.37882	-83.0147
	GRATIOT & VAN DYKE	42.37404	-83.0179
	GRATIOT & WARREN	42.44272	-83.2004
	GREENFIELD & JAMES COUZENS	42.35576	-83.1969
	GREENFIELD & MACKENZIE	42.41598	-83.1993
	GREENFIELD & MCNICHOLS	42.41967	-83.1995
	GREENFIELD & OUTER DRIVE	42.37256	-83.1976
	GREENFIELD & PLYMOUTH	42.38797	-83.1615
	GRIGGS AND ILENE	42.41644	-82.9366
	HARPER & CADIEUX	42.27718	-83.142
	HART PLAZA	42.42718	-82.9653
	HAYES & SEYMOUR	42.38196	-83.0783
	JEFFERSON & BALDWIN	42.33087	-83.0398
	JOS. CAMPAU, MULLETT & CL	42.40435	-83.063
	JOSEPH CAMPAU & CAMMOR	42.39981	-83.0598
	JOSEPH CAMPAU & CANIFF	42.39981	-83.0598
	JOSEPH CAMPAU & CANIFF	42.40208	-83.0614
	JOSEPH CAMPAU & CASMERE	42.40435	-83.063

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	JOSEPH CAMPAU & COMMOR	42.3937	-83.0558
	JOSEPH CAMPAU & HOLBROOK	42.3937	-83.0558
	JOSEPH CAMPAU & HOLBROOK	42.40237	-83.0616
	KERCHEVAL & BUTZEL CENTER	42.36292	-83.0591
	KIRBY & ST. ANTOINE	42.34138	-83.0249
	LAFAYETTE & CHENE	42.34138	-83.0249
	LAFAYETTE & CHENE	42.33889	-83.0307
	LAFAYETTE & ORLEANS	42.33649	-83.0363
	LAFAYETTE & RIVARD	42.33473	-83.0404
	LAFAYETTE & ST. ANTOINE	42.33473	-83.0404
	LAFAYETTE & ST. ANTOINE	42.32937	-83.0453
	LASALLE, TUXEDO TO COLLIN	42.40295	-83.1272
	LINWOOD & FENKELL	42.39816	-83.1255
	LINWOOD & OAKMAN	42.44608	-83.142
	LIVERNOIS & 8 MI.	42.40266	-83.1404
	LIVERNOIS & FENKELL	42.41235	-83.1408
	LIVERNOIS & FLORENCE	42.41715	-83.141
	LIVERNOIS & MCNICHOLS	42.33111	-83.1203
	LODGE FREEWAY AND 3RD AVE	42.34752	-83.058
	MACK & CONNER	42.3484	-83.056
	MADISON, WITHERELL TO RAN	42.40705	-83.0981
	MANCHESTER & WOODWARD	42.40705	-83.0981
	MANCHESTER & WOODWARD	42.40705	-83.0981
	MANCHESTER & WOODWARD	42.36757	-83.1245
	MARTINDALE AND JOY ROAD	42.41814	-83.0915
	MCNICHOLS & CARDONI	42.41814	-83.0915
	MCNICHOLS & CARDONI	42.41598	-83.1993
	MCNICHOLS & GREENFIELD	42.41598	-83.1993
	MCNICHOLS & GREENFIELD	42.41706	-83.1536
	MCNICHOLS & NORTHLAWN	42.41659	-83.1798
	MCNICHOLS & SOUTHFIELD	42.41699	-83.1571
	MCNICHOLS TO PALMER PARK	42.33166	-83.0577
	MICHIGAN & 3RD	42.31643	-83.1949
	MROCK DRIVE - BELLE ISLE	42.44479	-83.211
	NULL	42.31894	-83.1868
	NULL	42.40881	-83.088
	OAKLAND & GERALD	42.40881	-83.088
	OAKLAND TO LINWOOD	42.39816	-83.1255

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	OAKMAN & LINWOOD	42.39816	-83.1255
	OAKMAN BOULEVARD TO LINWO	42.33453	-83.056
	OREGON AT GRAND RIVER	42.41988	-83.1946
	OUTER DRIVE & WCCC	42.35892	-83.1147
	PLEASANT END DRIVE - BELLE ISLE	42.37162	-83.2592
	PLYMOUTH & ROUGE PARK DRIVE	42.37187	-83.24
	PONTCHARTRAIN	42.4099	-83.1407
	PURTAIN & LIVERNOIS	42.3642	-83.1198
	QUINCY AND BLAINE	42.41683	-83.2585
	RIVER TO RIVER	42.34503	-83.0262
	ROBERT BRADBY	42.37321	-83.0972
	ROSA PARKS & BLAINE	42.3744	-83.259
	ROUGE PARK	42.35888	-83.0488
	RUSSELL & GARFIELD	42.36225	-83.051
	SPIRIT PLAZA	42.35554	-83.0545
	ST. ANTOINE & CANFIELD	42.3587	-83.0565
	ST. ANTOINE & HANCOCK	42.34971	-83.0524
	ST. ANTOINE & RECEIVING HOSPITAL	42.3599	-83.0574
	ST. JEAN & SHOEMAKER TERMINAL	42.43915	-83.1202
	STATE FAIR & WOODWARD	42.43258	-83.0084
	TEPPERT	42.34019	-83.0719
	TRUMBELL & ASH	42.43397	-83.0243
	VAN DYKE & CLARK	42.37882	-83.0147
	VAN DYKE & GRATIOT	42.41951	-83.0237
	VAN DYKE & MCNICHOLS	42.42674	-83.024
	W. GRAND BLVD & LODGE FWY	42.28186	-83.1276
	W. JEFFERSON AND BRENNAN	42.32027	-83.0958
	W. VERNOR @ CLARK, 48209	42.40608	-82.9298
	WARREN & CANYON	42.35608	-83.0667
	WARREN & CASS	42.38929	-82.976
	WARREN & GD. RIVER	42.36091	-83.0546
	WARREN & I-75	42.36225	-83.051
	WARREN & SOUTHFIELD	42.3599	-83.0574
	WARREN & ST. ANTOINE	42.3599	-83.0574
	WARREN & ST. ANTOINE	42.3599	-83.0574
	WARREN & ST. ANTOINE	42.35696	-83.0644
	WARREN & WOODWARD	42.35696	-83.0644

Facilities Within HAZMAT Buffer Area			
Classification	Address	Latitude	Longitude
	WARREN & WOODWARD	42.35696	-83.0644
	WEST GRAND BOULEVARD TO B	42.43212	-83.1154
	WOODWARD & 7 MI	42.43212	-83.1154
	WOODWARD & 7 MI	42.36655	-83.0709
	WOODWARD & AMSTERDAM	42.38637	-83.0841
	WOODWARD & CHICAGO	42.38282	-83.0817
	WOODWARD & CLAIRMONT	42.39029	-83.0868
	WOODWARD & COLLINGWOOD	42.3846	-83.0829
	WOODWARD & EDISON	42.37717	-83.0779
	WOODWARD & FAIRGROUNDS	42.41316	-83.1022
	WOODWARD & FERRY	42.35474	-83.063
	WOODWARD & FOREST	42.35999	-83.0664
	WOODWARD & KIRBY	42.34752	-83.058
	WOODWARD & MACK	42.40705	-83.0981
	WOODWARD & MANCHESTER	42.40705	-83.0981
	WOODWARD & MANCHESTER	42.34959	-83.0594
	WOODWARD & SELDEN	42.43915	-83.1202
	WOODWARD & STATE FAIR	42.38941	-83.0862
	WOODWARD & TROWBRIDGE	42.35696	-83.0644
	WOODWARD & WARREN	42.35696	-83.0644
	WOODWARD TO OAKLAND	42.40971	-83.16
	WYOMING & PURITAN	42.45627	-83.162

Listing of SARA Title III Facilities

SARA TITLE III (SECTION 302): EMERGENCY PLANNING NOTIFICATION LIST

Source: Detroit Local Emergency Planning Committee

Active Facilities

This report was exported by the Online TIER II MANAGER™ version 5.3 on 01/07/2022 at 09:27:48 AM

	MI SARA ID	Company Name	Facility/Site Name	Facility Address
				Multiple Addresses For The Facility
1	2465	3M DETROIT ABRASIVES	3M DETROIT ABRASIVES	11900 EAST 8 MILE ROAD, DETROIT, MI 48205
2	21086	Aevitas Specialty Services	Aevitas Specialty Services Corp	663 Lycaste, Detroit, MI 48214
3	22558	ADMIN/WAREHOUSE COMPLEX	AJAX METAL PROCESSING	4600 BELLEVUE AVE., DETROIT, MI 48207
4	5060	Ajax Metal Processing	AJAX METAL PROCESSING, INC.	4651 BELLEVUE AVE, DETROIT, MI 48207
5	1745	Covia Corporation	ALPHA RESINS, LLC	17350 RYAN RD, DETROIT, MI 48212
6	4133	Ameriti Manufacturing	AmeriTi Manufacturing Company	19300 FILER AVE, detroit, MI 48234
7	14637	Fini Finish Products	ARTED CHROME PLATING INC	38 PIQUETTE, DETROIT, MI 48202
8	19647	AT&T CORP.	AT&T - M10B92	445 State St, Detroit, MI 48226-1308
9	15536	New Cingular Wirelesss PCS, LLC - m62016	AT&T - M62016	23201 W 8 MILE RD, DETROIT, MI 48219-1188
10	6023	Michigan Bell Telephone Company/AT&T Michigan	BELL BLDG. - M11101	1365 CASS AVE., DETROIT, MI 48226
11	14418	Bridgewater Interiors LLC	BRIDGEWATER INTERIORS, L.L.C.	4617 W FORT ST, DETROIT, MI 48209
12	14697	C. F. Burger Cremery	C. F. BURGER CO	8101 GREENFIELD RD, DETROIT, MI 48228
13	21789	Cardinal Health	Cardinal health	6000 Rosa parks, Detroit, MI 48208
14	19526	Clean Earth of Michigan (Formerly DARTDisposal and Recycling Technologies, Inc.)	Clean Earth of Michigan (Formerly DARTDisposal and Recycling Technologies, Inc.)	8647 Lyndon Street, Detroit, MI 48238
15	22614	New Cingular Wireless PCS, LLC	COBO CENTER DAS - USID128105	1 WASHINGTON BOULEVARD, DETROIT, MI 48226
16	6024	Michigan Bell Telephone Company/AT&T Michigan	COLUMBIA CENTRAL OFFICE - M11145	52 SELDEN, DETROIT, MI 48226
17	22155	Detroit Sportservice, Inc	Comerica Park	2100 Woodward Ave, Detroit, MI 48201
18	12805	FCA US LLC	Conner Center	20000 CONNER AVE, DETROIT, MI 48234
19	10448	COOPER HEAT TREATING LLC	COOPER HEAT TREATING LLC	20251 SHERWOOD ST., DETROIT, MI 48234
20	1834	Advanced Urethanes, Inc. dba Aldoa Company	dba Aldoa Company	12727 Westwood Street, Detroit, MI 48223
21	19176	Transtar LLC	Delray Connecting Railroad	1 Zug Island Road, Detroit, MI 48218
22	17252	DTE ELECTRIC COMPANY	DELRAY PEAKERS	6911 WEST JEFFERSON, DETROIT, MI 48209
23	6028	Michigan Bell Telephone Company/AT&T Michigan	DET MADISON BLDG. - M56132	105 E BETHUNE, DETROIT, MI 48202
24	2415	Dubois Chemicals	Detroit	6100 Vancouver St, Detroit, MI 48204
25	20184	Alro Steel Corporation	DETROIT (DT)	18695 Sherwood Avenue, Detroit, MI 48234-2813
26	13421	FCA US LLC - DACM	DETROIT ASSEMBLY COMPLEX - MACK (FORMERLY MACK AVE ENGINE)	4000 St Jean, Detroit, MI 48214-1692
27	13638	Detroit Chrome Inc. Aerotech	DETROIT CHROME INC, AEROTECH	7515 LYNDON AVE, DETROIT, MI 48238
28	12238	United States Postal Service	DETROIT MAIN VEHICLE MAINTENANCE	1770 14TH STREET, DETROIT, MI 48216-1840

29	1827	FCA US LLC	Detroit Office and Warehouse	12501 Chrysler Dr, Detroit, MI 48203
30	16631	Detroit Transportation Corporation	DETROIT PEOPLE MOVER-DETROIT TRANSPORTATION CORP	1250 PARK PLACE, DETROIT, MI 48226
31	13215	Michigan Bell Telephone Company/AT&T Michigan	DETROIT PLAZA CO - M16111	7799 WHIPPLE ST, DETROIT, MI 48213
32	1759	Great Lakes Coca-Cola Distribution, LLC	DETROIT PRODUCTION CENTER	5981 WEST WARREN AVE, DETROIT, MI 48210
33	14565	CenturyLink	DETROIT REGEN	5664 COMMERCIAL ST, DETROIT, MI 48209
34	1732	Detroit Renewable Power LLC	DETROIT THERMAL BEACON HEATING PLANT	541 MADISON AVE, DETROIT, MI 48226
35	11358	Ecolab	Ecolab	3896 Lonyo Avr, Detroit, MI 48210
36	14438	EQ DETROIT, INC (dba US Ecology - Detroit South)	EQ DETROIT, INC	1923 FREDERICK ST,DETROIT, MI 48211 - 2000 FERRY ST. - 1947 E. KIRBY
37	20146	Faygo Beverages	Faygo Beverages Inc.	3579 Gratiot, Detroit, MI 48207
38	8143	FCA US LLC	FCA US LLC - Detroit Assembly Complex Jefferson	2101 CONNER, CIMS 435-07-00, DETROIT, MI 48215
39	23214	Wolverine Packing Co.	Fisher Building	1335 Fisher Service Drive, Detroit, MI 48207
40	1761	Fitzgerald Finishing, L.L.C.	Fitzgerald Finishing, L.L.C.	17450 Filer Avenue, Detroit, MI 48212
41	22931	Flex-N-Gate	Flex-N-Gate Detroit	9201 St. Cyril Street, Detroit, MI 48213
42	10087	Lonyo Land LLC dba FPT Lonyo	FPT Lonyo L.L.C.	3100 Lonyo Avenue, Detroit, MI 48209-1089
43	22239	New Cingular Wireless PCS, LLC	GENERAL MOTORS HQ - USID162267	400 RENAISSANCE CENTER B4055, DETROIT, MI 48243
44	1982	General Motors Detroit-Hamtramck Assembly	GM DETROIT/HAMTRAMCK ASSEMBLY	2500 EAST GRAND BLVD, DETROIT, MI 48211
45	17224	General Motors	GM GLOBAL HEADQUARTERS COMPLEX	300 RENAISSANCE CENTER, DETROIT, MI 48265
46	1848	Ajax Materials Corporation	Great Lakes Petroleum Terminal LLC	12500 STOCKER RD, DETROIT, MI 48217
47	18230	USPS	GWY facility	1401 WEST FORT ST, DETROIT, MI 48233
48	6025	Michigan Bell Telephone Company/AT&T Michigan	HEADQUARTERS - M11103	444 MICHIGAN AVE, DETROIT, MI 48226
49	6026	Michigan Bell Telephone Company/AT&T Michigan	HOGARTH CO - M62103	10515 NORTHLAWN, DETROIT, MI 48204
50	13711	International Hardcoat, Inc.	INTERNATIONAL HARDCOAT	12400 BURT ROAD, DETROIT, MI 48228
51	1861	Intrastate Distributors Inc	Intrastate Exeter	20021 Exeter Ave, Detroit, MI 48203
52	18362	US Dept. Veteran Affairs	JOHN D DINGELL VA MED CENTER	4646 JOHN R STREET, DETROIT, MI 48201
53	1951	Kolene Corporation	KOLENE CORPORATION	12890 WESTWOOD ST, DETROIT, MI 48223
54	19560	Labtech Corporation	Labtech	7707 Lyndon, Detroit, MI 48238
55	20335	Lear Corporation	Lear Davison	6555 E Davison, Detroit, MI 48212
56	20704	Lear Corporation	Lear Detroit Nevada Street	6501 East Nevada, Detroit, MI 48234
57	21225	Intergrated Manufacturing Assembly	Lear Service Center	12601 Southfield Freeway, Detroit, MI 48223
58	6027	Michigan Bell Telephone Company/AT&T Michigan	LENNOX - M17105	11640 Kercheval St, DETROIT, MI 48214-3429
59	15587	Level 3 Communications dba CenturyLink	Level 3 - DETROIT - DTRTMITK	1965 PORTER ST, DETROIT, MI 48216-1835
60	15062	Comcast of Detroit	Lyndon St. OTN, Tech Ops, Warehouse & Office	12775 LYNDON ST, DETROIT, MI 48227
61	21056	Gleaners Community Food Bank	Main Distribution Facility	2131 Beaufait, Detroit, MI 48207
62	14484	Verizon Business	MCI DTBMMI (MIDTBMMI)	645 GRISWOLD STREET, DETROIT, MI 48226-4105

63	21714	Michigan Bell Telephone Company/AT&T Michigan	Michigan Bell Telephone Company - MG6485	15569 W 8 Mile, Detroit, MI 48212
64	2015	MARATHON PETROLEUM COMPANY LP	MICHIGAN REF DIV-STAFF	1300 S Fort Street, DETROIT, MI 48217
65	1762	FCA US LLC	MT. ELLIOTT TOOL & DIE MANUFACTURING	3675 EAST OUTER DRIVE, DETROIT, MI 48234-2659
66	1917	Michigan Bell Telephone Company/AT&T Michigan	NIAGARA CO -M17106	17045 MACK, DETROIT, MI 48224
67	6515	Great Lakes Water Authority	NORTHEAST WATER PLANT	11000 EAST 8 MILE ROAD, DETROIT, MI 48205
68	4183	Stericycle	NORTRU TRANSPORTATION GROUP	11700 FREUD, DETROIT, MI 48214
69	6254	Pepsi Beverages Company	Pepsi Bottling Group LLC – Detroit Facility	1555 MACK AVE, DETROIT, MI 48207
70	6031	Michigan Bell Telephone Company/AT&T Michigan	PINGREE - M16102	13635 GREINER, DETROIT, MI 48205
71	2004	Praxair Distribution, Inc	PRAXAIR DISTRIBUTION INC	12820 EVERGREEN RD, DETROIT, MI 48223
72	20031	Progressive Distribution Center	Progressive Distribution Centers Inc	9900 Mt Elliott, Detroit, MI 48211
73	10431	PVS Nolwood Chemicals	PVS NOLWOOD CHEMICALS, INC	WAREHOUSE DIVISION, 6500 FRENCH, DETROIT, MI 48213
74	1843	PVS Nolwood Chemicals	PVS NOLWOOD CHEMICALS, INC.	9000 HUBBELL AVE., DETROIT, MI 48228
75	7294	PVS Technologies, Inc.	PVS TECHNOLOGIES, INC.	10825 HARPER AVE, DETROIT, MI 48213
76	1844	PVS Transportation	PVS Transportation, Inc.	11001 HARPER AVE, DETROIT, MI 48213
77	6305	Qualawash	Quala - Detroit	130 S. GREEN ST., DETROIT, MI 48209
78	6033	Michigan Bell Telephone Company/AT&T Michigan	REDFORD CO - M62110	17151 LAHSER RD, DETROIT, MI 48239
79	6034	Michigan Bell Telephone Company/AT&T Michigan	RIVERFRONT CO - M11110	1000 E JEFFERSON, DETROIT, MI 48226-3102
80		Harvest Sherwood Food Distributors, Inc.	Sherwood Food Distributors, L.L.C.	12499 Evergreen Road, Detroit, MI 48228
81	4219	Sprint United Management Co	Sprint Detroit Switch	1320 Third Street, DETROIT, MI 48226
82	13449	Ferrous Processing & Trading Company	STRONG STEEL PRODUCTS L.L.C.	6464 STRONG STREET, DETROIT, MI 48211
83	22800	Sunbelt Rentals, Inc	Sunbelt Rentals PC 1313/1028	3411 West Fort St, Detroit, MI 48216
84	1733	DTE ELECTRIC COMPANY	SYSTEM OPERATIONS CENTER	2000 THIRD, DETROIT, MI 48226
85	19380	The Home Depot U.S.A., Inc.	The Home Depot Store #2781	18700 Meyers Road, Detroit, MI 48235
86	1744	Thermo Fisher Scientific - Advanced Bioprocessing	Thermo Fisher Scientific - Detroit Site	920 HENRY ST, DETROIT, MI 48201
87	6036	Michigan Bell Telephone Company/AT&T Michigan	TWINBROOK CO - M16108	18900 RYAN, DETROIT, MI 48234
88	6037	Michigan Bell Telephone Company/AT&T Michigan	TYLER CO - M56135	6125 GRAND RIVER, DETROIT, MI 48208
89	6038	Michigan Bell Telephone Company/AT&T Michigan	UNIVERSITY CENTRAL OFFICE - M52154	7000 W MCNICHOLS, DETROIT, MI 48221
90	1700	US Ecology Michigan, Inc.	US Ecology Michigan, Inc.	6520 GEORGIA ST, DETROIT, MI 48211
91	4221	Usher Oil co	USHER OIL COMPANY	9000 ROSELAWN AVE, DETROIT, MI 48204
92	14983	Verizon Business	Verizon Business - DTRRMI (MIDTRRMI)	2436 BAGLEY ST FL 1, DETROIT, MI 48216
93	22038	Verizon Wireless	Verizon Wireless 1111-Detroit Downtown DAS II (ID:23497438)	1256 Elizabeth Street, Detroit, MI 48226
94	20798	Verizon Wireless	Verizon Wireless 1157-DETROIT DAS DWNTWN - New Build (ID:12767336)	1974 E. Milwaukee, Detroit, MI 48211
95	22045	Verizon Wireless	Verizon Wireless 9110-COMERICA PARK - InBuilding DAS/Repeater (ID:26309869)	230 East Fisher, Detroit, MI 48226
96	6039	Michigan Bell Telephone Company/AT&T Michigan	VERMONT CO - M62112	15371 GRAND RIVER, DETROIT, MI 48227

97	6040	Michigan Bell Telephone Company/AT&T Michigan	VINEWOOD CO - M61111	7420 FORT ST, DETROIT, MI 48209
98	1739	DTE ELECTRIC COMPANY	WARREN SERVICE CENTER	6200 Warren Ave, DETROIT, MI 48210
99	6514	Great Lakes Water Authority	WATER RESOURCE RECOVERY FACILITY	9300 W JEFFERSON, DETROIT, MI 48209
100	6512	Great Lakes Water Authority	WATER WORKS PARK PLANT	10100 EAST JEFFERSON, DETROIT, MI 48214
101	2399	WAYNE STATE UNIVERSITY	WAYNE STATE UNIVERSITY	410 WEST WARREN, DETROIT, MI 48201
102	12832	Wolverine Packing Co.	Wolverine Packing Co. Distribution Plant including Freezer Division & Steak Room	2535-37 Rivard, Detroit, MI 48207
103	22834	Wolverine Packing Co.	Wolverine Packing Co. Forest Park Plant	4225 Dequindre, Detroit, MI 48207
104	17562	Wolverine Packing Co.	Wolverine Packing Co. PC South	1337 Winder, Detroit, MI 48207

Listing of Fire Department Stations in the City of Detroit

Unless listed otherwise, all area codes are (313).

Administration:	**313-596-2900**	**Emergency Medical Services:**	596-5180
Community Relations:		**Fire Marshal:**	
General Information	596-2959	General Information	596-2954
Smoke Detector Program	596-2968	Arson	596-2940
		Fire Prevention	596-2932
		Complaints	596-2930

ENG	LAD	SQD	B/C	MEDIC	MISC.	*LOCATION*
			203			1301 Third St 48226
1						111 W. Montcalm 48201
	20	2		6		433 W. Alexandrine 48201
Hazardous	Materials	Unit	1	8		3050 Russell 48207
9	6			21		3737 E. Lafayette 48207
Regional	Training	Center		7	Air	2775 W. Warren 48208
17	7		5		Air	6100 Second 48202
						Detroit City Airport 48213
		3				1818 E. Grand Blvd 48211
	14			12		2200 Crane 48214
27	8		7		Air	4700 W. Fort 48209
29						7600 W. Jefferson 48209
30				3	Air	16543 Meyers 48227
		4			Air	1697 W. Grand Blvd. 48208
			6			11740 E. Jefferson 48214
33	13					1041 Lawndale 48209
34						6535 Livernois 48210
35						111 Kenilworth 48202
39				1	Air	8700 Fourteenth 48206
40	17			10		13939 Dexter 48238
41				14	Air	5000 Rohns 48213
42	21			2		6324 W. Chicago 48204
44	18		8			35 W. Seven Mile 48203
46						10101 Knodell 48213
48				11		2300 S. Fort 48217
50	23		9	15		12985 Houston –Whittier 48205
		5				18236 Livernois 48221
52	31					5029 Manistique 48224
53	25					15127 Greenfield 48227
54	26			4		16825 Trinity 48219
55	27		2	5		18149 Joy Rd. 48228
56				16		18601 Ryan Rd. 48234
57						13960 Burt Rd. 48223
58						10800 Whittier 48224

59		1	4			17800 Curtis 48235
60						19701 Hoover 48205
ENG	LAD	SQD	B/C	MEDIC	MISC.	*LOCATION*
		6				10700 Shoemaker 48213
	22					6830 McGraw 48210
Fire	Boat					40 24th 48214

Source: Detroit Fire Department 08/10/2014

APPENDIX D: HAZUS 100-500 Year Reports

This appendix provides a summary of the HAZUS Flood Global Risk Report for the City of Detroit.

Hazus: Flood Global Risk Report

Region Name:	DetroitMI_FLD
Flood Scenario:	100-year
Print Date:	Friday, December 24, 2021

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Table of Contents

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Michigan

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is approximately 139 square miles and contains 15,904 census blocks. The region contains over 269 thousand households and has a total population of 713,777 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 295,643 buildings in the region with a total building replacement value (excluding contents) of 88,546 million dollars. Approximately 92.00% of the buildings (and 71.82% of the building value) are associated with residential housing.

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

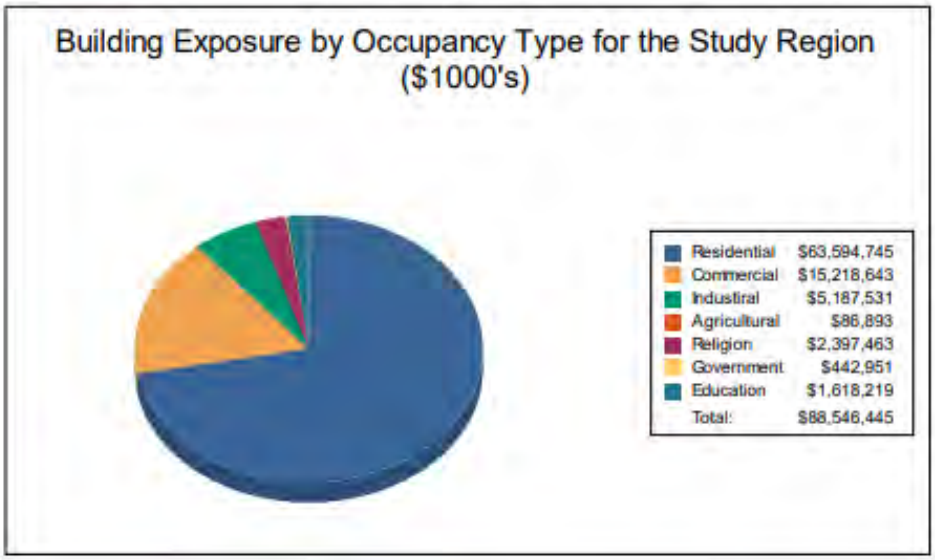
Building Inventory

General Building Stock

Hazus estimates that there are 295,643 buildings in the region which have an aggregate total replacement value of 88,546 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

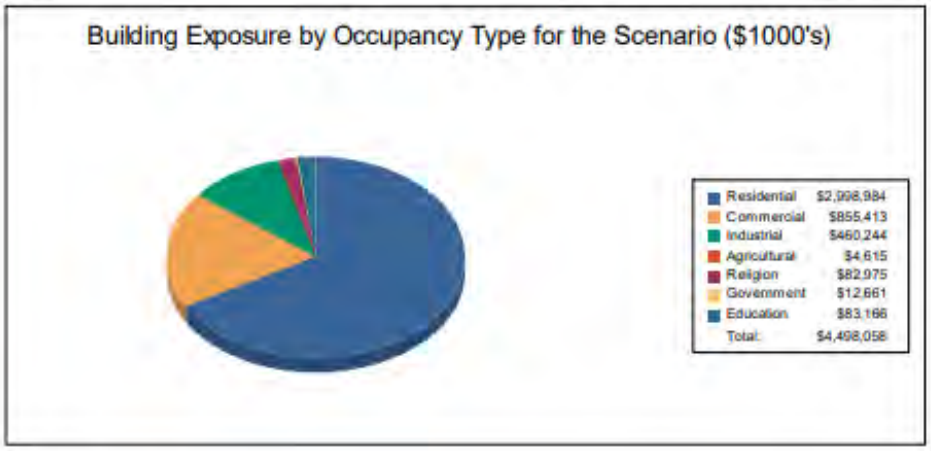
Occupancy	Exposure ($1000)	Percent of Total
Residential	63,594,745	71.8%
Commercial	15,218,643	17.2%
Industrial	5,187,531	5.9%
Agricultural	86,893	0.1%
Religion	2,397,463	2.7%
Government	442,951	0.5%
Education	1,618,219	1.8%
Total	**88,546,445**	**100%**



HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	2,998,984	66.7%
Commercial	855,413	19.0%
Industrial	460,244	10.2%
Agricultural	4,615	0.1%
Religion	82,975	1.8%
Government	12,661	0.3%
Education	83,166	1.8%
Total	**4,498,058**	**100%**



Essential Facility Inventory

For essential facilities, there are 16 hospitals in the region with a total bed capacity of 3,386 beds. There are 261 schools, 46 fire stations, 19 police stations and 1 emergency operation center.

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

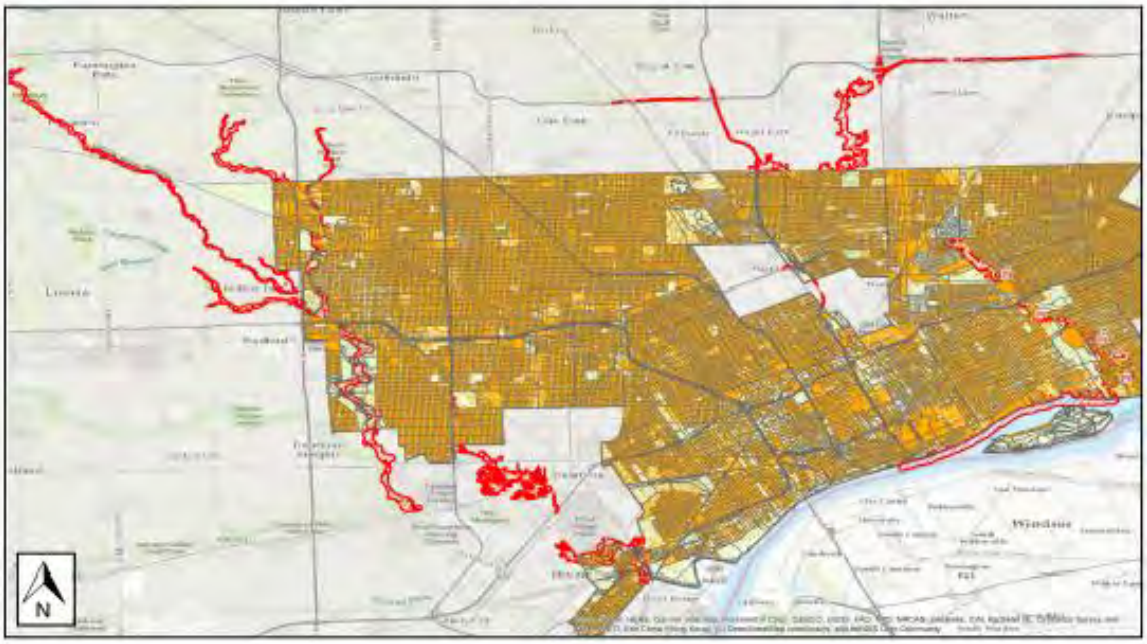
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	DetroitMI_FLD
Scenario Name:	1
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



HAZUS
EARTHQUAKE • WIND • FLOOD • TSUNAMI

Building Damage

General Building Stock Damage

Hazus estimates that about 464 buildings will be at least moderately damaged. This is over 64% of the total number of buildings in the scenario. There are an estimated 17 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	9	100	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	1	33	0	0	0	0	0	0	1	33	1	33
Religion	0	0	1	100	0	0	0	0	0	0	0	0
Residential	1,070	70	358	23	45	3	28	2	14	1	16	1
Total	**1,080**		**359**		**45**		**28**		**15**		**17**	

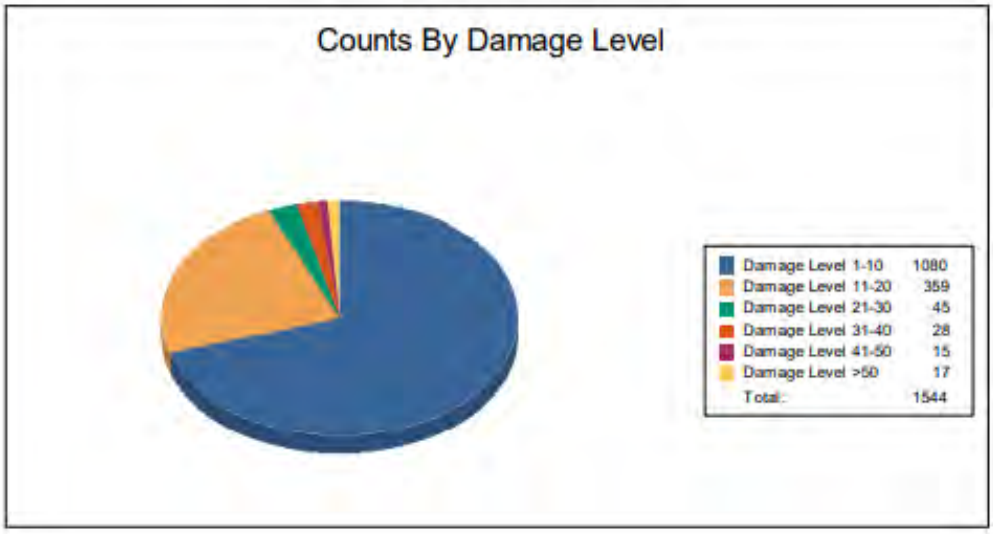


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	2	100	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	133	76	33	19	5	3	3	2	1	1	0	0
Steel	3	75	0	0	0	0	0	0	1	25	0	0
Wood	939	69	325	24	40	3	25	2	13	1	16	1

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 3,386 hospital beds available for use. On the day of the scenario flood event, the model estimates that 3,386 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	46	1	0	1
Hospitals	16	0	0	0
Police Stations	19	0	0	0
Schools	261	3	0	3

If this report displays all zeros or is blank, two possibilities can explain this.

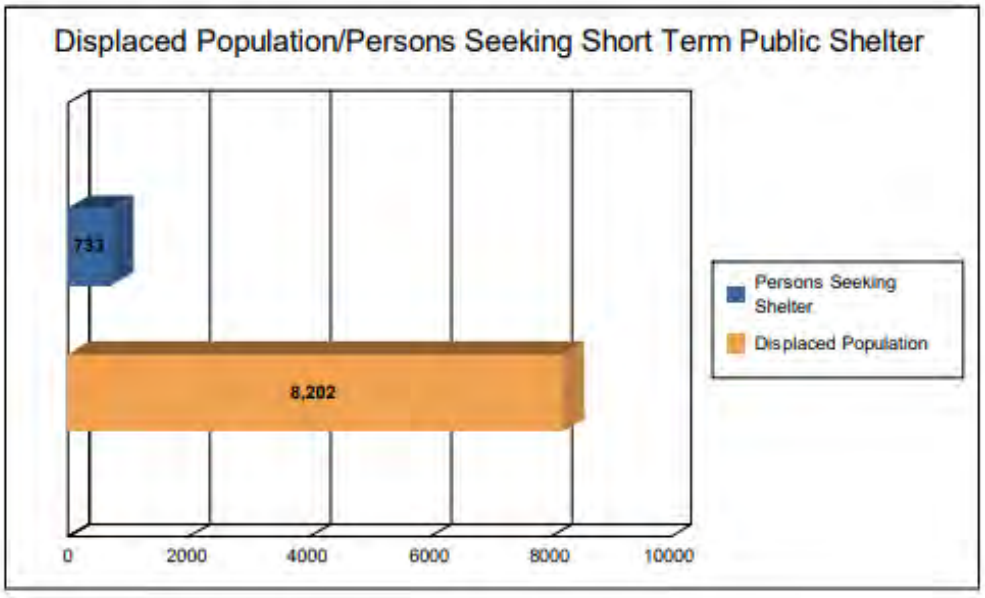
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 2,734 households (or 8,202 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 733 people (out of a total population of 713,777) will seek temporary shelter in public shelters.



HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Economic Loss

The total economic loss estimated for the flood is 385.34 million dollars, which represents 8.57 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

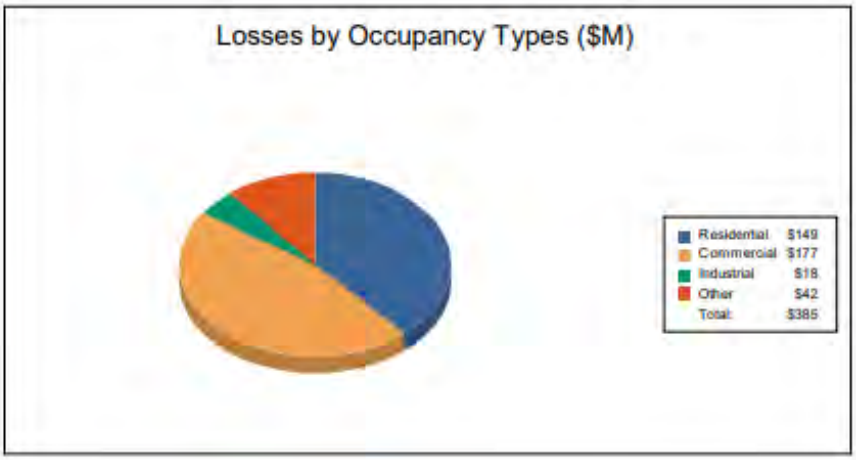
The total building-related losses were 165.06 million dollars. 57% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 38.63% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

HAZUS
EARTHQUAKE - WIND - FLOOD - TSUNAMI

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	53.25	11.83	4.66	1.66	71.42
	Content	33.04	37.71	10.06	10.15	90.96
	Inventory	0.00	1.07	1.55	0.06	2.68
	Subtotal	**86.29**	**50.61**	**16.29**	**11.88**	**165.06**
Business Interruption						
	Income	1.86	43.75	0.34	6.51	52.46
	Relocation	37.54	14.63	0.41	3.26	55.85
	Rental Income	18.77	10.47	0.07	0.31	29.62
	Wage	4.38	57.59	0.56	19.82	82.35
	Subtotal	**62.55**	**126.45**	**1.38**	**29.90**	**220.28**
ALL	**Total**	**148.84**	**177.05**	**17.67**	**41.78**	**385.34**



Appendix A: County Listing for the Region

Michigan

- Wayne

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Michigan				
Wayne	713,777	63,594,745	24,951,700	88,546,445
Total	**713,777**	**63,594,745**	**24,951,700**	**88,546,445**
Total Study Region	**713,777**	**63,594,745**	**24,951,700**	**88,546,445**

Appendix B: Regional Population and Building Value Data

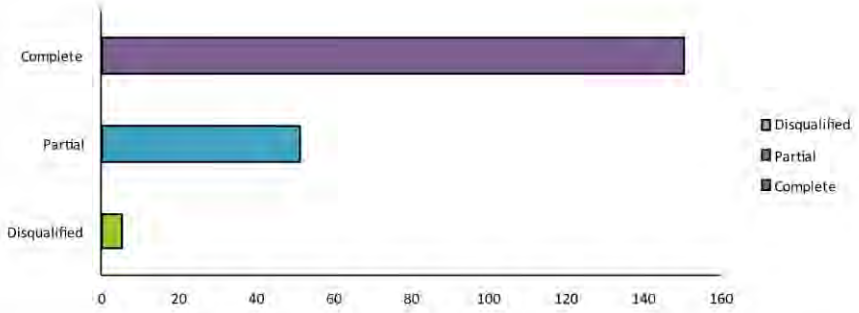
	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Michigan				
Wayne	713,777	63,594,745	24,951,700	88,546,445
Total	**713,777**	**63,594,745**	**24,951,700**	**88,546,445**
Total Study Region	**713,777**	**63,594,745**	**24,951,700**	**88,546,445**

APPENDIX E: COMPLETE COMMUNITY SURVEY

Report for City of Detroit Community Preparedness Survey

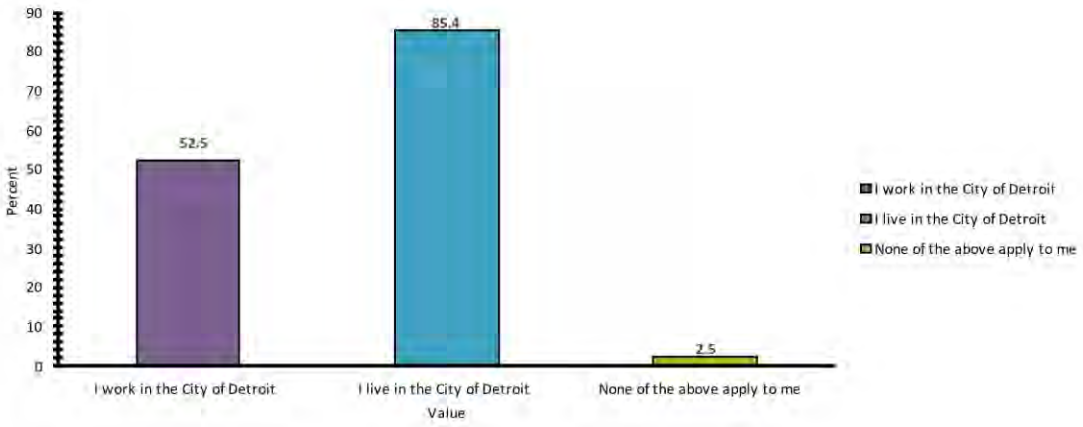
City of Detroit Community Preparedness Survey

Response Statistics

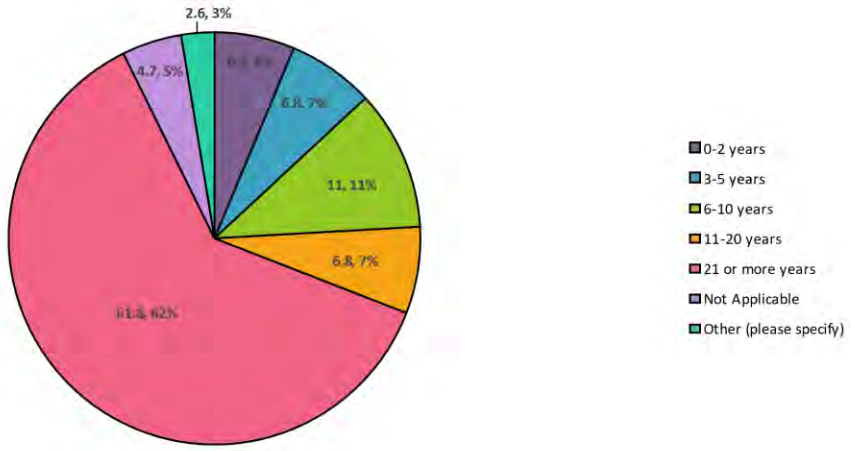


	Count	Percent
Complete	150	72.8
Partial	51	24.8
Disqualified	5	2.4
Total	206	

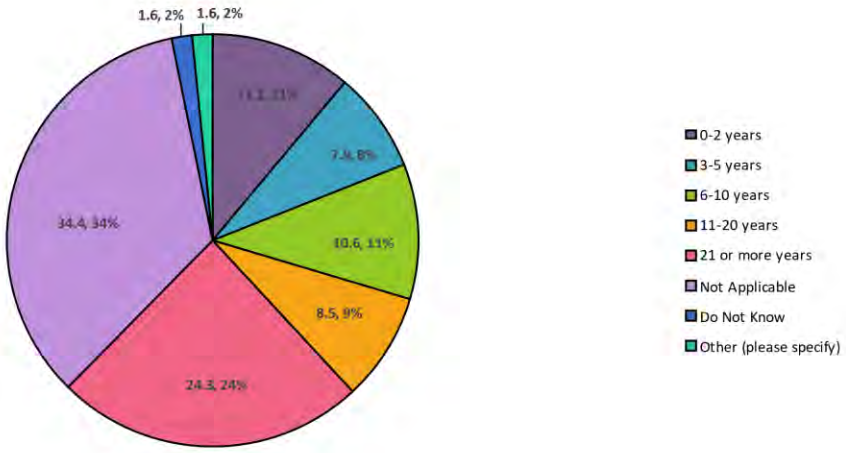
Please select your affiliation with the City of Detroit. Select all that apply.



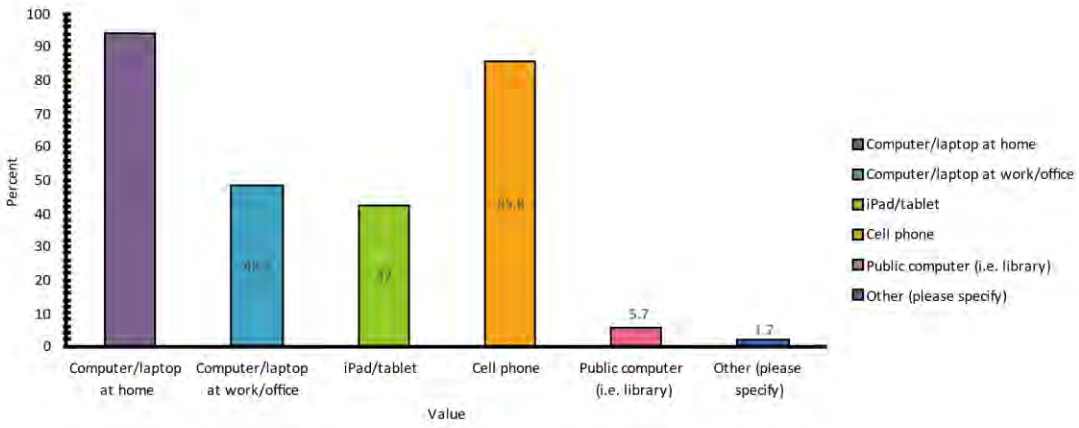
Approximately how many years have you lived in the City of Detroit?



Approximately how many years have you worked for the City of Detroit?



Please indicate what type of device(s) you use to access the internet. Select ALL that apply.



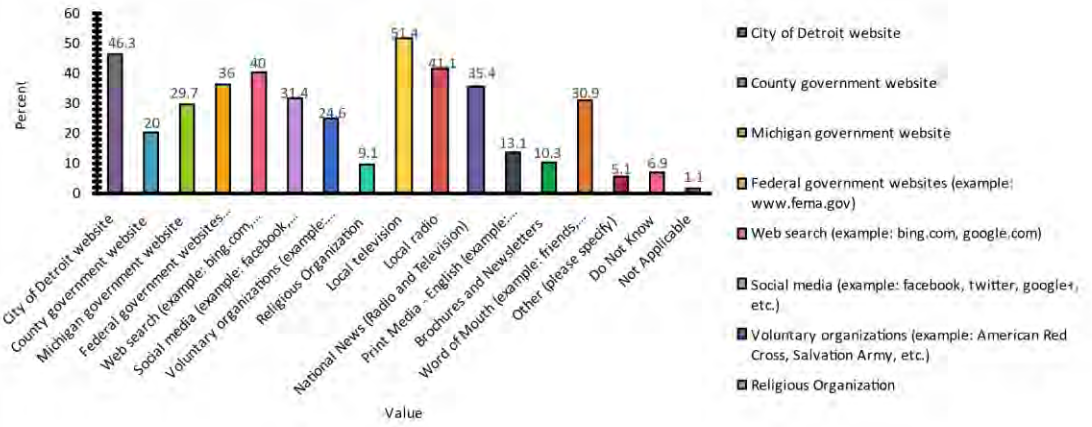
Please indicate those activities you and your family have done to prepare for emergencies and disasters. Please select ALL that apply.
I have...

Value		Percent	Count
An emergency preparedness plan		26.1%	46
Flood Insurance		15.3%	27
A 72 hour kit/disaster supply kit		25.6%	45
Visited local government web site(s) for emergency preparedness information		31.8%	56
An evacuation plan		21.6%	38
A weather radio		26.7%	47
Signed up for emergency alerts for the City of Detroit (from any source)		49.4%	87
Done nothing		26.1%	46
Other (please specify)		6.8%	12

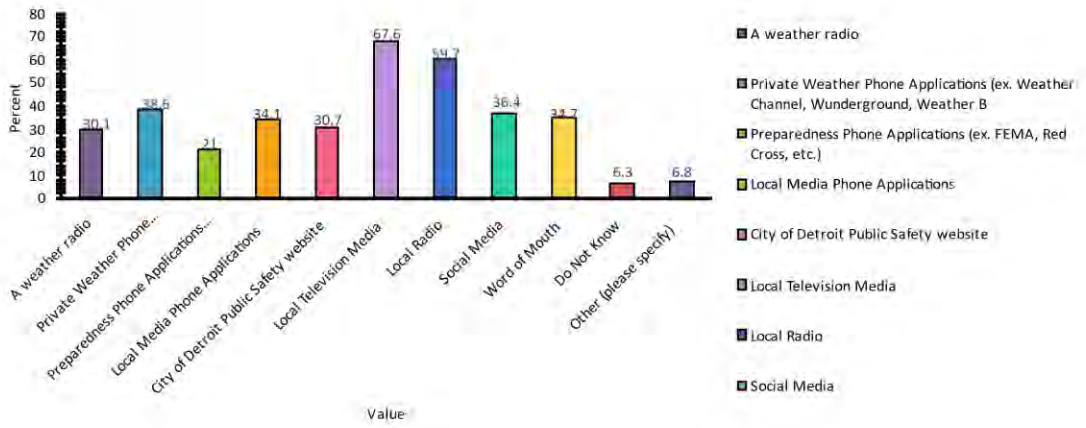
Have any of the reasons below prevented you from pursuing additional preparedness activities? Please select ALL that apply.

Value		Percent	Count
I don't think it will make a difference.		9.2%	16
I don't know what to do.		43.1%	75
I don't have the time.		9.8%	17
It costs too much.		20.1%	35
I don't need to prepare because emergency responders (fire, police, etc.) will help me during an		1.1%	2
None of the above apply to me.		28.2%	49
Other (please specify)		10.9%	19

Please indicate where you go to obtain emergency and disaster preparedness related information? Please select ALL that apply.



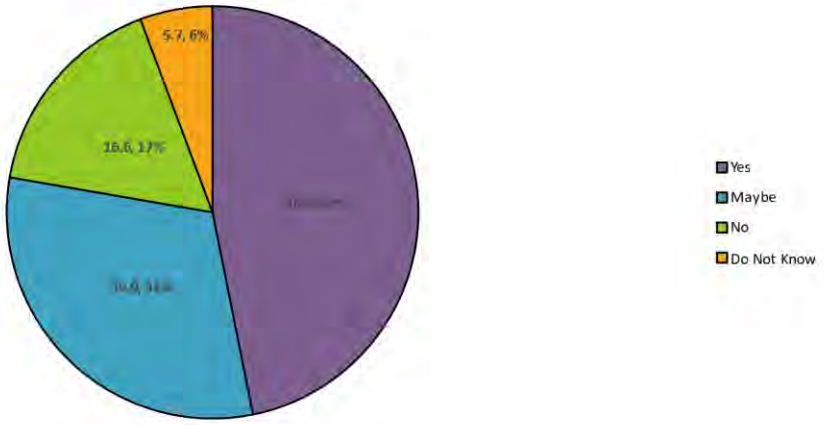
Please indicate how you expect to receive alerts and information during an emergency. Please select ALL that apply.



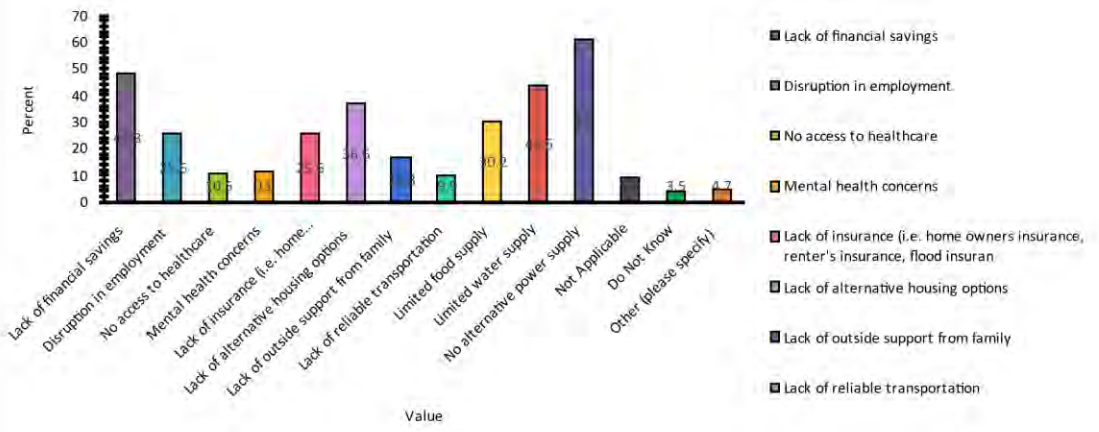
Would you agree or disagree with the following statements?

	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Do Not Know		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
The City of Detroit is providing the services necessary to prepare me for a disaster.	6	3.4%	26	14.8%	48	27.3%	30	17.0%	38	21.6%	28	15.9%	176
I am familiar with the City of Detroit website and can easily obtain information about emergencies and disasters.	14	8.0%	57	32.4%	42	23.9%	30	17.0%	24	13.6%	9	5.1%	176
During times of emergency, information	45	25.6%	77	43.8%	32	18.2%	8	4.5%	2	1.1%	12	6.8%	176

If a disaster (i.e. snowstorm) impacted your community, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days?



Which of the following may prevent youfrom recovering from a disaster? Please select ALL that apply.



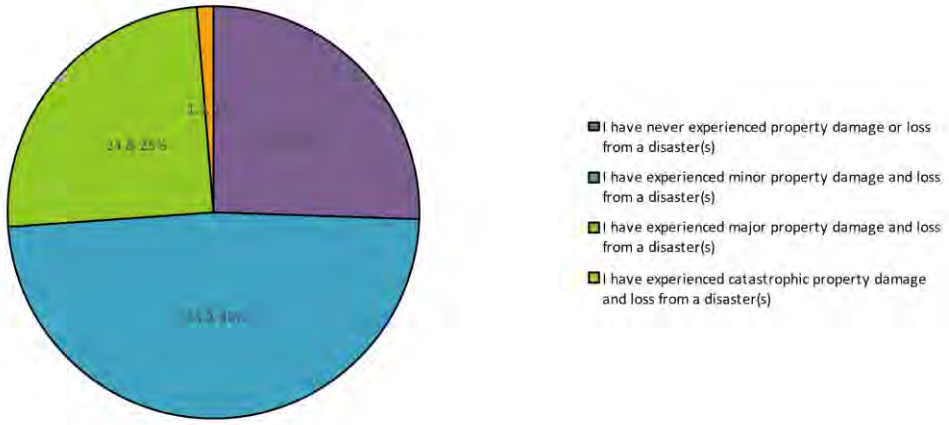
Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what haz ards present the greatest risk in terms of Impact . Low Risk = Low impact on threat to life and property damage. Medium Risk = Medium impact on threat to life and property damage. High Risk = High impact on threat to life and property damage.

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Structural Fires	51	35.2%	54	37.2%	39	26.9%	1	0.7%	145
Public Health Emergencies	27	18.2%	64	43.2%	56	37.8%	1	0.7%	148
Extreme Winter Weather	16	10.7%	62	41.6%	70	47.0%	1	0.7%	149
Earthquake	104	70.3%	23	15.5%	12	8.1%	9	6.1%	148
Flooding	19	12.8%	40	26.8%	89	59.7%	1	0.7%	149
Infrastructure Failure-Energy Emergency	12	8.1%	45	30.4%	89	60.1%	2	1.4%	148
Extreme Summer Weather	29	19.7%	59	40.1%	57	38.8%	2	1.4%	147
Public Transportation Accidents	85	57.8%	34	23.1%	16	10.9%	12	8.2%	147
Hazardous Materials Releases/Oil and Natural Gas Well Accidents	56	37.8%	49	33.1%	39	26.4%	4	2.7%	148
Civil Disturbance	46	31.1%	65	43.9%	36	24.3%	1	0.7%	148
Drought	87	58.8%	43	29.1%	11	7.4%	7	4.7%	148
Nuclear Power Plant Accidents	73	49.7%	36	24.5%	28	19.0%	10	6.8%	147

Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what haz ards present the greatest risk in terms of probability of occurrence . Low Risk = Low probability of occurrence. Medium Risk = Medium probability of occurrence. High Risk = High probability of occurrence

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Structural Fires	51	35.7%	63	44.1%	28	19.6%	1	0.7%	143
Public Health Emergencies	25	17.9%	53	37.9%	61	43.6%	1	0.7%	140
Extreme Winter Weather	11	7.7%	48	33.8%	82	57.7%	1	0.7%	142
Earthquake	107	76.4%	19	13.6%	5	3.6%	9	6.4%	140
Flooding	17	12.0%	45	31.7%	80	56.3%	0	%	142
Infrastructure Failure-Energy Emergency	11	7.7%	49	34.5%	80	56.3%	2	1.4%	142
Extreme Summer Weather	32	22.7%	48	34.0%	60	42.6%	1	0.7%	141
Public Transportation Accidents	81	59.1%	33	24.1%	13	9.5%	10	7.3%	137
Hazardous Materials Releases/Oil and Natural Gas Well Accidents	60	43.2%	43	30.9%	30	21.6%	6	4.3%	139
Civil Disturbance	48	34.5%	57	41.0%	33	23.7%	1	0.7%	139
Drought	84	60.4%	39	28.1%	10	7.2%	6	4.3%	139
Nuclear Power Plant Accidents	86	61.9%	28	20.1%	17	12.2%	8	5.8%	139

Please select the answer that best describes your experience. Minor is Repairable, non-structural damage to a home or damage from flood waters when the waterline is 18 inches or below in a conventionally built home or when the waterline is in the floor system of a manufactured home. Major is Structural damage or other significant damage that requires extensive repairs or damage from flood waters when the waterline is 18 inches or above in a conventionally built home or when the waterline enters the living space of a manufactured home. Catastrophic - s Significant enough damage that the home is deemed a total loss.



Please select the best answer. The risks associated with the City's most important hazard is :

Value		Percent	Count
Increasing quickly		55.3%	83
Increasing slowly		13.3%	20
Staying the same		5.3%	8
Decreasing slowly		2.0%	3
Do not know		22.0%	33
Not applicable		0.7%	1
Other (please specify)		1.3%	2
Total			150

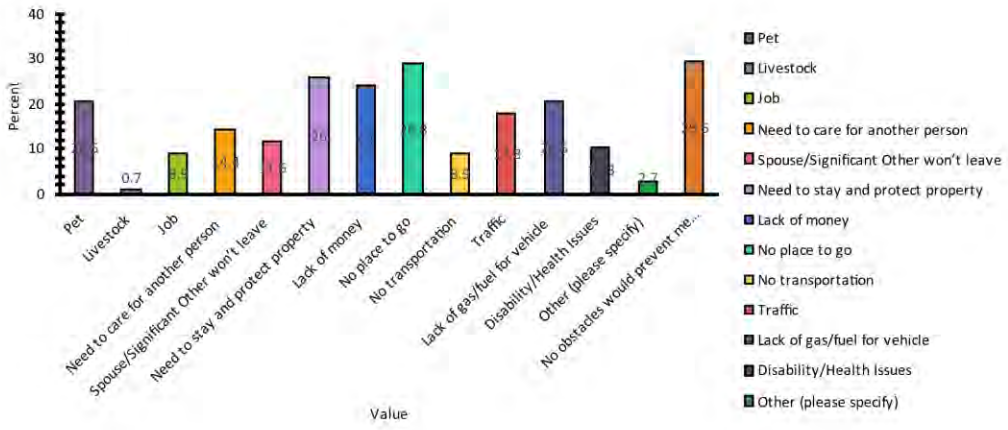
20.Based on YOUR PERCEPTION of your jurisdiction's hazards, to what degree of emphasis would you expect the City of Detroit to mitigate the following hazards? Mitigation: The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reco nstruction, and repeated damage. No Mitigation Needed = No mitigation on this hazard is expected or needed. Low Priority = This hazard should be mitigated, but is not a high priority compared to other hazards. Medium Priority = It is important to mitigate this hazard. High Priority = It is a high priority to emphasize mitigation for this hazard.

	No Mitigation Needed		Low Priority		Medium Priority		High Priority		Do not know		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Structural Fires	13	8.9%	30	20.5%	43	29.5%	52	35.6%	8	5.5%	146
Public Health Emergencies	5	3.5%	8	5.6%	25	17.5%	102	71.3%	3	2.1%	143
Extreme Winter Weather	4	2.8%	18	12.5%	45	31.3%	74	51.4%	3	2.1%	144
Earthquake	55	38.2%	53	36.8%	16	11.1%	13	9.0%	7	4.9%	144
Flooding	4	2.8%	8	5.6%	9	6.3%	121	84.6%	1	0.7%	143
Infrastructure Failure-Energy Emergency	4	2.8%	7	4.9%	32	22.2%	99	68.8%	2	1.4%	144
Extreme Summer Weather	6	4.3%	23	16.3%	54	38.3%	55	39.0%	3	2.1%	141
Public Transportation Accidents	14	9.7%	51	35.4%	41	28.5%	31	21.5%	7	4.9%	144
Hazardous Materials Releases/Oil and Natural Gas Well Accidents	10	6.9%	41	28.3%	39	26.9%	51	35.2%	4	2.8%	145

If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

	Very Likely		Somewhat Likely		Not Very Likely		Not Likely at All		Do Not Know		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Immediately evacuate as instructed.	94	63.5%	37	25.0%	7	4.7%	3	2.0%	7	4.7%	0	%	148
I would first consult with family and friends outside my household before making a decision to evacuate.	47	33.6%	45	32.1%	25	17.9%	19	13.6%	2	1.4%	2	1.4%	140
Wait and see how bad the situation is going to be before deciding to evacuate.	15	10.9%	38	27.5%	40	29.0%	38	27.5%	6	4.3%	1	0.7%	138
Refuse to evacuate no matter what.	3	2.2%	4	2.9%	19	13.8%	105	76.1%	6	4.3%	1	0.7%	138

What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



If you were to evacuate, where would you most likely stay? Please select the best answer.

Value		Percent	Count
Shelter/evacuation center		6.0%	9
Church or place of worship		2.0%	3
Workplace		2.0%	3
Home of a friend or relative		40.0%	60
Hotel/motel		26.7%	40
Do not know		19.3%	29
Other (please specify)		4.0%	6
Total			150

24.In an evacuation, would you or anyone in your household require special assistance?

Value		Percent	Count
Yes		16.0%	24
Maybe		17.3%	26
No		60.7%	91
Do not know		5.3%	8
Not applicable		0.7%	1
Total			150

If yes, would that assistance be provided by someone within your household, by an outside agency, or by a friend or relative outside your household?

Value		Percent	Count
Within household		54.0%	27
Friend/Relative (outside household)		12.0%	6
Outside agency		12.0%	6
Do not know		22.0%	11
Total			50

What type of structure do you live in?

Value		Percent	Count
Detached single family home		78.5%	117
Duplex, triplex, quadruplex home		8.1%	12
Multi-family building – 2 stories or more (apartment/condo)		11.4%	17
Manufactured home		0.7%	1
Not Applicable		1.3%	2
Total			149

Do you own or rent your home/place of residence?

Value		Percent	Count
Own		83.9%	125
Rent		14.1%	21
Not Applicable		1.3%	2
Other (please specify)		0.7%	1
Total			149

How many persons, including yourself, are currently living in your household?

	1		2		3		4		5		6		7		8		9		10 or more		Respon ses
	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	
Under age 5	66.7%	10	33.3%	5	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	15
Ages 6 - 10	63.6%	7	27.3%	3	0.0%	0	0.0%	0	9.1%	1	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	11
Ages 11 - 19	72.2%	13	27.8%	5	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	18
Ages 20 - 44	47.6%	30	46.0%	29	3.2%	2	1.6%	1	1.6%	1	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	63
Ages 45 - 64	67.8%	37	39.1%	25	1.6%	1	0.0%	0	1.6%	1	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	64
Ages 65-79	58.7%	27	41.3%	19	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	46
Ages 80+	100.0%	6	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	6
Total											223										

Please indicate the language(s) spoken in your household. Please select ALL that apply.

Value		Percent	Count
English		99.3%	149
Spanish		4.0%	6
Arabic		0.7%	1
Asian and Pacific Island language		0.7%	1
Other (please specify)		3.3%	5