

Dane County Natural Hazard Mitigation Plan

City of Madison Annex
Summer 2022

City of Madison Annex

This annex is a part of the Dane County Natural Hazard Mitigation Plan (DCNHMP). The DCNHMP contains additional information to support the Federal Emergency Management Agency's (FEMA) recognition of the plan (including this annex) as the formal natural hazard mitigation plan for the county and participating local governments. This annex will be valid for as long as FEMA approves the DCNHMP. The strategies adopted in this annex are designed to guide community efforts to reduce risks from natural hazards. These strategies work in conjunction with neighboring communities and Dane County government to reduce risks from natural hazards.

COMMUNITY PROFILE

The City of Madison is located in the center of Dane County. The city completely surrounds the smaller Town of Madison and the City of Monona, as well as the villages of Maple Bluff and Shorewood Hills. Madison shares borders with its largest suburb, Sun Prairie, and three other communities, Middleton, McFarland, and Fitchburg. Downtown Madison is located on an isthmus between Lakes Mendota and Monona. The city is sometimes described as The City of Four Lakes, comprising the four successive lakes of the Yahara River: Lake Mendota ("Fourth Lake"), Lake Monona ("Third Lake"), Lake Waubesa ("Second Lake") and Lake Kegonsa ("First Lake"), although Waubesa and Kegonsa are not actually in Madison, and is situated to the south of the city. A fifth smaller lake, Lake Wingra, is within the city as well, separate to the Yahara River chain. The Yahara flows into the Rock River, which in turn, flows into the Mississippi River. The city's trademark of "Lake, City, Lake" reflects this geography. Notable areas within the City include the Wisconsin State Capitol and the University of Wisconsin-Madison. Land use is intensely urban in the City's core, with commercial, residential, and industrial land uses throughout the other areas of the City. According to the Dane County Land Information Office, the City of Madison a total area of 79.4 square miles.

As of the 2019 Census Estimates, the population is approximately 254,977 people, and the number of 110,294 households residing in the City of Madison. The population density is 3,037 per square mile, and the average of household size is 2.21 people per household. Table 1 shows the population profile by age for City of Madison.

Table 1 Population Profile of City of Madison, Dane County

Category	Number	Percent
Total Population	254,977	100%
Under 5 years	12,572	4.9%
5 to 9 years	11,590	4.5%
10 to 14 years	10,951	4.3%
15 to 19 years	19,337	7.6%
20 to 24 years	41,241	16.2%
25 to 29 years	26,831	10.5%
30 to 34 years	22,328	8.8%
35 to 39 years	17,267	6.8%
40 to 44 years	13,942	5.5%
45 to 49 years	12,414	4.9%
50 to 54 years	12,315	4.8%
55 to 59 years	12,425	4.9%
60 to 64 years	12,167	4.8%
65 to 69 years	10,957	4.3%
70 to 74 years	6,573	2.6%
75 to 79 years	4,801	1.9%
80 to 84 years	3,351	1.3%
85 years and over	3,915	1.5%

Data Source: 2019 ACS Estimates - U.S. Census

Growth & Development Trends

Table 2-3 illustrates how the entire City of Madison has grown in terms of population and number of households between 2010 and 2020. Housing data is to 2020 due to data availability. Table 2-3 is drawn from the Wisconsin Department of Administration.

Table 2 City of Madison Change in Population and Households, 2010-2020

2010 Population	2020 Population	Percent Change (%) 2010-2020	2010 # of Households	2020 # of Households	Percent Change (%) 2010-2020
233,209	259,233	11.15%	102,516	144,245	40.70%

Data Source: DCEM & Wisconsin Department of Administration

Table 3 City of Madison Population Projections, 2020-2040

Population Projection	2020	2025	2030	2035	2040
Increase by half of percent of change (11.15%/2) every 5 yrs.	259,233	273,672	288,915	305,007	321,996

Data Source: Demographic Services Center, Wisconsin Department of Administration, 2021

Note: Population estimates offered by the U.S. Census Bureau's American Community Survey may differ from the WDOA data, due to sourcing, margin of error, and data availability.

Population Summary

Tables 4-7 illustrates key population demographics within the City of Madison. Key demographics include: (1) Disability Characteristics, (2) Federal Income Poverty Levels, (3) Educational Attainment, and (4) Household Language with English Speaking Capabilities. Due to data availability, all key demographic information has been provided by the American Community Survey (ACS) 2019 estimates. The ACS is a self-reported survey and may include total sample size differences and statistical margin of error.

Table 4 City of Madison, Dane County – Disability Characteristics by Detailed Age

Category	Number	Percent
Total of Residents Self-Identified as Disabled	36,240	100%
With a hearing difficulty	5,049	13.9%
Population under 18 years	155	-
Population 18 to 64 years	1,947	-
Population 65 years and over	2,947	-
With a vision difficulty	3,054	8.4%
Population under 18 years	145	-
Population 18 to 64 years	1,654	-
Population 65 years and over	1,255	-
With a cognitive difficulty	8,417	23.2%
Population under 18 years	981	-
Population 18 to 64 years	5,778	-
Population 65 years and over	1,658	-
With an ambulatory difficulty	8,612	23.8%
Population under 18 years	110	-
Population 18 to 64 years	4,117	-
Population 65 years and over	4,385	-
With a self-care difficulty	3,827	10.6%
Population under 18 years	264	-
Population 18 to 64 years	1,981	-
Population 65 years and over	1,582	-
With an independent living difficulty	7,281	20.1%
Population 18 to 64 years	4,257	-
Population 18 to 34 years	1,605	-
Population 65 years and over	3,024	-

Data Source: 2019 ACS Estimates - U.S. Census

Table 5.1: City of Madison, Dane County – Federal Income Poverty Levels (FIPL) by Families Summary

Category	Number of Families
50 percent of poverty level	1,415
125 percent of poverty level	4,256
150 percent of poverty level	5,574
185 percent of poverty level	7,559
200 percent of poverty level	8,382
300 percent of poverty level	13,712
400 percent of poverty level	20,348
500 percent of poverty level	27,026

Data Source: 2019 ACS Estimates - U.S. Census

Note: Use table 5.2 to interpret table 5.1:

5.1 identifies the *total number of families* (regardless of size) by percentage.

5.2 identifies *family size* in relation to annual family income and the percentage category of the FIPL.

Table 5.2: City of Madison, Dane County – Annual Federal Income Poverty Level Guide

2021 Annual Federal Poverty Level Guide									
Family Size	50%	100%	125%	150%	185%	200%	300%	400%	500%
1	\$6,440	\$12,880	\$16,100	\$19,320	\$23,828	\$25,760	\$38,640	\$51,520	\$64,400
2	\$8,710	\$17,420	\$21,775	\$26,130	\$32,227	\$34,840	\$52,260	\$69,680	\$87,100
3	\$10,980	\$21,960	\$27,450	\$32,940	\$40,626	\$43,920	\$65,880	\$87,840	\$109,800
4	\$13,250	\$26,500	\$33,125	\$39,750	\$49,025	\$53,000	\$79,500	\$106,000	\$132,500
5	\$15,520	\$31,040	\$38,800	\$46,560	\$57,424	\$62,080	\$93,120	\$124,160	\$155,200
6	\$17,790	\$35,580	\$44,475	\$53,370	\$65,823	\$71,160	\$106,740	\$142,320	\$177,900

Data Source: dhs.wisconsin.gov

Table 6: City of Madison, Dane County – Educational Attainment by Householders

Category	Number	Percent
Total of Householders	50,843	100%
Less than high school graduate	2,033	4.0%
High school graduate (includes equivalency)	6,508	12.8%
Some college, associate's degree	11,721	23.1%
Bachelor's degree or higher	30,581	60.1%

Data Source: 2019 ACS Estimates - U.S. Census

Table 7: City of Madison, Dane County – Household Language & English Speaking Capabilities

Category	Number	Percent
Total of Households	110,294	100%
English only:	93,590	84.9%
Spanish:	5,377	4.9%
Limited English speaking household	831	-
Not a limited English speaking household	4,546	-
Other Indo-European languages:	4,151	3.8%
Limited English speaking household	368	-
Not a limited English speaking household	3,783	-
Asian and Pacific Island languages:	5,945	5.4%
Limited English speaking household	1,694	-
Not a limited English speaking household	4,251	-
Other languages:	1,231	1.1%
Limited English speaking household	216	-
Not a limited English speaking household	1,015	-

Data Source: 2019 American Community Survey

Note: Population estimates offered by the U.S. Census Bureau's American Community Survey may differ from the WDOA data, due to sourcing, margin of error, and data availability.

Asset Inventory

Assets include the people, property, and critical facilities within the City of Madison that are exposed to hazards in general. Inventories of property, essential infrastructure, and natural, cultural or historic resources help provide a comprehensive picture of the community and provide a method of assessing exposure to hazards by establishing the improved and total values, capacities and populations for these assets. It also forms the basis for estimating potential losses, where possible.

General Property

Table 8 Property Exposure Summary

Property Type	Parcel Count	Improved Land Count	Improved Land Value (\$)	Content Value (\$)	Total Value (\$)
Total	75,020	75,020	45,808,306,300	22,904,153,150	68,712,459,450
Agriculture	150	150	32,957,500	16,478,750	49,436,250
Industrial	807	807	1,356,041,200	678,020,600	2,034,061,800
Residential	69,705	69,705	36,000,796,800	18,000,398,400	54,001,195,200
Transportation	171	171	284,639,400	142,319,700	426,959,100
Utility	225	225	40,227,400	20,113,700	60,341,100
Commercial	2,875	2,875	7,737,232,200	3,868,616,100	11,605,848,300
Other	381	381	100,084,400	50,042,200	150,126,600
Institutional/ Governmental	706	706	256,327,400	128,163,700	384,491,100

Data Source: Dane County Land Information Office, December 2021

Critical Facilities

The City of Madison has identified the critical facilities important to protect from disaster impacts. These are collected in Table 9. Table 9 is based on GIS data inventories from Dane County and information gathered from the Town. No further supplemental data was provided by the community through the Data Collection Guide.

Table 9 Critical Facility Summary/Essential Infrastructure

Facility	Type*	No. of Facilities	Replacement Value (\$)
Housing Structures by Type	X	X	X
- Single Family	VF	47,975	\$10,025,647,600
- Multi Family	VF	7,095	\$8,542,538,700
- Condos	VF	25	\$324,016,200
- Owner Occupied	VF	46,058	\$10,563,055,200
- Housing units owned & Maintained by City	VF	742	N/A
Built Environment	X	X	X
- Lane Miles for motorized vehicles	EI	998	N/A
- Miles of storm sewer maintained by City	EI	529	N/A
- Water holding / retention ponds	EI	509	N/A
- Greenways	EI	195	N/A
- Government Buildings	EI	982	N/A
- Healthcare Facilities	EI	25	N/A
- Power Generating Facilities	EI	2	N/A
- Public & Private Schools (K-12)		43	N/A
- Colleges & Technical Schools	EI	14	N/A
- Food Pantries	EI	19	N/A
Natural Environment	X	X	X
- Public Parks	NA	255	N/A
- Active Landfills	NA	1	N/A
- Ponds / Lakes / Streams	NA	67	N/A
Economy	X	X	X
- Number of Jobs	X	242,364	N/A
- Average Commute Time	X	19 Minutes	N/A
- Madison GDP	X	\$51,475,512	N/A

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: Natural Assets

Data Source: 2021 City of Madison Data Collection Guide

Other Assets

Other assets help define a community beyond the current composition of the City of Madison. These assets may provide economic benefit to the community, in addition to preserving the heritage and diversity of the community and may include natural, cultural and historic assets or economic assets such as major employers. It may also include more specific detail on critical facilities. The City of Madison has not identified any other assets.

VULNERABILITY ASSESSMENT

A hazard identification and vulnerability analysis was completed for the City of Madison using the same methodology in the County's base plan. The information to support the hazard identification and risk assessment for this Annex was collected through a Data Collection Guide, which was distributed to each participating municipality to complete.

The first step in a hazard analysis is to identify which hazards the community is vulnerable to. Table 10 outlines the hazard identification for the City of Madison based on the Data Collection Guide issued in 2021. The Data Collection Guide listed all of the hazards that could impact Dane County. The purpose of this worksheet was to identify and rank the hazards and vulnerabilities specific to the jurisdiction. Brooklyn's planning team members were asked to complete the matrix by ranking each category on a scale of 0 to 5 based on the experience and perspective of each planning team member. A ranking of 0 indicated "no concern" while a ranking of 5 indicated "highest concern." This matrix appears as Table 10. This matrix reflects the significance of the hazards relative to one another as perceived by the Example's planning team.

This matrix reflects that the City of Madison is most vulnerable to tornadoes, wind storms, and floods. The vulnerability established here is a qualitative assumption based on the impacts, geographic extent, probability of future occurrence, and magnitude/severity.

Table 10: Vulnerability Assessment Matrix for the City of Madison

Name of Jurisdiction: <u>City of Madison</u>										
Hazard	Hazard Attributes			Impact Attributes						Total of Row Values
	Area of Impact	Past History, Probability of Future Occurrence	Short Term Time Factors	Primary Impact (Short Term - Life and Property)			Secondary Impact (Long Term – Community Impacts)			
Impact on General Structures				Impact on Critical Facilities	Impact on At-Risk Populations	Social Impact	Economic Impact	Severity Of Other Associated Secondary Hazards		
	(1-5)	(1-5)	(1-5)	(0-5)	(0-5)	(0-5)	(0-5)	(0-5)	(0-5)	
Dam/Levee failure	5	2	5	3	4	3	4	4	4	34
Extreme Cold	5	5	2	2	3	5	2	2	1	27
Extreme Heat	5	5	2	1	3	5	2	2	1	25
Drought	5	5	2	0	1	2	2	2	1	20
Expansive soils	1	1	1	1	1	1	1	1	1	9
Flood	3	5	5	4	4	4	4	4	4	37
Fog	2	4	3	0	0	0	0	0	0	9
Hail Storm	3	4	3	4	1	2	2	3	2	24
Landslide	1	1	1	1	1	1	1	1	1	9
Lightning	3	5	4	3	3	2	2	2	2	26
Tornado	3	5	4	5	5	4	4	4	4	38
Wildfire	1	1	1	1	1	1	1	1	1	9
Windstorm	4	4	4	4	4	4	4	4	4	36
Winter Storm	5	5	3	2	2	4	4	2	2	29

Vulnerability to Specific Hazards

This section details vulnerability to specific hazards, where quantifiable, and where it differs from that of the overall County. The previous inventory tables quantify what is exposed to the various hazards within City of Madison. Table 11 cross-references the hazards with the various tables where exposure or vulnerability specifics are found. The intent of Table 6 is to quantify, where possible, future impacts of each hazard on the jurisdiction. In many cases it is difficult to estimate potential losses, so the overall exposure of populations, structures, and critical facilities is referenced.

Table 11 Hazard Vulnerability Specifics

Hazard	Populations	Structures	Critical Facilities	Future Damage Potential
Dam Failure	See Tables 4-7 Population	See Property Exposure table 8	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Drought	Moderate	None	Minimal	Specifics unknown; See hazard profile in County Plan
Flooding	See Tables 13-14 below	See Tables 13-14 below	See Tables 13-14 below	See Tables 13-14 below
Fog	None	None	None	Specifics unknown; See hazard profile in County Plan
Hailstorm	Moderate	See Property Exposure table 8	Minimal	Specifics unknown; See hazard profile in County Plan
Landslide/ Sinkholes/ Erosion	Minimal	Minimal	Minimal	Specifics unknown; See hazard profile in County Plan
Lightning	Moderate	See Property Exposure table 8	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Severe Cold	See Tables 4-7 Population	Moderate	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Severe Heat	See Tables 4-7 Population	Minimal	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan
Winter Storm	See Tables 4-7 Population	Moderate	Moderate	Specifics unknown; See hazard profile in County Plan
Tornado	See Table 15 below	See Table 15 below	See Table 15 below	See Table 15 below
Wildfire	Minimal	Minimal	Minimal	Specifics unknown; See hazard profile in County Plan
Windstorm	See Tables 4-7 Population	See Property Exposure table 8	See Critical Facility Inventory Table(s)	Specifics unknown; See hazard profile in County Plan

Data Source: 2021 City of Madison Data Collection Guide – Prepared by DCEM

Previous Hazard Events

Through the Data Collection Guide, the City of Madison noted specific historic hazard events to include in the community profile. These events have been incorporated into the appropriate hazard chapters in the main mitigation plan. These events had a particular impact on the community beyond the impacts and events recorded in the Dane County Hazard Mitigation Plan. This is not a comprehensive summary of past incidents, as the hazard profiles collected in the main Mitigation Plan include other events that may have historically impacted the jurisdiction. The events noted by this jurisdiction in the Data Collection Guide include:

City of Madison Historic Natural Hazards

Table 12 City of Madison Historic Natural Hazards

Natural Hazard	Date	Impacted Structures	Comprehensive Harm to Jurisdiction	Other reported Losses (Fiscal reports, programs, etc.)	Comments
Winter Storm	1/29/1996	N/A	A rare, widespread ground blizzard tormented Southcentral and Southeast Wisconsin with the worst whiteout conditions ever experienced by some residents and travelers.	N/A	High likelihood of reoccurring
Winter Storm	1/16/1997	N/A	Whiteout conditions, due to blowing snow, stopped traffic on I-94 in Kenosha county before daybreak. Traffic was also brought to a standstill in rural points of Racine county during the late afternoon hours.	N/A	High likelihood of reoccurring
Winter Storm	2/24/2007	N/A	Heavy snows at the rate of 1 to 3 inches per hour occurred for several hours along with frequent east wind gusts of 30 to 33 knots (35 to 38 mph) reduced visibilities to 1/8 to 1/4 mile.	N/A	High likelihood of reoccurring

Winter Storm	12/11/2010	N/A	An upper-level trough deepened over the central Plains, developing a deep area of surface low pressure that tracked from Iowa across Illinois. A state of emergency was declared for all 72 counties by Governor James Doyle.	N/A	High likelihood of reoccurring
Winter Storm	2/1/2011	N/A	Drifting snow closed county roads, with many stranded motorists having to be rescued from vehicles buried in the drifting snow. About 100 National Guardsman were mobilized statewide in response to Gov. Scott Walker's emergency declaration for 29 counties to help rescue motorists and run emergency shelters at armories.	N/A	High likelihood of reoccurring
Winter Storm	12/20/2012	N/A	Major highways as well as a majority of side roads became nearly impassible as plowing operations were greatly limited, or completely suspended as plows became stuck in the heavy, wet, drifting snow. Area airports suspended all flight operations.	N/A	High likelihood of reoccurring
Drought	8/1/2002	N/A	N/A	N/A	High likelihood of reoccurring
Drought	8/1/2003	N/A	N/A	N/A	High likelihood of reoccurring
Drought	9/1/2003	N/A	N/A	N/A	High likelihood of reoccurring

Drought	10/1/2003	N/A	N/A	N/A	High likelihood of reoccurring
Drought	11/1/2003	N/A	N/A	N/A	High likelihood of reoccurring
Drought	12/1/2003	N/A	N/A	N/A	High likelihood of reoccurring
Drought	7/1/2005	N/A	The drought was preceded by a long period of below-normal precipitation extending back to March, 2005.	N/A	High likelihood of reoccurring
Drought	8/1/2005	N/A	At Madison's Truax Field (Dane Co.) , a 3.11 inch rainfall deficit was reported in August, setting the March through August deficit at 7.19 inches.	N/A	High likelihood of reoccurring
Drought	9/1/2005	N/A	Rainfall deficits grew once again the following week as a hot and dry air mass resided over the region.	N/A	High likelihood of reoccurring
Drought	10/1/2005	N/A	N/A	N/A	High likelihood of reoccurring
Drought	11/1/2005	N/A	For the month, except for Lafayette County, all counties had at least 3 to 4 inches of rain, with a band from Beloit to West Bend to Port Washington receiving 4 to 5 inches	N/A	High likelihood of reoccurring
Drought	7/1/2007	N/A	The corn, soybean, and alfalfa (hay) crops planted in poorer or well-drained soils had their growth affected. Yields per acre were expected to be below normal during the fall harvest season.	N/A	High likelihood of reoccurring

Drought	6/26/2012	N/A	Rainfall amounts ranged from around 3/10 inch in the south-central area to around 3 inches in the city of Sheboygan. This translated to monthly deficits ranging from around 4 inches to 1 inch.	N/A	High likelihood of reoccurring
Drought	7/1/2012	N/A	The extremely dry conditions that began in June continued in July across southern Wisconsin. Many locations did not see any precipitation until several rounds of thunderstorms moved through the region during the middle and end of the month.	N/A	High likelihood of reoccurring
Drought	7-11/2012	N/A	Conditions continue	N/A	High likelihood of reoccurring
Drought	9/1/2012	N/A	Conditions continue	N/A	High likelihood of reoccurring
Drought	10/1/2012	N/A	Conditions continue	N/A	High likelihood of reoccurring
Drought	11/1/2012	N/A	Conditions continue	N/A	High likelihood of reoccurring
Excessive Heat	1-3/2000	N/A	Extreme heat conditions throughout January to March.	N/A	High likelihood of reoccurring
Excessive Heat	7/17/2011	N/A	Maximum daily heat index values ranged from 102 to 110 over the four days of July 17th through July 20th.	N/A	High likelihood of reoccurring
Excessive Heat	7/2/2012	N/A	N/A	N/A	High likelihood of reoccurring
Excessive Heat	6/29/2018	N/A	Heat index values ranging from 100 to 118 degrees.	N/A	High likelihood of reoccurring

Extreme Cold	1-2/1996	N/A	Extended below freezing conditions throughout January to February.	N/A	High likelihood of reoccurring
Extreme Cold	1/17/1997	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	5/20/1997	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/5/1999	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	12/18/2005	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	2/17/2006	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	2/18/2006	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	2/3/2007	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/2008	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	12/2008	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/13/2009	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/14/2009	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/24/2009	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/21/2011	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/21/2013	N/A	N/A	N/A	High likelihood of reoccurring
Extreme Cold	1/27/2014	N/A	Wind chill temperatures ranged from 20 below to 34 below zero.	N/A	High likelihood of reoccurring
Extreme Cold	1/7/2015	N/A	Wind chill temperatures of 20 below to 34 below zero.	N/A	High likelihood of reoccurring
Extreme Cold	1/9/2015	N/A	Wind chill temperatures of 15 below to 25 below zero.	N/A	High likelihood of reoccurring
Extreme Cold	12/14/2016	N/A	Wind chill	N/A	High likelihood

			temperatures dropped to around 20 below zero.		of reoccurring
Extreme Cold	12/18/2016	N/A	Wind chill temperatures dropped to 20 to 26 below zero with the coldest readings the morning of December 19th.	N/A	High likelihood of reoccurring
Extreme Cold	12/25/2017	N/A	Wind chill temperatures of 20 below to 34 below zero, and low temperatures below zero occurred at times during this period of prolonged arctic air. The Dane County Medical Examiner confirmed four deaths due to hypothermia. Four businesses and two apartments suffered water damage from burst pipes, but more instances of frozen and burst pipes likely occurred.	N/A	High likelihood of reoccurring
Extreme Cold	1/1/2018	N/A	Wind chill temperatures of 20 below to 34 below zero, and low temperatures below zero occurred at times during this period of prolonged arctic air. The Dane County Medical Examiner confirmed four deaths due to hypothermia. Four businesses and two apartments suffered water damage from burst pipes, but more instances of frozen and burst pipes likely occurred.	N/A	High likelihood of reoccurring

Extreme Cold	2/6/2021	N/A	Wind chill temperatures mainly from 20 below to 34 below zero.	N/A	High likelihood of reoccurring
Extreme Cold	2/13/2021	N/A	Coldest wind chill temperatures mainly from 25 below to 34 below zero.	N/A	High likelihood of reoccurring
Flood	06/17/1996	N/A	Significant flooding up to 3 ft. deep on roadways, retention ponds over flowed in housing developments, soil erosion and flooded farm lands. \$10 million in crop damage, \$3 million in economic loss.	N/A	High likelihood of reoccurring
Flood	08/04/1997	Multiple Intuitional Structures Impacted	Urban street flooding, water reported over the curbs on the UW Campus.	N/A	High likelihood of reoccurring
Flood	03/30/1998	None	Brief power outage, minor urban street flooding.	N/A	High likelihood of reoccurring
Flood	02/11/1999	N/A	Torrential rain with frozen ground lead to urban street flooding, mudslide on the UW campus. Power outages, trees and power lines toppled.	N/A	High likelihood of reoccurring
Flood	06/28/1999	N/A	Urban street flooding.	N/A	High likelihood of reoccurring
Flood	06/14/2001	N/A	Torrential rain lead to urban street flooding 1-2 inches of rain per hour. Minor urban and small stream flooding.	N/A	High likelihood of reoccurring
Flood	09/07/2001	N/A	Street flooding cause many cars to stall out in lowlying areas.	N/A	High likelihood of reoccurring

Flood	06/04/2004	Multiple Impacted Structures	Street flooding lakes at record levels. Minor flooding to 127 homes, and major damage to three homes. \$1 Million in total damages.	N/A	High likelihood of reoccurring
Flood	08-09/2018	Multiple Impacted Structures	Hundreds of homes flooded and damaged. One death attributed to flash flooding. \$1 million in damage	N/A	High likelihood of reoccurring
Flood	06/29/2020	Primary Impacted Structure	Sustained flooding, primarily in camp Randall stadium.	N/A	High likelihood of reoccurring
Wind Storm	04/06/1997	N/A	Strong gradient winds enhanced by scattered snow showers Madison tv-3 recorded peak wind of 71 mph. Power outages followed.	N/A	High likelihood of reoccurring
Wind Storm	11/10/1998	Multiple Impacted Structures	Numerous reports of damage toppled and damaged trees, barns, fences, boats, campers, trucks, homes, sheds. One death from windblown vehicle. Power outages followed. Extensive crop damage and commercial damage.	N/A	High likelihood of reoccurring
Wind Storm	10/10/2010	Multiple Impacted Structures	Numerous reports of damage roofs peeled back. trees fell on homes on the east side and regent street semi-trailer toppled by wind toppled and damaged trees, barns, fences, boats,	N/A	High likelihood of reoccurring

			campers, trucks, homes, sheds.		
Wind Storm	01/10/2013	N/A	Power outages, power lines down, toppled trees.	N/A	High likelihood of reoccurring
Wind Storm	03/16/2016	Multiple Impacted Structures	10k structure damage to roofs and shingles. Power outage to 2200 MG & E customers.	N/A	High likelihood of reoccurring
Wind Storm	07/19/2017	Multiple Impacted Structures	Home damage and power outages.	N/A	High likelihood of reoccurring
Lightening	07/1997	Multiple Impacted Structures	Multiple impacted structures, caused fires, and damages.	N/A	High likelihood of reoccurring
Lightening	06/18/1998	Multiple Impacted Utilities	Scattered trees and powerline damage	N/A	High likelihood of reoccurring
Lightening	05/16/1999	Multiple Impacted Properties	1 serious home fire and 5 vehicles damaged at a car dealership.	N/A	High likelihood of reoccurring
Lightening	06/01/2000	Multiple Impacted Structures	60 downed trees blocked various roads damage to homes damage to vehicles. 18 power lines down streets flooded.	N/A	High likelihood of reoccurring
Lightening	04/18/2002	Multiple Impacted Structures	2 home fires due to roof lightening strikes.	N/A	High likelihood of reoccurring
Lightening	05/21/2004	Multiple Impacted Properties	\$150,000 lightening and storm damage	N/A	High likelihood of reoccurring
Lightening	05/06/2005	Multiple Impacted Properties	Struck 3 condo units causing \$60,000 in damage.	N/A	High likelihood of reoccurring
Tornado	06/23/2004	Multiple impacted structures	2000 customers lost their electrical power. 194 residential homes reported damage. 11 residential homes had major damage 410k.	N/A	High likelihood of reoccurring

Tornado	08/08/2011	N/A	Tornado EFO	N/A	High likelihood of reoccurring
Tornado	06/16/2014	Multiple Impacted Structures	23 homes damaged. uprooted and snapped trees. \$5 million in economic loss.	N/A	High likelihood of reoccurring
Tornado	10/07/2017	Multiple Impacted Structures	EFO Severe storm damage o property, homes and vehicles 3 households were displaced 250.k damage.	N/A	High likelihood of reoccurring
Winter Storm	03/08/1998	N/A	Interstate hwy 90/94 and hwy 51 north closed during the afternoon and evening dozens of toppled powerlines many other road closures.	N/A	High likelihood of reoccurring
Winter Storm	01/02/1999	N/A	10.8 inches of snow fall	N/A	High likelihood of reoccurring
Winter Storm	02/11/2003	N/A	4- 5.1 inches of snow fall reported wind gusts 44mph.	N/A	High likelihood of reoccurring
Winter Storm	01/06/2005	N/A	11 inches of snow fall reported wind gusts 35mph.	N/A	High likelihood of reoccurring
Winter Storm	04/11/2007	N/A	Scattered power outages 10,000 customers lost power in south central wisconsin numerous flight delays and cancellations.	N/A	High likelihood of reoccurring
Winter Storm	2008	N/A	Dropped temperatures, vehicle slide offs, thunderstorms and wind gusts in late and early winter.	N/A	High likelihood of reoccurring
Winter Storm	2009	N/A	Heavy snow, blowing, and drifting snow in late and early winter.	N/A	High likelihood of reoccurring

Winter Storm	02/26/2013	N/A	Heavy snow 6-9 inches	N/A	High likelihood of reoccurring
Winter Storm	01/26/2014	N/A	1 road closure, stranded motorists and vehicle slide offs.	N/A	High likelihood of reoccurring
Winter Storm	2015	N/A	Moderate to heavy snowfall 2-12 inches. Heavy snow in late and early winter.	N/A	High likelihood of reoccurring
Winter Storm	12/29/2020	N/A	Heavy snowfall 4-8 inches.	N/A	High likelihood of reoccurring

Data Source: 2021 City of Madison Data Collection Guide

Flood Hazard

Structures and Properties in the Floodplain

Refer to the flood profile in the mitigation plan for a description of the methodology used to identify potentially flood-prone properties. Figure 1 shows mapped floodplains, future growth areas, and critical or vulnerable facilities. Tables 13 and 14 outline the primary structures on them within the City of Madison, Dane County. Potential number of individuals at risk figures are based on primary residential structures and the average household size within Dane County (2.37 people as of 2021). Estimated loss potentials for all structures on the floodway can be found within section 4.6 in chapter 4 of the county plan.

Table 13 Primary Structures in the 100 Year Floodplain

Residential Structures in 100 yr. Floodway	Non-Residential Structures in 100 yr. Floodplain	Total Structures in 100 yr. Floodplain	Potential # of People at Risk in 100 yr. Floodplain	Total Assessed Values (\$) of Structures in 100 yr. Floodplain
61	28	89	144	\$72,714,415

Source: Analysis based on Dane County Land Information Office Data

Table 14 Primary Structures in the 500 Year Floodplain

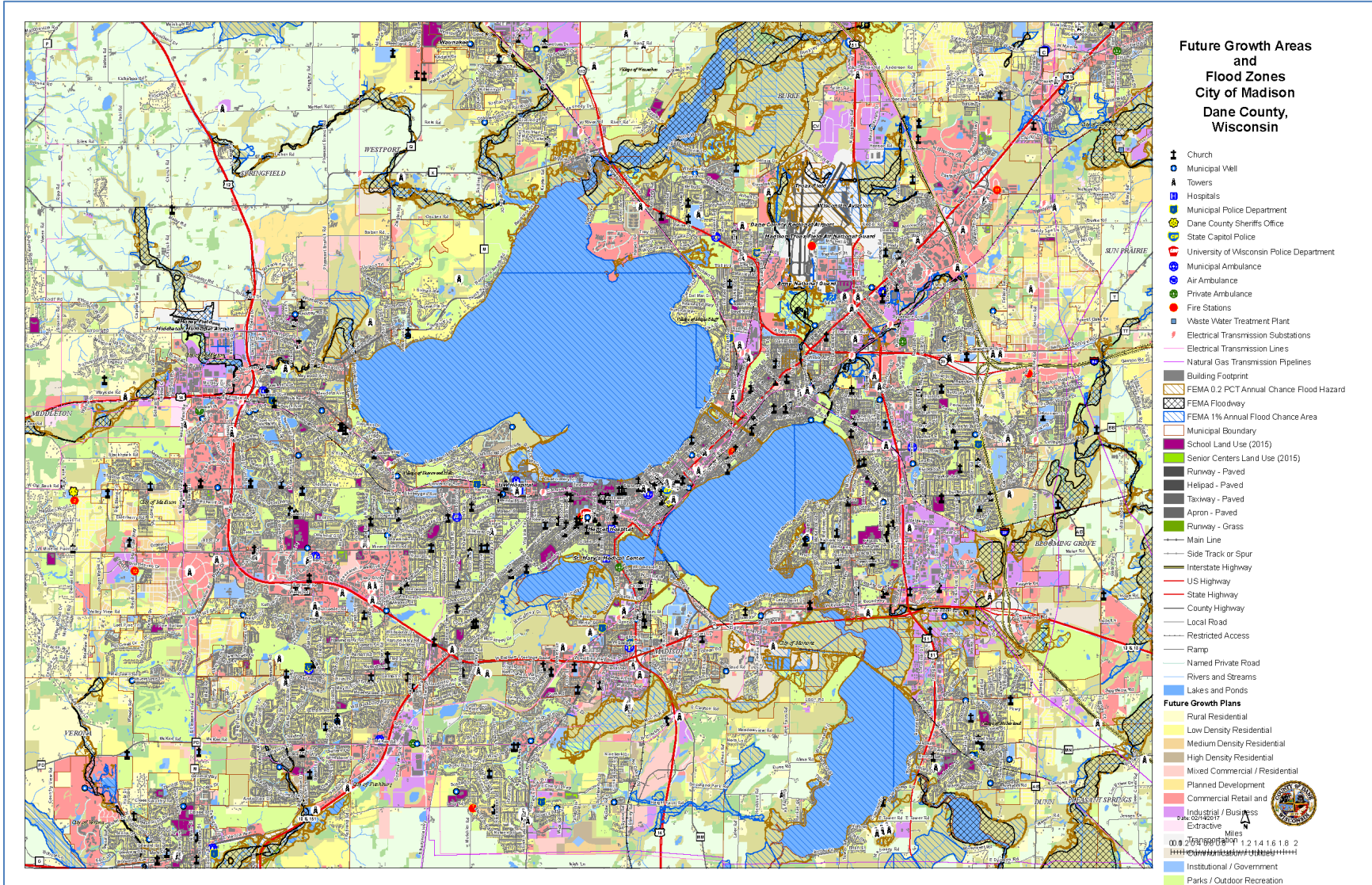
Residential Structures in 500 yr. Floodway	Non-Residential Structures in 500 yr. Floodplain	Total Structures in 500 yr. Floodplain	Potential # of People at Risk in 500 yr. Floodplain	Total Improved Values (\$) of Structures in 500 yr. Floodplain
281	9	290	666	\$94,755,706

Source: Analysis based on Dane County Land Information Office Data

Repetitive Loss Properties and Flood Insurance Policies

- Three repetitive loss properties have been reported in the City of Madison, Dane County.
- The City of Madison has 373 flood insurance policies in force within Dane County, with a total coverage of \$112,829,900.

Figure 1 Flood Hazards and Future Land Use Map



Tornado

While it is difficult to estimate specific losses to a tornado due to the random nature of the event, a methodology was developed that was applied to each jurisdiction during the 2023 update. The table below estimates the percent area of the jurisdiction that could be impacted based on the average sized tornado (F2) in Dane County. High value exposure is based on 100% loss, medium 50% loss, and low is 25% loss to the property potentially impacted. The loss ratio, which is the ratio of the damaged building value to total exposed building value, is a measure of the impact to the jurisdiction as a whole. Communities with loss ratios 10% or more may have difficulty recovering from a disaster. Refer to the tornado hazard profile in the main mitigation plan for more details on this methodology.

Table 15 Tornado Loss Estimate

% Area impact	Improved Parcel Count	Affected Structure Estimate	Total Exposed Value (\$)	Estimated Loss \$ (High Damage Range)	Estimated Loss \$ (Moderate Damage Range)	Estimated Loss \$ (Low Damage Range)	Loss Ratio for Moderate Damage Range
1.06%	75,020	797	68,712,459,450	730,177,417	365,088,708	182,544,354	1%

Data Source: Analysis Based on Dane County Land Information Office's data

Problems or Additional Vulnerability Issues

Please refer to Chapter 4 in the County Plan for emerging vulnerability issues.

CAPABILITY ASSESSMENT

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This capabilities assessment summarizes regulatory mitigation capabilities, administrative and technical mitigation capabilities, and fiscal mitigation capabilities for the City of Madison.

Mitigation Capabilities Summary

Table 16 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, or by themselves contribute to reducing hazard losses. The table also indicates which of these tools are currently utilized in the City of Madison.

Table 16 City of Madison Regulatory Mitigation Capabilities

Regulatory Tools (ordinances, codes, plans)	Yes/ No	Comments
Existing Natural Hazard Mitigation Plan	Yes	2018 annex to Dane County Plan
General or Comprehensive plan	Yes	Imagine Madison adopted 2018
Zoning ordinance	Yes	CH 28 MGO
Subdivision ordinance	Yes	CH 16 MGO
Growth management ordinance	N/A	N/A
Shoreland / wetland zoning ordinance	Yes	Ch 28 MGO
Floodplain zoning ordinance	Yes	Ch 28 MGO
FEMA / NFIP Community Rating System	Yes	As administered by FEMA.
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	CH 37 MGO (Stormwater)
Building code	Yes	2015 International Building Code
Fire department ISO rating	Yes	Rating: 1
Climate change Impact program	Yes	In 2021, the City of Madison hired a sustainability and resilience coordinator. That position is charged with developing a plan to abate climate change.
Erosion or sediment control program	Yes	CH 37 MGO (Stormwater)
Stormwater management program	Yes	CH 37 MGO (Stormwater)
Site plan review requirements	Yes	CH 37 MGO (Stormwater); Ch28 Zoning, others
Capital improvements plan	Yes	Capitol Finance Budget
Economic development plan	Yes	Connect Madison: Economic Development Plan approved 201

Regulatory Tools (ordinances, codes, plans)	Yes/No	Comments
Local emergency operations plan	Yes	Adopted in 2011
Other special plans	N/A	N/A
Flood insurance study or other engineering study for streams	Yes	Citywide Watershed Studies (23 total; in progress)
Elevation certificates (for floodplain development)	Yes	Part of plan submittal and approval
Climate Action Plan	Yes	In 2021, the City of Madison hired a sustainability and resilience coordinator. That position is charged with developing a plan to abate climate change.

Data Source: City of Madison Data Collection Guide, 2021

Table 17 identifies the personnel responsible for mitigation and loss prevention activities as well as related data and systems in the City of Madison.

Table 17 Responsible Personnel and Departments for the City of Madison

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices	Yes	Engineering; Various staff Planning, various staff	Engineering: Stormwater, Sanitary Sewer, Street, etc. Planning: Development Review, Neighborhood Planning, Comprehensive Planning
Engineer/professional trained in construction practices related to buildings and/or infrastructure	Yes	Building Inspection/ Construction Supervisor	Kyle Bunnow, P.E.
Planner/engineer/scientist with an understanding of natural hazards	Yes	Engineering; Various staff	Stormwater, Sanitary Sewer, Street, etc.
Personnel skilled in GIS	Yes	Planning, Engineering, Traffic Engineering; IT; Parking Utility; Water Utility	30+ staff
Full-time Building Official	Yes	Building Inspection	N/A
Personnel Skilled in Climate Resilience	Yes	Mayor's Office/Sustainability and Resilience Coordinator	N/A
Floodplain Manager	Yes	Zoning Administrator functions in this capacity.	N/A
Emergency Manager	Yes	Fire/ Fire Marshal- Emergency Management Coordinator	N/A

Real Estate Acquisition Personnel	Yes	Economic Development-Office of Real Estate	N/A
Grant Writer	N/A	Grant director and citywide grants group with representatives from various agencies	N/A
Other Personnel	N/A	N/A	N/A
GIS Data Resources – (land use, building footprints, etc.)	Yes	Engineering, Planning, IT, Water Utility,	Critical facilities maintained by engineering and respective utilities, land use data updated by planning, building footprints updated by Engineering, vulnerable facilities maintained by planning
Warning systems/services	Yes	Outdoor warning sirens, Emergency Alert System, RAVE alerts, cell phone alerts	RAVE is similar to Reverse 911

Data Source: City of Madison Data Collection Guide 2021

Table 18 identifies financial tools or resources that the City of Madison could potentially use to help fund mitigation activities.

Table 18 Financial Resources for the City of Madison

Financial Resources	Accessible/Eligible to Use (Yes/No)
Community Development Block Grants	Yes
Capital improvements project funding	Yes
Authority to levy taxes for specific purposes	Yes
Dedicated funding for land, easement or conservation easement acquisition	Yes
Fees for water, sewer, gas, or electric services	Yes
Impact fees for new development	Yes
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold Spending in hazard prone areas	No

Data Source: City of Madison Data Collection Guide

National Flood Insurance Program Status

The City of Madison currently participates in the National Flood Insurance.

Additional Capabilities

The City of Madison has identified the following as additional capabilities in the 2021 Data Collection Guide:

- City of Madison Flooding website has a variety of information for homeowners <https://www.cityofmadison.com/flooding> for household preparedness, adaption and emergency response.
- The City of Madison Stormwater website has environmental education: <https://www.cityofmadison.com/engineering/stormwater/education>
- The Water Utility has information on sustainability and water use: <https://www.cityofmadison.com/water/sustainability>
- Citywide Flood Mitigation studies and watershed studies to identify deficiencies in the Stormwater and drainage system. This program helps inform capital improvement projects. The high lake level analysis/dam breach analysis identified vulnerable infrastructure and provides key elevations for the installation of back-up generators and helps improve emergency response.

Public Involvement Activities

The City of Madison provided a publically noticed listening session with the City of Madison Common Council Executive meeting on December 7, 2021 as well as the Sustainable Madison Committee on November 11, 2021. Both meetings were noticed on the City of Madison website, and provided an agenda discussing the draft mitigation strategies. Minimal additions have been added to the draft mitigation strategies.

MITIGATION STRATEGIES

Below are the identified mitigation strategies developed by the City of Madison’s NHMP steering committee. Mitigation is defined as a sustained action to reduce or eliminate risk to people and property from hazards and their effects. A *mitigation strategy* is a long-term vision for risk reduction in local jurisdictional or regional planning. A mitigation strategy can be achieved by a list of overall improvements to achieve (goals) that provide direction for community efforts to reduce potential losses identified in the risk assessment.

Strategy #1	Emergency power for critical facilities and services	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>Provide emergency back-up power to critical emergency services and public works facilities including but not limited to fire stations, police stations, communication towers, and lift stations. During severe weather and power interruptions, it is imperative that essential City facilities have back-up power generators to ensure that essential services and communications are maintained without interruption. While many facilities buildings have now been equipped for this, some still remain and this remains a key strategy. Grant funding would be very useful for completing this strategy.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Develop a prioritized list of City facilities based on criticality of need for emergency back-up power during severe weather and power interruptions. <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – City of Madison c. <i>Completion date</i> – January 2022 		

Strategy #1	Emergency power for critical facilities and services
	<p>2. Conduct site visits to develop a comprehensive inventory of existing emergency back-up power generators, map circuits and functional areas served by existing equipment and assess current condition.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – City of Madison c. <i>Completion date</i> – June 2022
	<p>3. Inventory and assess the power use of existing equipment, complete a power generator load study to determine the most economical, reliable and efficient solution for each facility.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – City of Madison c. <i>Completion date</i> – December 2022
	<p>4. Design, procurement, and installation.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – City of Madison, FEMA Hazard Mitigation Grant Program c. <i>Completion date</i> – December 2027
	<p>5. Train facilities maintenance personnel on proper operation and maintenance.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – City of Madison, FEMA Hazard Mitigation Grant Program c. <i>Completion date</i> – December 2027

Strategy #2	Improving Resilience to Extreme Heat Events	
Prevention	Natural Resource Protection	
Property Protection	Critical Facilities Protection	
Public Education & Awareness	Structural Project	
<p>Purpose: Characterize risk and vulnerabilities to extreme heat events, develop and apply a Heat Resilience Action Plan to equitably avoid, minimize, and mitigate the impacts of these events in the City of Madison.</p> <p>Desired outcome: Through the successful application of equitable, community-driven solutions, the City of Madison will minimize or eliminate urban heat island effect and negative health outcomes and death from extreme heat events. City of Madison operations and residents have the information, tools, and resource they need to be resilient during extreme heat events. Extreme heat events no longer disproportionately impact our most vulnerable residents.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Conduct analysis to create maps that identify and visualize air and surface temperatures in Madison, where urban heat islands occur, and the location of populations most sensitive or vulnerable to extreme heat events.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison in partnership with researchers at the University of Wisconsin at Madison b. <i>Funding source</i> – City of Madison budget plus grant assistance if available. c. <i>Completion date</i> – Q4 2022 or earlier 		
<p>2. Engage the community to understand current heat resilience practices, identify needs, and develop solutions that will improve heat resilience that result in a Heat Resilience Action Plan, with a particular focus on equitable solutions that providing heat island mitigation and adaptation for sensitive and vulnerable populations.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison in partnership with researchers at the University of Wisconsin at Madison and community organizations b. <i>Funding source</i> – City of Madison budget plus grant assistance. c. <i>Completion date</i> – Q3 2023 or earlier 		

Strategy #2	Improving Resilience to Extreme Heat Events
<p>3. Apply solutions identified in the Heat Resilience Action Plan to minimize or eliminate urban heat island effect and provide City operations and residents with the information, tools, and resource they need to be resilient during extreme heat events.</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – City of Madison in partnership with community organizationsb. <i>Funding source</i> – City of Madison budget plus grant assistance.c. <i>Completion date</i> – Q4 2023 and beyond	

Strategy #3	Improving Resilience to Extreme Heat Events	
Prevention	Natural Resource Protection	
Property Protection	Critical Facilities Protection	
Public Education & Awareness	Structural Project	
<p>Purpose: Characterize risk and vulnerabilities to climate change impacts, develop and apply a plan to equitably improve climate resilience of people, infrastructure, and natural systems in the City of Madison.</p> <p>Desired outcome: Through the successful application of equitable, community-driven solutions, the City of Madison operations and residents will be prepared for and experience minimal disruption from a changing climate. The impacts of climate change will no longer disproportionately impact our most vulnerable residents.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Conduct GIS and social analyses as well as community outreach to understand and map community vulnerability to a full suite of climate change impacts and create maps that communicate risk. <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison in partnership with researchers at the University of Wisconsin at Madison and others b. <i>Funding source</i> – City of Madison budget plus grant assistance if available. c. <i>Completion date</i> – Q4 2023 or earlier 2. Engage the community to identify needs and develop solutions that will improve climate resilience, with a particular focus on equitable solutions that improve the capacity and resilience of sensitive and vulnerable populations. <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison in partnership with researchers at the University of Wisconsin at Madison and community organizations b. <i>Funding source</i> – City of Madison budget plus grant assistance. c. <i>Completion date</i> – Q4 2025 or earlier 		

Strategy #3	Improving Resilience to Extreme Heat Events
<p>3. Apply solutions identified to improve climate resilience and provide City operations and residents with the information, tools, and resource they need to prepare for and adapt to a changing climate.</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – City of Madison in partnership with community organizationsb. <i>Funding source</i> – City of Madison budget plus grant assistance.c. <i>Completion date</i> – 2025 and beyond as funding sources become available	

Strategy #4	Forsythia Place Floodwall	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, and the Forsythia Place floodwall project would reduce flood risk to adjacent properties by preventing flooding up to the 1% chance storm.</p> <p>The project would include creating a channel to direct stormwater from the north/south Park Division property line along Elder Place and Forsythia Place to the major stormwater system. The project would also build a floodwall along the major stormwater channel that would be high enough to prevent flooding of homes along Forsythia Place and Bordner Drive in the 1% chance event.</p> <p>The project will also help keep residents safe as they travel through their neighborhood, and improve emergency response times during flood events. Additionally, it would allow for access to the public housing facilities that currently flood in the 1% chance event.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #4	Forsythia Place Floodwall
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #5	Frisch Rd.-Tottenham Rd. Box Culvert	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, and the Frisch Rd and Tottenham Rd box culvert upgrades would significantly reduce street flooding and structural flooding during the 10% chance storm in this area. Such improvements would also help reduce flooding during the 1% chance storm.</p> <p>The project would include upsizing the box culverts at street crossings to allow for improved conveyance downstream. This effort, combined with improvements in the local storm sewer, would significantly reduce flood risk of the 24 homes that currently flood in the 1% chance storm.</p> <p>The project will also help keep residents safe as they travel through their neighborhood, and improve emergency response times during flood events where impassible flood water is present for several hours.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #5	Frisch Rd.-Tottenham Rd. Box Culvert
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #6	General Flooding Storm Improvements	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, and is currently developing watershed studies that lay out storm sewer system upgrades that will build flood resilience citywide. Each year, the city will upsize stormwater infrastructure along with street reconstruction projects per what is defined within the watershed studies. The City will also complete non-street related flood mitigation projects as budgeting allows. The flood mitigation projects will be prioritized in part based on where the flood risk is the greatest, and where there are vulnerable residents and facilities.</p> <p>By working to implement the master plans established by the watershed studies, the City will begin to reduce the amount of homes that flood in the 1% chance storm, and keep streets passable by emergency vehicles in up to the 4% chance event.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #6	General Flooding Storm Improvements
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #7	Gettle Ave Box Culvert	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, and the Gettle Ave Box Culvert upsizing project would reduce flood risk to adjacent properties by significantly reducing the flood depths around homes and significantly reduce the number of homes that flood during the 1% chance storm.</p> <p>The project would include upsizing the Gettle Ave box culvert to allow for all of the floodwater running through Bordner Park to enter the box culvert and prevents backups and surcharging of the storm sewer.</p> <p>The project will also help keep residents safe as they travel through their neighborhood, and improve emergency response times during flood events.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #7	Gettle Ave Box Culvert
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #8	Odana Pond Reconstruction	
Prevention	Natural Resource Protection	
Property Protection	Critical Facilities Protection	
Public Education & Awareness	Structural Project	
<p>The City of Madison is working to mitigate flood impacts on residents, Enhance Wetland functionality and lessen downstream flooding. The Odana Ponds reconstruction project would reduce flood risk to adjacent properties by providing sufficient flood storage to keep the 1% storm from inundating surrounding homes maintaining the existing peak discharge rate.</p> <p>The project would also reduce the depth and frequency of residential street flooding on Dearholt Rd and Milward Drive that currently flood frequently, and to impassible depths during large events. The pond project will help protect resident’s property and improve travel on the residential streets.</p> <p>The last component of this project is to provide natural resource protection. Odana Pond is a shallow kettle pond and the ecological function of the pond has been degraded due to stormwater. The pond retrofit will enhance emergent vegetation zones, provide areas for sediment removal and improve the habitat in the pond.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #8	Odana Pond Reconstruction
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #9	Old Sauk Trails Business Park Ponds	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, Enhance Wetland functionality and lessen downstream flooding. The Odana Ponds reconstruction project would reduce flood risk to adjacent properties by providing sufficient flood storage to keep the 1% storm from inundating surrounding homes maintaining the existing peak discharge rate.</p> <p>The project would also reduce the depth and frequency of residential street flooding on Dearholt Rd and Milward Drive that currently flood frequently, and to impassible depths during large events. The pond project will help protect resident’s property and improve travel on the residential streets.</p> <p>The last component of this project is to provide natural resource protection. Odana Pond is a shallow kettle pond and the ecological function of the pond has been degraded due to stormwater. The pond retrofit will enhance emergent vegetation zones, provide areas for sediment removal and improve the habitat in the pond.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Complete detailed design and permitting</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<p>2. Seek public feedback on design</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #9	Old Sauk Trails Business Park Ponds
<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 	
<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – General Contractor per competitive bidding process b. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budget c. <i>Completion date</i> – 2-4 years after project initiation. 	

Strategy #10	University Ave Flood Mitigation	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents and local businesses, and to increase passability of arterial streets by emergency vehicles during large flood events. Improvements to the University Ave corridor storm sewer infrastructure to increase conveyance would reduce risk of private property flooding adjacent to University Ave, making it less likely that private structures will flood in mid-sized storm events.</p> <p>The project would also reduce the depth and frequency of flooding on University Ave, a major east-west corridor through the City that serves several neighborhoods, the University of Wisconsin – Madison, and perhaps most critically, the UW Hospital complex, a major area health center. Currently, the road floods and becomes impassible in relatively small rain events (down to the 5-year event). This project will help keep residents safe as they travel across the City, and improve emergency response times during flood events.</p>		
Defined steps to achieving this mitigation strategy		
<ol style="list-style-type: none"> 1. Complete detailed design and permitting <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 2.0 years of project initiation. 		
<ol style="list-style-type: none"> 2. Seek public feedback on design <ol style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		

Strategy #10	University Ave Flood Mitigation
	<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – City of Madison Engineeringb. <i>Funding source</i> – Municipal Budgetc. <i>Completion date</i> – Complete within 2.0 years of project initiation.
	<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – General Contractor per competitive bidding processb. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budgetc. <i>Completion date</i> – 2-4 years after project initiation.

Strategy #11	West Towne Pond Expansion	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>The City of Madison is working to mitigate flood impacts on residents, and the West Towne Pond expansion project would reduce flood risk to adjacent properties by providing sufficient flood storage within in the pond up to the 1% chance storm.</p> <p>The project would also reduce the depth and frequency of arterial street flooding on Mineral Point Road, Gammon Road and Odana Road that currently flood frequently, and to impassible depths during large events. The pond project will help keep residents safe as they travel across the City, and improve emergency response times during flood events. Additionally, it would allow for access to the high school, middle school, and neighboring childcare facilities.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Complete detailed design and permitting</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		
<p>2. Seek public feedback on design</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first year of project initiation. 		
<p>3. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program, Wisconsin DNR, Dane County, and other applicable parties</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Engineering b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within 1.5 years of project initiation. 		

Strategy #11	West Towne Pond Expansion
<p>4. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – General Contractor per competitive bidding processb. <i>Funding source</i> – FEMA, DNR, Dane County, City of Madison Municipal Budgetc. <i>Completion date</i> – 2-4 years after project initiation.	

Strategy #12	Backup Generators for Police Facilities	
Prevention	Natural Resource Protection	
Property Protection	Critical Facilities Protection	
Public Education & Awareness	Structural Project	
<p>The police department is tasked with providing 24/7/365 services throughout the City. Currently, several of our key facilities (3 district stations, Training Center, and 1 evidence storage location) do not have any emergency/backup generators. This project would ensure that police services are maintained during a natural disaster that may cause interruption in power supply. The project also identifies the training center, key for service deliver, and the evidence storage, where key evidence may be destroyed if loss of power results in loss of refrigeration/freezing of said evidence.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Emergency power generator decision on location(s)</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Police Department b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first month of project initiation. 		
<p>2. Grant writing to FEMA – Pre-Disaster Mitigation Grant Program</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City of Madison Emergency Management b. <i>Funding source</i> – Municipal Budget c. <i>Completion date</i> – Complete within first six months of project initiation 		
<p>3. Implementation process/construction after awarded grant is received.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Third party vendor b. <i>Funding source</i> – FEMA c. <i>Completion date</i> – 1 year after project initiation 		

Strategy #13	Emergency Action Plans	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>Everyone has the right to know where and when to shelter or evacuate during an emergency. The action plan would go over routes to take, where to shelter, where not to shelter, evacuations, safe practices, etc.</p> <p>The desired outcome would be a better overall knowledge and sense of confidence when an event occurs.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Make Emergency Evacuation Maps of all City owned Buildings</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Risk Management b. <i>Funding source</i> – N/A c. <i>Completion date</i> – 2025 		
<p>2. Display finished Emergency Maps</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Facilities/Engineering/Risk b. <i>Funding source</i> – N/A, but maybe the Budget c. <i>Completion date</i> – After maps are done 		
<p>3. Train Employees/Public on Emergency Plans</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Risk/help from L&D b. <i>Funding source</i> – N/A c. <i>Completion date</i> – Ongoing 		

Strategy #14	Storm Shelter(s)
Prevention	Natural Resource Protection
Property Protection	Critical Facilities Protection
Public Education & Awareness	Structural Project
<p>Three mobile home communities are located in the city. Due to the limited protection provided by a mobile home during a tornado, those residents are at greater risk of injury and death. The same is true for homeless people and those living at the Dairy Drive encampment. FEMA approved storm shelters are necessary to protect residents during extreme wind events.</p>	
Defined steps to achieving this mitigation strategy	
<p>1. Determine best location(s) for community storm shelter(s).</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Emergency Management Coordinator b. <i>Funding source</i> – City budget c. <i>Completion date</i> – January of 2023 	
<p>2. Acquire land for construction of storm shelter(s)</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City Real Estate and City Engineering b. <i>Funding source</i> – City Budget c. <i>Completion date</i> – June of 2024 	
<p>3. Design storm shelter(s)</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City Engineering b. <i>Funding source</i> – City Budget and Hazard mitigation Grant Funds c. <i>Completion date</i> – To be determined 	

Strategy #14	Storm Shelter(s)
	<p>4. Construct storm shelter(s)</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – City Engineeringb. <i>Funding source</i> – City budget and hazard mitigation grant fundsc. <i>Completion date</i> – To be determined

Strategy #15	Debris collection site
Prevention	Natural Resource Protection
Property Protection	Critical Facilities Protection
Public Education & Awareness	Structural Project
<p>Natural hazards can create significant amounts of debris, from construction materials to downed trees and limbs. Further snow events often require hauling to offsite location from locations near downtown due to limited storage creating vision hazards for pedestrians, bikes and autos.</p> <p>The city needs a site to collect debris. A perfect site would be a fenced hard surface, minimum 3 acres with electric service and located within 6 miles of the State Capitol.</p>	
Defined steps to achieving this mitigation strategy	
<p>1. Identify three potential properties that can be used as debris collection sites. Conduct feasibility study and solicit neighborhood input.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Streets and Real Estate b. <i>Funding source</i> – City Budget c. <i>Completion date</i> – October 2023 	
<p>2. Purchase the selected property</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – City Real Estate b. <i>Funding source</i> – City budget and hazard mitigation funds c. <i>Completion date</i> – January 2025 	
<p>3. Design and bid site work. Obtain city approvals.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – Streets, City Engineering, City Real Estate, Zoning b. <i>Funding source</i> – City budget c. <i>Completion date</i> – July 2025 	

Strategy #15	Debris collection site
	<p>4. Site improvements</p> <ul style="list-style-type: none">a. <i>Responsible Party</i> – City Engineeringb. <i>Funding source</i> – City budgetc. <i>Completion date</i> – November 2025

Strategy #16	SCADA-MWU Emergency Generator Monitoring and fueling	
Prevention		Natural Resource Protection
Property Protection		Critical Facilities Protection
Public Education & Awareness		Structural Project
<p>This will enable the system Operator to monitor the generator status and fuel levels for MWU owned Emergency Generators using our SCADA System. A second goal is in the event of widespread power outage we need to modify current security measures to allow our fuel vendor to daily auto fill our generators with fuel during an emergency, without the need to contact MWU.</p>		
Defined steps to achieving this mitigation strategy		
<p>1. Connecting all MWU Emergency generators to the SCADA system for monitoring purposes.</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – MWU Supply and Operations as well as NCummins b. <i>Funding source</i> – Operating budget c. <i>Completion date</i> – 7-1-2022 		
<p>2. Establish security protocols and an Emergency fuel provider contract</p> <ul style="list-style-type: none"> a. <i>Responsible Party</i> – MWU Operations and Supply b. <i>Funding source</i> – Operating budget c. <i>Completion date</i> – This will be completed once the generator monitoring and security protocols have been established and an Emergency fuel provider contract has been awarded. 		