Section 4 – Risk Assessment

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation practices must be based on sound risk assessment. A risk assessment involves quantifying the potential loss resulting from a disaster by assessing the vulnerability of buildings, infrastructure, and people.

Basing risk assessments on the best information available is important in developing effective mitigation actions that benefit communities. Geographic Information System (GIS) tools are not only helpful in producing maps, but they also show structures at risk and may determine damage estimates for potential hazard scenarios. MN Homeland Security and Emergency Management (HSEM) mitigation staff encourages the use of GIS tools in risk assessments because they produce good information to be used in the risk assessment process. In recognition of the importance of planning in mitigation activities, FEMA created **Haz**ards **US**A **M**ulti-**H**azard (Hazus-MH), a powerful GIS-based disaster risk assessment tool. This tool enables communities to predict estimated losses from floods, hurricanes and other related phenomena and to measure the impact of various mitigation practices that might help reduce those losses. Hazus-MH was used by UMD Geospatial Analysis Center staff in the flood hazard risk assessment (see section 4.4.5).

This assessment identifies the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of 3 components — hazard identification and prioritization, risk profile, and vulnerability profile.

4.1 Hazard Identification/Profile

4.1.1 Hazard Identification

The cornerstone of the risk assessment is identification of the hazards that affect jurisdictions. To facilitate the planning process, several sources were employed to ensure that the natural hazards are identified prior to assessment.

The county maintenance of the plan includes continual updates of the hazards identified in the initial plan. The mitigation steering committee compared the hazards in the initial plan to current publications to determine if new hazards should be considered or if some should be deleted.

Natural hazards are identified in the FEMA publication "Multi-Hazard Identification and Risk Assessment – A Cornerstone of the National Mitigation Strategy," also known as MHIRA. FEMA Region V developed a list based on state mitigation plans in the region. The list was divided into natural (Table 8) and other hazards (Table 9) as was done in the 2014 Minnesota State Hazard Mitigation Plan.

Table 8. FEMA MHIRA Natural Hazards in the 2014 Minnesota State Hazard Mitigation Plan

Flooding	Hail	Drought
Dam/Levee Failure	Lightning	Extreme Heat
Wildfire*	Winter Storms	Extreme Cold
Windstorms	Erosion	Earthquakes
Tornadoes	Land Subsidence (Sinkholes & Karst)	

**Addressed in the State Mitigation Plan because Minnesota is a heavily forested state compared to other states in Region V.*

For the purpose of this plan, FEMA defines other hazards or "man-made hazards" as technological hazards and terrorism. These are distinct from natural hazards primarily in that they originate from human activity. In contrast, while the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human-induced. The term "technological hazards" refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. For the sake of simplicity, this guide assumes that technological emergencies are accidental and that their consequences are unintended. The term "terrorism" refers to intentional, criminal, and malicious acts. There is no single, universally accepted definition of terrorism, and it can be interpreted in many ways. For the purposes of this plan, FEMA refers to "terrorism" as the use of Weapons of Mass Destruction (WMD), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and "cyber terrorism."

Table 9. FEMA MHIRA Other Hazards in the 2014 Minnesota State Hazard Mitigation Plan

Terrorism	Nuclear Generating Plant Incidents	Ground and Surface Water Supply Contamination*
Infectious Disease Outbreak	Hazardous Materials Incidents	
Fires (Structures and Vehicles)	Transportation Incidents	

**Addressed in the State Hazard Mitigation Plan because Minnesota has made a high investment in its prized resource, water.*

4.1.2 Vulnerability Assessment by Jurisdiction

The steering committee met multiple times to review and update the hazards faced by residents of Steele County, update the existing mitigation actions published in the 2010 Multi-Hazard Mitigation Plan, and propose new mitigation actions.

To engage in this process, the committee drew on a number of data sources. First, the committee examined the hazards identified in the 2010 Hazard Mitigation Plan (Table 10). The natural hazards that pose risk to Steele County were discussed and adjusted to reflect the definitions of natural hazards used in the 2014 Minnesota State Hazard Mitigation Plan. This was done in order to assure that the risks faced by Steele County were categorized the same way as the priority hazards established by the State of Minnesota.

Table 10. Hazards identified in the 2010 Steele County Multi-Hazard Mitigation Plan

High Priority Hazards			
Agricultural Disaster	Communication Interruption	911 System Interruption	Telecommunication Failure
Emergency Radios	Explosion WMD	External Sabotage	Extreme Temperatures
HazMat Release	Health Hazard/Disease	Heat/Natural Gas Interruption	Incendiary Device
Industrial Accident	Power Failure/Interruption	Strong Storms/High Winds	Snow and Ice Storms
Terrorism	Tornado	Violence in Schools/ Workplace	Water Supply Failure/Contamination
Medium Priority Hazards			
Biological WMD	Bomb Threat	Chemical WMD	Economic Disaster
Explosion	Fire (Wildfire)	Fire (Structure Fire)	Food Supply Crisis
Flooding	Information System Failure	Internal Sabotage	Mischief/Vandalism
Medical Care (Facilities or Supplies)	Sewer Infrastructure Failure	Theft of Assets	Transportation Rail Crisis
Transportation Highway Crisis	Transportation Pipeline Crisis		
Low Priority Hazards			
Civil Disturbance	Drought	Earthquake	Incompetence Catastrophic
Nuclear Accident Regional	Radiological WMD	Strike	Theft of Information
Transportation Air Crisis			

While the focus of this MHMP is on natural hazards, planning took place with the understanding that many non-natural hazards could occur as a result of natural disasters (i.e. disruption in electrical service due to freezing rain causing problems for both utility corporations and vulnerable populations dependent on electricity for heat).

This plan draws on a variety of data sources including the State of Minnesota and Homeland Security Emergency Management Critical Infrastructure Strategy for the State of Minnesota (2010), FEMA's Local Mitigation Planning How-to Guide Integrating Manmade Hazards into Mitigation Planning (2003), and the State of Minnesota Multi Hazards Identification Risk Assessment.

Steele County ranked hazards based on a Calculated Priority Risk Index, or CPRI, for their 2014 Threat Hazard Identification and Risk Assessment (THIRA). These rankings were considered by the steering committee in the process of ranking hazards for the MHMP update. The methodology of the CPRI is outlined below.

4.1.3 Calculated Priority Risk Index

The vulnerability assessment builds upon the previously developed hazard information by identifying the community assets and development trends and intersecting them with the hazard profiles to assess the

potential amount of damage that could be caused by each hazard event. A summary of Calculated Priority Risk Index (CPRI) categories and risk levels is shown in Table 11.

Definitions of CPRI Categories

Probability – a guide to predict how often a random event will occur. Annual probabilities are expressed between 0.001 or less (low) up to 1 (high). An annual probability of 1 predicts that a natural hazard will occur at least once per year.

Magnitude/Severity – indicates the impact to a community through potential fatalities, injuries, property losses, and/or losses of services. The vulnerability assessment gives information that is helpful in making this determination for each community.

Warning Time – plays a factor in the ability to prepare for a potential disaster and to warn the public. The assumption is that more warning time allows for more emergency preparations and public information.

Duration – relates to the span of time local, state, and/or federal assistance will be necessary to prepare, respond, and recover from a potential disaster event.

Table 11. Summary of Calculated Priority Risk Index (CPRI) Categories and Risk Levels

CPRI Category	DEGREE OF RISK			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 0.001	1	45%
	Possible	Rare occurrences with at least one documented or anecdotal historic event. Annual probability that is between 0.01 and 0.001.	2	
	Likely	Occasional occurrences with at least two or more documented historic events. Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability that is greater than 0.1.	4	
Magnitude/Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). Injuries or illnesses are treatable with first aid and there are no deaths. Negligible quality of life lost. Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability and there are no deaths. Moderate quality of life lost. Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least one death. Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and multiple deaths. Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Less than 6 hours	4	15%
	6 to 12 hours	6 to 12 hours	3	
	12 to 24 hours	12 to 24 hours	2	
	More than 24 hours	More than 24 hours	1	
Duration	Brief	Up to 6 hours	1	10%
	Intermediate	Up to 1 day	2	
	Extended	Up to 1 week	3	
	Prolonger	More than 1 week	4	

The hazard rankings for the Steele County MHMP update (Table 12) were based upon review of 1) hazard rankings in the past MHMP, 2) hazard rankings in the Calculated Priority Risk Index (CPRI) conducted by the county, and 3) group review and discussion during the MHMP steering committee meetings and public meetings.

Table 12. Hazard Ranking for 2017 MHMP Update

Natural Hazards	MHMP Hazard Ranking
Severe Summer Storms (Thunderstorms, Lightning, Hailstorms, Windstorms, Tornadoes)	High
Severe Winter Storms (blizzards, heavy snow)	High
Flash Flood & Riverine Flood	High
Erosion / Land Subsidence (Sinkholes & Karst)	High
Extreme Heat & Extreme Cold	Moderate
Wildfire	Low
Drought	Low
Dam Failure	Low

4.1.4 Hazard Profiling Concept of Planning

The risk assessments identify the characteristics and potential consequences of a disaster, how much of the community could be affected by a disaster, and the impact on community assets. A risk assessment consists of 3 components—hazard identification, risk profile, and vulnerability profile.

4.1.5 GIS and Risk Assessment

The risk analysis step in this assessment quantifies the risk to the population, infrastructure, and economy of the community. Hazards that can be geographically identified (wildland fires, windstorms, tornadoes, hail, floods) were mapped.

Hazus-MH was used to estimate the damages incurred for a 100-year flood and for general asset assessment. Hazus-MH also generates aggregated loss estimates for the entire county due to a 100-year flood. Aggregate inventory loss estimates, which include building stock analysis, are based upon the assumption that building stock is evenly distributed across each census block. Therefore, it is possible that overestimates of damage will occur in some areas while underestimates will occur in other areas. With this in mind, total losses tend to be more reliable over larger geographic areas (groups of many blocks) than for individual census blocks. It is important to note that Hazus-MH is not intended to be a substitute for detailed engineering studies.

4.1.6 National Centers for Environmental Information (NCEI) Records

Historical storm event data was compiled from the National Centers for Environmental Information (NCEI). NCEI records are estimates of damage reported to the National Weather Service (NWS) from

various local, state, and federal sources. However, these estimates are often preliminary in nature and may not match the final assessment of economic and property losses related to given weather events.

The NCEI data included 278 reported events in Steele County between 1950 and March 2017. However, some weather event categories only had available data going back as recent as 1996. No records before 1950 were available. A summary table of events related to each hazard type is included in the hazard profile sections that follow. A full table listing all events, including additional details, is included in Appendix C. NCEI hazard categories used in this plan are listed in Table 13.

Table 13. National Centers for Environmental Information Historical Hazards

Hazard	
Tornado	Hail
Thunderstorm Wind	Flood/Flash Flood
Winter Weather/ Winter Storm/Blizzard	Cold/Wind Chill
Excessive Heat/Heat	Lightning

4.1.7 FEMA Declared Disasters

Another historical perspective is derived from FEMA-declared disasters. 11 major disaster and 2 emergency declarations in Steele County have been made between 1957 and July 2017 (Figure 4).

Figure 4. FEMA-Declared Disasters and Emergencies in Minnesota, 1957-July 2017

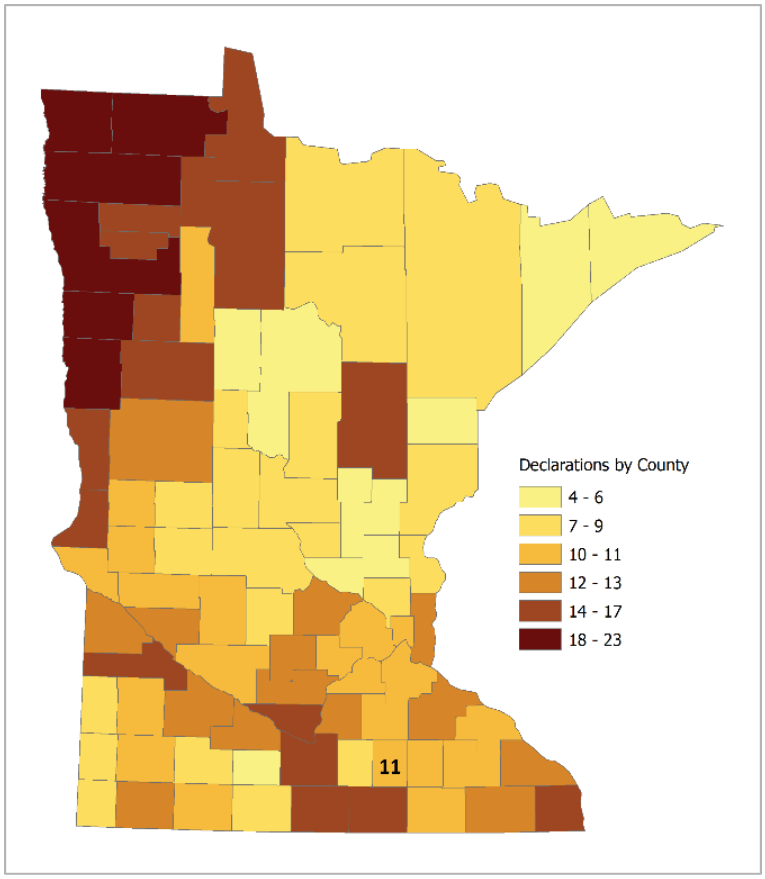


Table 14 and Table 15 show the details of the disasters including payments for Public Assistance (PA) and Individual Assistance (IA), listed under the flooding and severe storm profiles. No declarations were made for the other storms listed in the NCEI database. Reviewing the federal payments for damages from the declared disasters is a way of correlating the impact from the NCEI report.

Table 14. FEMA-Declared Major Disasters in Steele County (1953-July 2017)

Incident	Declaration Date and Disaster Number	Incident Period	Total PA Obligated by FEMA for Disaster in Minnesota	Total PA Obligated by FEMA for Disaster in Steele County	Individual Assistance in Minnesota	Individual Assistance in Steele County
Severe Storms and Flooding	11/02/2016 DR-4290	9/21/2016-9/24/21016	$1,308,184 (as of 2/8/17)	Yes, amount unknown	$2,460,692.05	None
Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	7/21/2014 DR-4182	6/11/2014-7/11/2014	$55,180,608	$532,893	None	None
Severe Storms and Flooding	10/13/2010 DR-1941	9/22/2010-10/14/2010	$33,453,783	$10,181,611	None	None
Severe Storms, Tornadoes, and Flooding	7/17/2010 DR-1921	6/17/2010-6/26/2010	$17,728,370	$126,294	None	None
Severe Storms and Flooding	8/23/2007 DR-1717	8/18/2007-8/31/2007	$39,751,469	$439,883	$19,808,889	$346,670
Severe Storms and Flooding	10/7/2004 DR-1569	9/14/2004-9/27/2004	$5,016,667	$379,311	$4,210,930	$490,348
Severe Winter Storms, Blizzards	1/16/1997 DR-1158	1/3/1997-2/3/1997	Yes, amount unknown	Yes, amount unknown	None	None
Flooding	6/1/1996 DR-1116	3/14/1996-6/17/1996	Yes, amount unknown	Yes, amount unknown	None	None
Flooding, Severe Storm, Tornadoes	6/11/1993 DR-993	5/6/1993-8/25/1993	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown
Ice Storm	12/26/1991 DR-929	10/31/1991-11/29/1991	Yes, amount unknown	Yes, amount unknown	None	None
Flooding	4/11/1965 DR-188	4/11/1965	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown	Yes, amount unknown

** Data provided by MN HSEM in September 2016, https://www.fema.gov/openfema-dataset-disaster-declarations-summaries-v1 accessed February 2017, and https://www.fema.gov/openfema-dataset-registration-intake-and-individuals-household-program-v1 accessed 6/7/2017. Values are estimates collected at the time of the disaster.*

Table 15. FEMA-Declared Emergencies in Steele County (1974-July 2017)

Incident	Declaration Date and Disaster Number	Incident Period	Individual Assistance in Minnesota	Public Assistance (all affected areas)
Minnesota Hurricane Katrina Evacuation	9/13/2005 EM-3242	8/29/2005-10/01/2005	Unknown	$2,470,003.23
Drought	6/17/1976 EM-3013	6/17/1976	Unknown	Unknown

** Data provided by MN HSEM in September 2016. Values are estimates collected at the time of the disaster.*

Table 16 depicts the historical projects in Steele County resulting from hazard mitigation funding.

Table 16. Historical Hazard Mitigation Funding (HMGP and PDM) in Steele County

Year	Project Description	Sub-Grantee	Federal Share
2012	Warning systems/Generators (PDM)	City of Owatonna	$441,495
2007	Local Multi-Hazard Mitigation Plan update (HMGP)	Steele County	$22,104
2007	Property acquisition/demolition (HMGP)	City of Owatonna	$255,826
2007	Property acquisition/demolition (HMGP)	City of Owatonna	$498,044
2007	Residential stormwater drainage rehabilitation (HMGP)	City of Owatonna	$1,084,955
2006	Property acquisition/demolition (HMGP)	City of Owatonna	$129,148
1998	Convert .4 miles of overhead electrical feeder line to underground (HMGP)	Blooming Prairie Public Utilities	$100,000
1996	Installation of living snow fence along 35W (HMGP)	MN DOT	$13,840
1991	Utility protective measures (HMGP)	Steele Waseca Co-Op Electric	$645,674
Total HMGP/PDM Funding – Steele County			**$3,191,086**

**Data downloaded from https://www.fema.gov/media-library/assets/documents/28323 and https://www.fema.gov/media-library/assets/documents/103341 on 2/20/2017.*

4.2 Vulnerability Assessment

4.2.1 Asset Inventory

A 2010 essential facility dataset (schools, medical facilities, fire stations, and police stations compiled from state and county sources) was used to override the default Hazus-MH input database. Other critical facilities identified by the county were geocoded and overlaid with the Hazus-MH flood model output.

For the purposes of this plan, critical infrastructure and key resources were defined by Steele County. Table 17 below identifies the critical facilities that were included in the analysis. Essential facilities are a subset of critical facilities. Names and locations of all critical facilities are found in Appendix B. Figure 5 below maps the critical facilities in Owatonna, while Figure 6 depicts critical facilities in Blooming Prairie. Critical facilities in Ellendale are mapped in Appendix A (Figure A - 18), and critical facilities in Medford are mapped in Figure A - 19.

Table 17. Steele County Critical Infrastructure and Facilities

ACAMS Category	Number of Facilities
Agriculture and Food	8
Banking and Finance	19
Chemical and Hazardous Materials	1
Commercial Facilities	2
Communications	5
Dams	10
Defense Industrial Base	0
Emergency Services	11
Energy	35

ACAMS Category	Number of Facilities
Government Facilities	23
Healthcare and Public Health	12
Information Technology	0
Manufacturing	0
National Monuments and Icons	0
Nuclear	0
Postal and Shipping	7
Transportation	10
Water	22

Figure 5. Critical Facilities in Owatonna

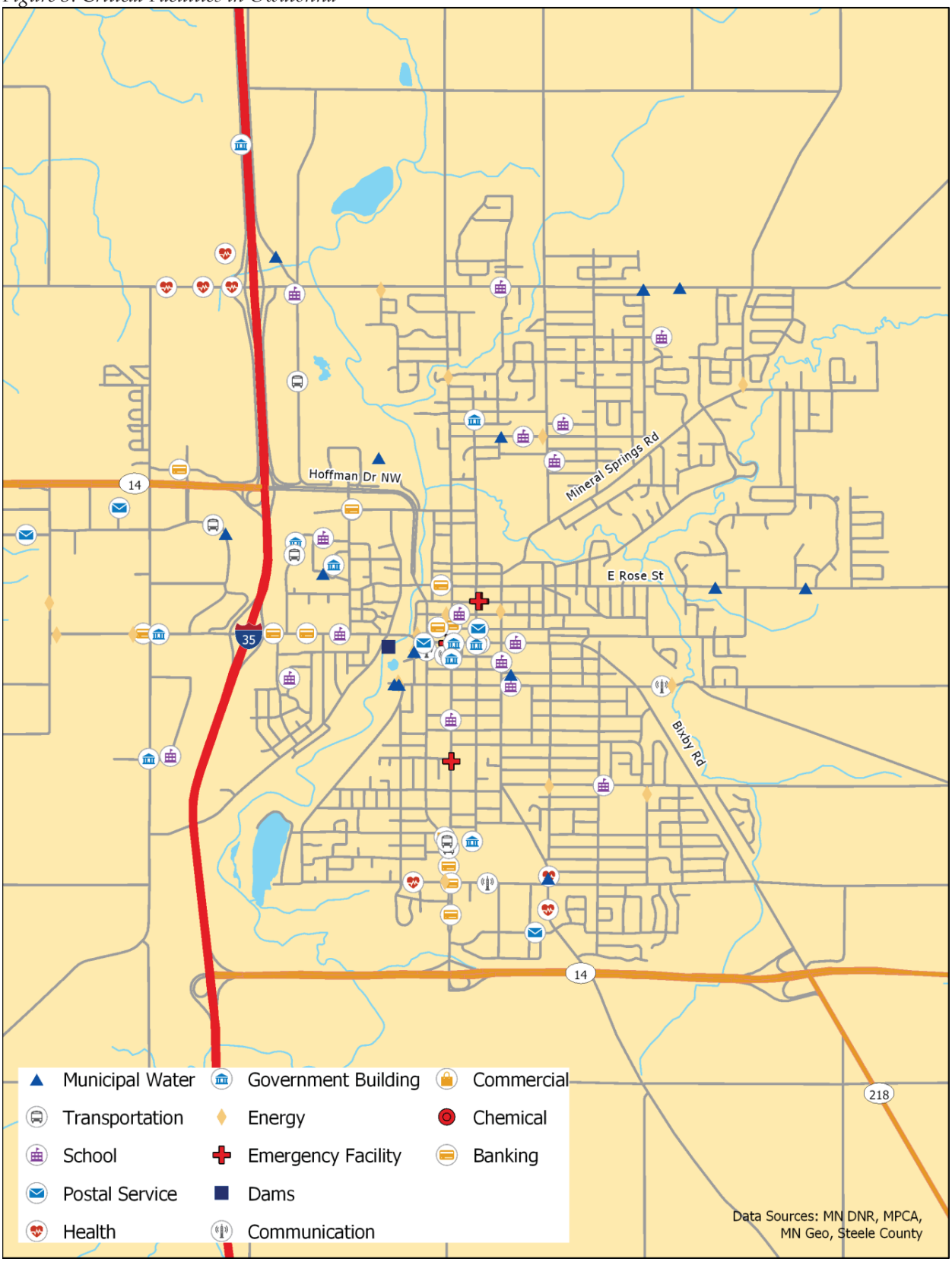
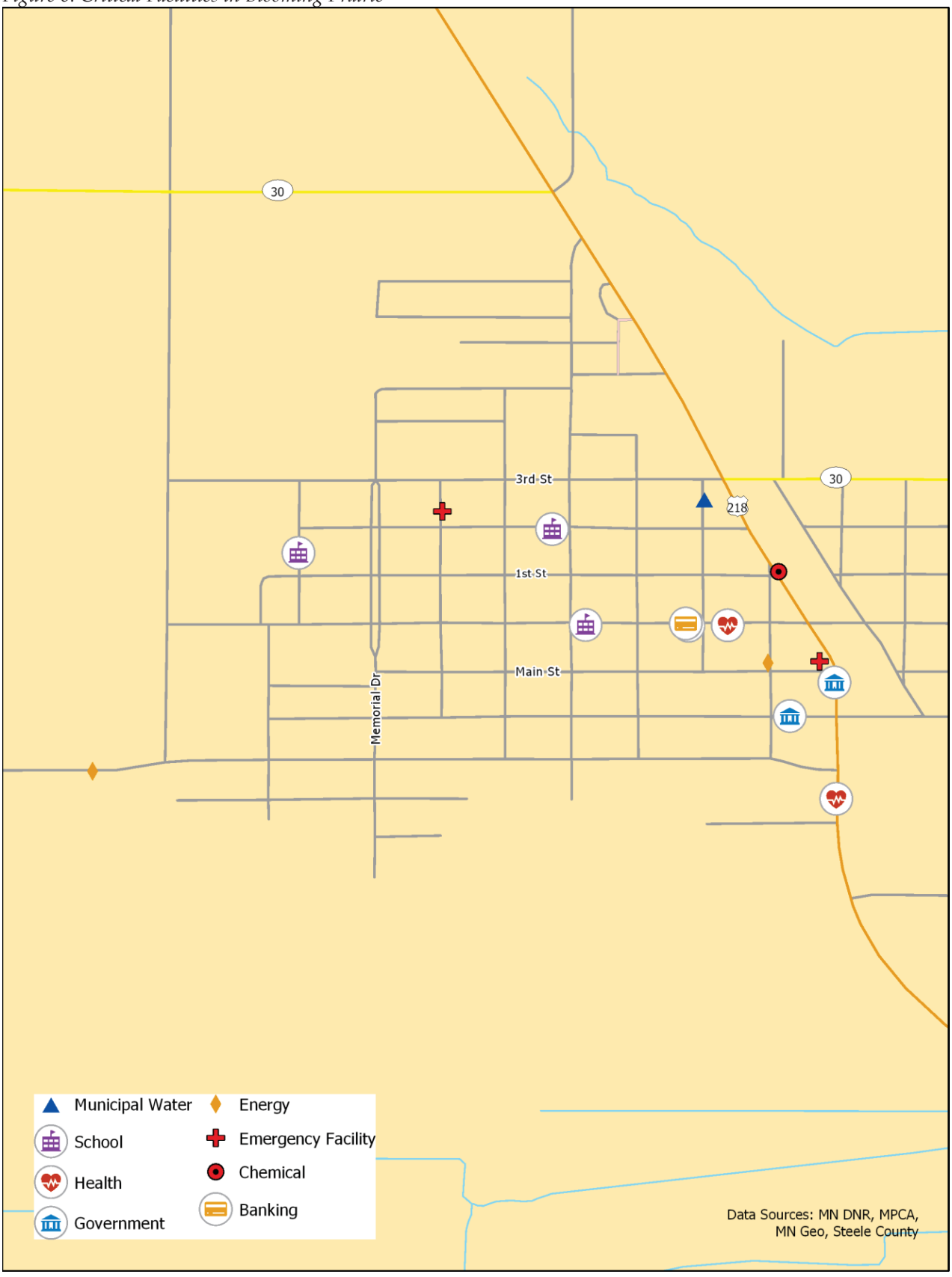


Figure 6. Critical Facilities in Blooming Prairie



4.2.2 *Facility Replacement Costs*

Steele County-specific building data was sourced from the parcel tax databases and parcel polygon data included building valuations and occupancy class. Structure values for each parcel were aggregated within each parcel and assigned to the parcel centroid point. Records were aggregated to the relevant census administrative boundaries for the flood hazard analysis.

Facility replacement costs and total building exposure by general occupancy class are identified in Table 18, as calculated by Hazus.

Table 18. Steele County Total Building Exposure

General Occupancy	Parcels Containing Structures	Total Building Exposure
Agriculture	1,082	$574,000
Commercial	619	$934,000
Education	33	$0
Government	127	$1,517,000
Industrial	186	$396,000
Religious/Non-Profit	89	$6,000
Residential	11,710	$10,504,000
Total:	**13,846**	**$13,931,000**

4.3 Future Development

Because Steele County is vulnerable to a variety of natural hazards, the county government—in partnership with the state government—must make a commitment to prepare for the management of these types of events. Steele County is committed to ensuring that county elected and appointed officials become informed leaders regarding community hazards so that they are better prepared to set and direct policies for emergency management and county response.

There has not been any changes in development, settlement patterns, and commercial land use patterns in Steele County since the last Multi-Hazard Mitigation Plan.

The Steele County Emergency Management Director will work to keep the jurisdictions covered by the Multi-Hazard Mitigation Plan engaged and informed during the plan's cycle. By keeping jurisdictional leaders actively involved in the monitoring, evaluation and update of the MHMP, they will keep their local governments aware of the hazards that face their communities and how to mitigate those hazards through planning and project implementation. Each jurisdiction has identified mitigation strategies they will seek to implement in their communities (see *Appendix G: Mitigation Actions by Jurisdiction*). Jurisdictions will include considerations for hazard mitigation in relation to future development when updating local comprehensive plans or other plans that may influence development.