YELLOW MEDICINE COUNTY
CHAPTER FOUR: RISK ASSESSMENT

Overview

The risk assessment is divided into three parts. The first part consists of Hazard Prioritizations for each hazard which are based on the information provided in Chapter Three. The second part discusses county vulnerability to natural hazards (Vulnerable Areas within Yellow Medicine County), while the third part consists of a vulnerability assessment for each community (City Risk Assessment). Maps are available for the vulnerability assessments in parts two and three within this chapter.

Explanation of Prioritized Risk Assessment

The following pages give a summary of each hazard by gathering information about each hazard. The risk assessment looks at these questions and then attempts to quantify the risk level by giving number values to levels of risk. This information allows the hazards to be compared in order to assess which hazards pose the greatest risk. The values for the prioritized risk assessment were determined by a variety of resources including meetings and discussions with the Local Task Force, Technical Task Force team, city representatives, and the County Emergency Manager to determine a ranking for each hazard based on the risk assessment criteria. Also taken into consideration was information from the community profile, analysis of historic disasters, and information provided by the task force and public to identify past, present and future disasters.

This risk assessment is determined by the following:

1) **The frequency of occurrence**: This asks how often it may happen and how likely is it that the hazard will occur. The number values are determined by:
    a. Unlikely: 1
    b. Occasional: 2
    c. Likely: 3
    d. Highly Likely: 4

2) **Warning Time**. This asks how long much warning time is available prior to the event.
    a. More than 12 hours: 1
    b. 6 – 12 Hours: 2
    c. 3 – 6 Hours: 3
    d. None – Minimal: 4

3) **Potential Severity**. This asks how severe the impact will be in a general sense.
    a. Limited: 1
    b. Minor: 2
    c. Major: 3
    d. Substantial: 4

4) **Risk Level**. The risk level looks at how severe the impact will be for each category of "Citizens/People", "Animals/Livestock", "Housing", "Critical Structures" and "Infrastructure". The average of all those categories determines the number for the risk.

The Overall Hazard Priority Level was then determined by adding up all the numbers and dividing by 4 to get the average risk level for each hazard. The hazard was determined "Very Low" if it was 1, "Low" if 2, "Moderate" if 3 and "High" if 4. The hazards were then listed in numerical order for the Yellow Medicine Local Task Force to review and comment upon at the second Local Task Force Meeting in Porter, MN on January 13, 2010. At the second Local Task Force Meeting, the team was presented with the Overall Hazard Priority Level determined by their risk assessments and the initial Overall Hazard Priority Level from the previous All-Hazard Mitigation Plan. Staff facilitators discussed differences between the two lists and questioned the Local Task Force if any changes were to be made. It was at this point that the Local Task Force held a discussion about the ranked list of hazards and staff provided information provided by the Technical Task Force team on questioned hazards. During this meeting two hazards: 100-Year Flood Events and Flash Flood/Other Flooding were shifted from their original places at the bottom of the list to their current positions. All other hazards retained their current hazard levels. The Overall Hazard Priority Level for Yellow Medicine County's All-Hazard Mitigation Plan update is found on page 14 of this chapter.

Table 41. Hazard: Violent Storms and Extreme Temperatures

Hazard:	**Winter Weather** Blizzard, Ice Storms, Heavy Snow, Extreme Cold	**Summer Weather** Thunderstorm, Lightning, Hail, Wind (excluding tornado), Extreme Heat	**Tornado**
Location	County	County	County
Historic events	3-6 storms per year 0-3 blizzards per year Often below freezing Extreme cold 1-3 days per year	1-3 storms per year 1-3 days of extreme heat per year	19 tornado occurrences in last 44 years. 1 every 2 years
Likely to happen now?	Yes	Yes	No
How often?	3-6 storms per year 0-3 blizzards per year Often below freezing Extreme cold 1-3 days per year	1-2 storms per year .87 thunderstorms per year 1.38 hail events per year 1-3 days of extreme heat per year	.52 tornados annually (averaged)
Where would it strike?	County	County	County
How bad could hazard get?	2-3 days per storm, multiple storms in one season, limited visibility, record snow is 9-12 in. in one day and 70-79 in. in one season, record cold is –39^{o} wind chill is factor	Lightning, strong wind and hail. Record heat is 111 ^{o} F. Humidity is factor	F4/F3
When would hazard likely occur?	November – March	Spring - Fall	Spring - Fall
What other hazards could occur simultaneously?	Wind, transportation accidents, extreme temp, collapsed structure/gas leaks, spring flooding, disruption of utilities	Flooding, lightning, hail, wind, transportation accidents, drought, violent storms, fires, wildfire, collapsed structure, gas leaks	Hazardous materials, utility failure, fire, collapsed structure, gas leaks
Economic impacts	Cost of snow removal, loss of livestock, school closing, store closing	Loss of livestock, fire potential, agriculture and property damage	Structure loss and community shut down
Loss of life impacts	Dangerous to transport emergencies, heat turn-off issues, transportation accidents	Lightning strike, heat stroke, rare	Extremely dangerous
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**	Citizens/People: **High** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**	Citizens/People: **High** Animals/Livestock: **High** Housing: **High** Critical Structures: **High** Infrastructure: **Limited** **Total: High**
Risk Assessment			
Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	**Frequency of Occurrence** 3	**Frequency of Occurrence** 3	**Frequency of Occurrence** 2
More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	**Warning Time** 2	**Warning Time** 3	**Warning Time** 4
Limited 1 Minor 2 Major 3 Substantial 4	**Potential Severity*** 3	**Potential Severity*** 3	**Potential Severity*** 3
Minimal 1 Limited 2 High 3 Very High 4	**Risk Level**** 2	**Risk Level**** 3	**Risk Level**** 3
(total divide by 4) **Very Low 1** **Low 2** **Moderate 3** **High 4**	**Overall Priority** **2.51** **Low/Moderate**	**Overall Priority** **2.75** **Moderate**	**Overall Priority** **2.81** **Moderate**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 42. Hazard: Floods

Hazard:	100-year Floods	Other Flooding/Flash Floods
Location	Granite Falls, Cities, County	County, Hanley Falls
Historic events	1997, 2001	2002
Likely to happen now?	Yes	Yes
How often?	1% likelihood annually; 2 times per 10 years	2 times per 10 years
Where would it strike?	Along the Minnesota River, along ditches and rivers	Along rivers, drainage ditches, wetlands, basements, etc.
How bad could hazard get?	1997 was record year, improvements made since	Fast moving water, unable to prepare for floods
When would hazard likely occur?	Spring	Spring/Summer
What other hazards could occur simultaneously?	Utility failure, landslide, debris flow, interrupt transportation routes (emergencies), infectious diseases, hazardous material spills	Utility failure, landslide, debris flow, interrupt transportation routes (emergencies), infectious diseases, hazardous material spills
Economic impacts	Sandbagging and repair roads, expensive	Repair roads, expensive
Loss of life impacts	Danger if sandbagging	Danger if sandbagging
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **Limited** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**	Citizens/People: **Limited** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment		
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	1	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	2	2
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**1.84** **Low**	**1.93** **Low**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 43. Hazard: Drought

Hazard:	**Drought**
Location	County
Historic events	1976, 1988, 2003
Likely to happen now?	Occasionally
How often?	1 time per 20-30 years
Where would it strike?	County
How bad could hazard get?	1930's dust bowl
When would hazard likely occur?	Summer
What other hazards could occur simultaneously?	Utility failure (water, wastewater), Wildfires
Economic impacts	Crops/Agriculture
Loss of life impacts	Unlikely
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **Limited** Animals/Livestock: **High** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	1
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.05** **Low**
* Potential Severity asks the question, "How bad can it get?" ** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.	

Table 44. Hazard: Wildfire

Hazard:	**Wildfire**
Location	County – especially along the MN River Valley and CRP/CREP land
Historic events	2003 in Chippewa County (Milan area)
Likely to happen now?	Occasionally
How often?	Each year the potential increases as natural areas increase and managed burns do not take fuel away
Where would it strike?	County – especially along the MN River Valley and CRP/CREP land Yellow Medicine County has not experienced a wildfire since prior to 2000
How bad could hazard get?	Potential for hundreds of acres to burn
When would hazard likely occur?	Summer
What other hazards could occur simultaneously?	Erosion/landslide, severe wind, scrap tire fires, structure fires, hazardous materials, utility failure
Economic impacts	Extremely expensive for local fire departments
Loss of life impacts	Extremely dangerous for firefighters 3 Fire-related deaths in past 10 years
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **Limited** Animals/Livestock: **High** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	3
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.17** **Low**
* Potential Severity asks the question, "How bad can it get?" ** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.	

Table 45. Hazard: Dam Failure

Hazard:	**Dam Failure**
Location	Along Minnesota River
Historic events	None
Likely to happen now?	No
How often?	Unlikely
Where would it strike?	Granite Falls Dam, Del Clarke Lake Dam
How bad could hazard get?	Dam could break and flood Granite Falls or Canby
When would hazard likely occur?	Spring/Summer/Fall – due to thaw or rain event
What other hazards could occur simultaneously?	Flooding
Economic impacts	Devastating to Granite Falls and Canby
Loss of life impacts	Could harm residents in Granite Falls and Canby
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	1
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	2
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**1.98** **Low**

* Potential Severity asks the question, "How bad can it get?"
** Risk Level addresses the impact on the community, like infrastructure, people, housing, etc. (consider "How bad can it get?")

Table 46. Hazard: Infectious Diseases

Hazard:	**All Infectious Disease**
Location	County
Historic events	No major events West Nile death in neighboring county
Likely to happen now?	Unlikely with most H1N1 is likely
How often?	From 2003-2008: West Nile – 5 cases (likelihood 1 case annually) E. Coli – 3 cases (likelihood .6 cases annually) Pertussis – 5 cases (likelihood 1 case annually) *all other diseases haven't occurred during the time span
Where would it strike?	Small population within county Hospitals/Schools – places with large vulnerable populations
How bad could hazard get?	Major outbreak of life-threatening disease
When would hazard likely occur?	Anytime for most diseases Summer for West Nile
What other hazards could occur simultaneously?	Riots, terrorist attack, natural hazard event
Economic impacts	Tourism industry All industries with workers not at jobs
Loss of life impacts	Major if life-threatening outbreak
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **High** Housing: **Minimal** Critical Structures: **Minimal** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	2
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**1.99** **Low**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 47. Hazard: Fire

Hazard:	**Fire**
Location	Buildings/Cities/County
Historic events	3 fires per year
Likely to happen now?	Yes
How often?	Potential is always there. Average number of "Fire Runs" 59 per year
Where would it strike?	Structures throughout county
How bad could hazard get?	Entire structure/blocks could burn
When would hazard likely occur?	All year round
What other hazards could occur simultaneously?	Wildfire, hazardous materials, service disruptions, health risks
Economic impacts	Could harm business if fire is bad enough
Loss of life impacts	Potential if hazardous materials present Elderly and very young at risk 10 lives lost in past 24 years
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **High** Housing: **High** Critical Structures: **High** Infrastructure: **Limited** **Total: High**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	4
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	3
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.73** **Moderate**
* Potential Severity asks the question, "How bad can it get?" ** See above Risk Level Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.	

Table 48. Hazard: Hazardous Materials

Hazard:	**Hazardous Materials**
Location	Major transportation routes (railroads, highways) Pipeline locations Canby, Clarkfield, Wood Lake, Hanley Falls, Granite Falls
Historic events	None
Likely to happen now?	Likely Potential increases as hazardous materials increase 26 hazardous material spills in 6 years, (4.33 likelihood annually)
How often?	26 hazardous material spills in 6 years, (4.33 annually)
Where would it strike?	Specific locations throughout county, along transportation routes in county and local businesses that have hazardous materials delivered, Meth Labs can occur anywhere.
How bad could hazard get?	Major spill could be devastating to human and animal life Meth Labs make people extremely sick.
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Wildfire, storm, water supply contamination, wastewater contamination
Economic impacts	Could shut down area of spill
Loss of life impacts	Some potential depending on material
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	3
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.34** **Low**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level . Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 49. Hazard: Water Supply Contamination

Hazard:	**Water Supply Contamination**
Location	Granite Falls County - point and non-point sources Cities
Historic events	Granite Falls during flood events
Likely to happen now?	Likely – lift station in Granite Falls needs to be moved
How often?	Flood events – 2 times every 10 years
Where would it strike?	Granite Falls County - point and non-point sources
How bad could hazard get?	Water source could be contaminated for large population
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases
Economic impacts	Tourism, expensive to ship water in
Loss of life impacts	Potential to be life threatening
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **High** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	1
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	3
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	3
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.36** **Low**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 50. Hazard: Wastewater Treatment Facility Failure

Hazard:	**Wastewater Treatment System Failure**
Location	County
Historic events	Individual systems and municipal systems have either gotten old or flooding has prevented from working
Likely to happen now?	Occasionally
How often?	Spring, during floods, or as systems age
Where would it strike?	County
How bad could hazard get?	Water source could be contaminated
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases, flood, water supply contamination
Economic impacts	During flood, losing wastewater system is expensive and inconvenient
Loss of life impacts	Could affect lives if contaminate water
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **High** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	2
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	3
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.19** **Low**

* Potential Severity asks the question, "How bad can it get?"
** See above Risk Level. Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.

Table 51. Hazard: Civil Disturbance/Terrorism

Hazard:	**Civil Disturbance / Terrorism**
Location	County, cities, dam, airports, water systems
Historic events	None
Likely to happen now?	Unlikely
How often?	School violence is increasing annually No actual "terrorism" events in County
Where would it strike?	County
How bad could hazard get?	Threaten way of life in county
When would hazard likely occur?	Year-round
What other hazards could occur simultaneously?	Infectious diseases, flood, dam failure, water supply contaminations, hazardous materials
Economic impacts	Potential to be devastating
Loss of life impacts	Potential to affect lives
Risk Level VH: Very High H: High L: Limited M: Minimal	Citizens/People: **Limited** Animals/Livestock: **Limited** Housing: **Limited** Critical Structures: **Limited** Infrastructure: **Limited** **Total: Limited**
Risk Assessment	
Frequency of Occurrence Unlikely 1 Occasional 2 Likely 3 Highly Likely 4	1
Warning Time More than 12 hours 1 6 – 12 Hours 2 3 – 6 Hours 3 None – Minimal 4	3
Potential Severity* Limited 1 Minor 2 Major 3 Substantial 4	2
Risk Level** Minimal 1 Limited 2 High 3 Very High 4	2
Overall Priority **(total divide by 4)** **Very Low 1** **Low 2** **Moderate 3** **High 4**	**2.07** **Low**
* Potential Severity asks the question, "How bad can it get?" ** See above Risk Level, Risk Level addresses risk to Citizens, Animals, Housing, Critical Structures and Infrastructure.	

Overall Hazard Priority Level

Table 52. Yellow Medicine County Overall Hazard Priority Levels

Hazard	Yellow Medicine County	Special Areas of Concern
Tornado	**Moderate**	**County**
Summer Weather Thunderstorm, lightning, hail, wind (excluding tornado), extreme heat	**Moderate**	**County**
Structure Fire	**Moderate**	**County**
Winter Weather Blizzard, ice storms, heavy snow, extreme cold	**Moderate/Low**	**County**
100-Year Flood Event	**Moderate/Low**	**Granite Falls/Canby**
Hazardous Materials	**Low**	**County**
Water Supply Contamination	**Low**	**County**
Wastewater Treatment Facility Failure	**Low**	**County**
Flash Flood/Other Flooding	**Low**	**Granite Falls/ Hanley Falls/County**
Wildfire	**Low**	**County**
Civil Disturbance/ Terrorism	**Low**	**County**
Drought	**Low**	**County**
Infectious Diseases	**Low**	**County**
Dam Failure	**Low**	**Canby / Granite Falls**

Vulnerable Areas of Yellow Medicine County

The purpose of this section is to identify vulnerable areas in relation to Chapter 3 (Hazard Inventory), which provides detailed information on each potential hazard that may impact Yellow Medicine County and/or Yellow Medicine cities. In addition to the information supplied, this particular section identifies vulnerable areas of the county and highlights specific events that have occurred throughout the county, as they pertain to five types of hazardous events. These hazards include tornados, floods, wildfires, hazardous material spills/transportation of hazardous materials, and infectious diseases. The risk assessment maps for Yellow Medicine County identify areas that may be more prone to hazardous events. At least one map is available for each hazard, which are located and discussed in this chapter section.

Tornados

According to the Storm Database, the county has experienced 19 tornados since 1965 as well as three funnel clouds. Of the sixteen tornados, nine were classified as F0, six were classified as F1, one was classified as F2, two classified as F3 and one classified as F4. Significant damage was done to Clarkfield from an F3 tornado and to Granite Falls from a F4 tornado. See Figure 4 (pg. 17) for a visual representation of tornado paths in Yellow Medicine County. Many of the tornados occurred in rural areas and did little damage; however some of the destructive tornados destroyed farm buildings and downed trees.

Traditionally, tornados are seen as a countywide hazard. In order to predict estimated damage caused by an F4/F5 tornado, Yellow Medicine County based fiscal analysis on the recommendation of the National Weather Service Data Management Department. According to the NWS, an acceptable method to estimate damage from a F4/F5 tornado in a small community would be to model the event in Greensburg, Kansas with a population of approximately 1,500 people. The devastation totaled around $250 million dollars – approximately 95% of the city. To model an F4/F5 tornado, the NWS suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses, produced by 2009 market values. Table 53 below highlights this information, providing the number of parcels damaged and estimated damage value by city, with a final damage amount of $348,244,290 dollars impacting 3,811 parcels of residences, commercial/industrial buildings, schools, churches, and government-owned properties (summation of all city parcels and assessed parcel values).

Table 53. YMC Estimated potential damage by an F4/F5 Tornado

Geographic Area	Number of Parcels	Value of Parcels
Canby	963	$80,300,160
Clarkfield	492	$33,209,280
Echo	182	$8,755,020
Granite Falls	1,490	$191,697,660
Hanley Falls	166	$7,106,940.0
Hazel Run	59	$2,894,130
Porter	148	$7,850,070
St. Leo	67	$3,459,780
Wood Lake	244	$12,971,250
Total (Yellow Medicine County)	**3,811**	**$348,244,290**

Source: Yellow Medicine County Assessor, 2009

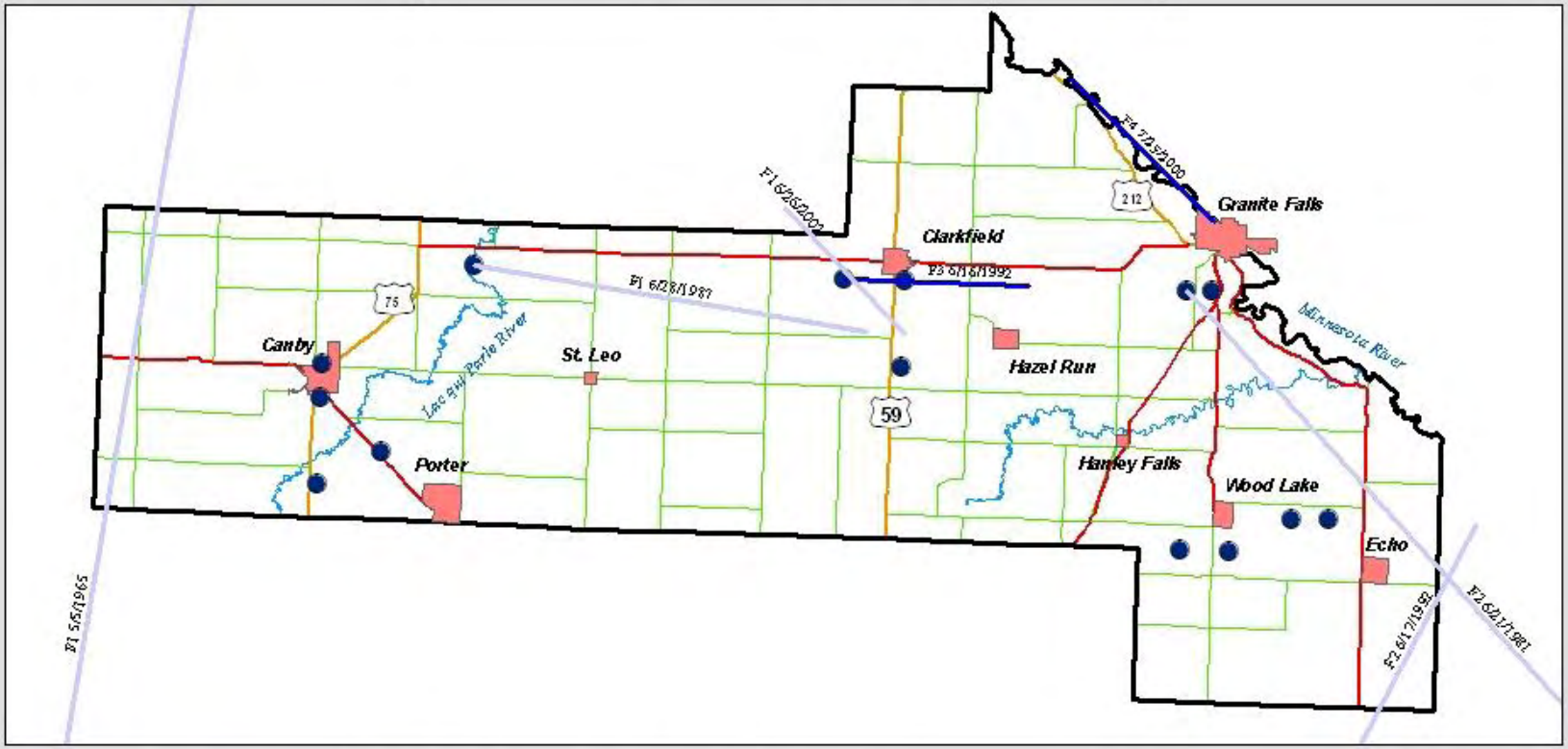
In addition to the information provided by Table 53, the two major tornados that financially impacted Yellow Medicine County took place in Granite Falls in 2000 and Clarkfield in 1997 provide case-study information that estimate total damage of two communities impacted by F3 and F4 tornados. On July 25, 2000 a tornado struck the city of Granite Falls, where one person was killed, over a dozen injured, and an estimated $20 million dollars of damage was done to residences, businesses, and public facilities. The tornado lifted before exiting Granite Falls, leaving the most concentrated damage path two miles long, and 500 feet wide, through a primarily residential area of Granite Falls. Most of the damage in Granite Falls was caused by F2 to F3 wind speeds. However, this tornado was classified as a minimal F4 tornado, based on the twisted wreckage of an overturned railroad car near the intersection of 9th Ave. and 14th St. in Granite Falls. **(City of Granite Falls)**

On June 16, 1992, an F3 tornado hit the south part of Clarkfield turning one house completely upside down and ripping siding off many homes. Late afternoon on the 16th spotters were called out to watch for tornadoes and they called in to report a tornado touchdown west of Clarkfield. This tornado damaged several buildings south and west of Clarkfield. The damage included several destroyed barns and buildings, and a house turned upside down and was set back on the foundation. A majority of the homes and businesses in the city were damaged and emergency workers estimated $7 million worth of damage was inflicted on the community. During the remainder of 1992 and in 1993, $2,350,000 worth of building permits were issued in the city of Clarkfield as residents worked to recover from the tornado damage. **(City of Clarkfield)**

Figure 4: Tornado Paths 1950-2006

Yellow Medicine County

All Hazard Mitigation Plan



Region 6W

Yellow Medicine

TORNADO PATH / FUJITA SCALE

- F0 - F2
- F3 - F4
- Recorded Touchdowns
- Cities

ROADS

- County State Aid Highway
- MN Trunk Highway
- U.S. Highway
- Yellow Medicine County

N

0 2 4 8 Miles

Map Created By: UMVRDC
Date: 1-31-2010
Data Source: MNDOT Basemap 2000, NOAA

Floods

Flooding in the county occurs primarily in the spring during periods of peak conditions (rainfall and snowmelt) and in areas where the soil has low permeability qualities. Damages are mainly confined to the Yellow Medicine and Lac qui Parle watersheds. According to estimates by the US Army Corp of Engineers and Soil Conservation Service, there are approximately 23,601 acres (see Table 54) in the 100-year floodplain within the Lac qui Parle and Yellow Medicine watersheds. Within the Lac qui Parle watershed, average annual damages resulting from flooding amount to about $390,030. In the Yellow Medicine River watershed annual damages amount to about $471,080. These figures were determined using 1985 cost benefit figures. Therefore, the damage figures given are underestimated in today's economy. See Figure 5 (page 20) for a visual representation of 100 and 500-year floodplains in Yellow Medicine County. Table 54 below identifies the number of floodplain acres throughout Yellow Medicine County. It is important to note that these acreages were found utilizing digital Flood Insurance Rate Maps from 1978 and may not be completely accurate due to flood mitigation projects throughout the county. Therefore, for the following All-Hazard Mitigation Plan update, Yellow Medicine County intends to use updated digital FIRM maps to adjust acreage values accordingly.

Table 54. YMC & Cities - Number of Floodplain Acres

Location	Total acres	Acres in 100-Year Floodplain	Acres in 500-Year Floodplain	Total Acres in 100 & 500-Year Floodplain	Percent of city in 100 & 500-year Floodplains
Yellow Medicine County	488,915	24,248	7,499	31,747	6.5%
Canby	1,373	266	14	280	20.4%
Granite Falls	2,235	397	276	395	30.1%
Porter	1,283	14	-	14	1.09%
Hanley Falls	161	1.1	-	1.1	0.68%
Wood Lake	489	12.7	-	12.7	7.78%

Source: 1978 FIRM Maps, FEMA/DNR

In order to predict an estimated damage value if all 100-year floodplains were flooded throughout the county at a given time; all structures (or parcels when data was unavailable) were identified on individual city basis, in addition to the number of rural housing/farmsteads throughout the county. Table 55 (following page), provides the number of structures and their assessed 2009 values within 100-year floodplains in all cities and Yellow Medicine County. This data was gathered through city-specific inventories and are detailed further in the City Risk Assessment section of this chapter. The Yellow Medicine County Assessor provided assessed values of structures located within 100-year floodplains and any Critical Facility or parcel located in the floodplain was included in this risk assessment.

Table 55. Number of Structures/Parcels in 100-year Floodplains

Geographic Area	Number of Critical Facilities	Value of Critical Facilities	Total Number of Parcels	Total Value of Parcels
Canby	1*	$189,000	147**	$9,724,993
Granite Falls	0	$0	87***	$6,040,060
Hanley Falls	0	$0	0	$0
Porter	0	$0	0	$0
Wood Lake	0	$0	0	$0
Total	**1**	**$189,000**	**234**	**$15,765,053**

Source: 1978 FIRM Maps, Yellow Medicine County Assessor 2009
*Canby Fire Hall
**Residential, Commercial, Industrial, Church, Government-owned structure/utility, Hazardous Facility, Critical Facility (See Table 60 for specific breakdown of facility type)
*** Residential and Commercial Parcels (See Table 76 for specific breakdown of facility type)

Two major flood events took place in Yellow Medicine County in 1997 and 2001, causing major damage to the county and Granite Falls in particular. In 1997, Yellow Medicine County spent $2.2 million for flood fighting efforts and cleanup; compared to $420,305 for flood fighting efforts and cleanup in 2001 **(Yellow Medicine County Assessor 2002)**. In Granite Falls during the 1997 flood, the city spent $852,086 for flood fighting efforts and cleanup (cost figures provided by city staff). Over $175,000 was spent by the US Corps of Engineers in construction contracts to fight the floods in 1997 and an estimated $3.1 million was prevented from damage from the 1997 flood due to flood fighting activities. In 2001, the city spent $437,115 for flood fighting efforts and cleanup **(City of Granite Falls)**. The US Corps of Engineers awarded temporary levee construction contracts in 2001 totaling $112, 250 for Granite Falls **(City of Granite Falls)**.

In summary, flood fighting efforts as a result of flooding over the past four years has cost hundreds of thousands of dollars, extensive property damages, economic hardship, and has carried a significant risk for the volunteers involved in the flood fighting efforts (See Table 56 below). In 1997 and 2001, Granite Falls experienced floods, residential property damage and the forced evacuation of people from their homes. The total private property damages for the 2001 floods, based on estimates by the county assessor's office, were in excess of $150,000.00. Damage to public structures amounted to $1.5 million.

Table 56. Summary of Expenses to Fight Flooding

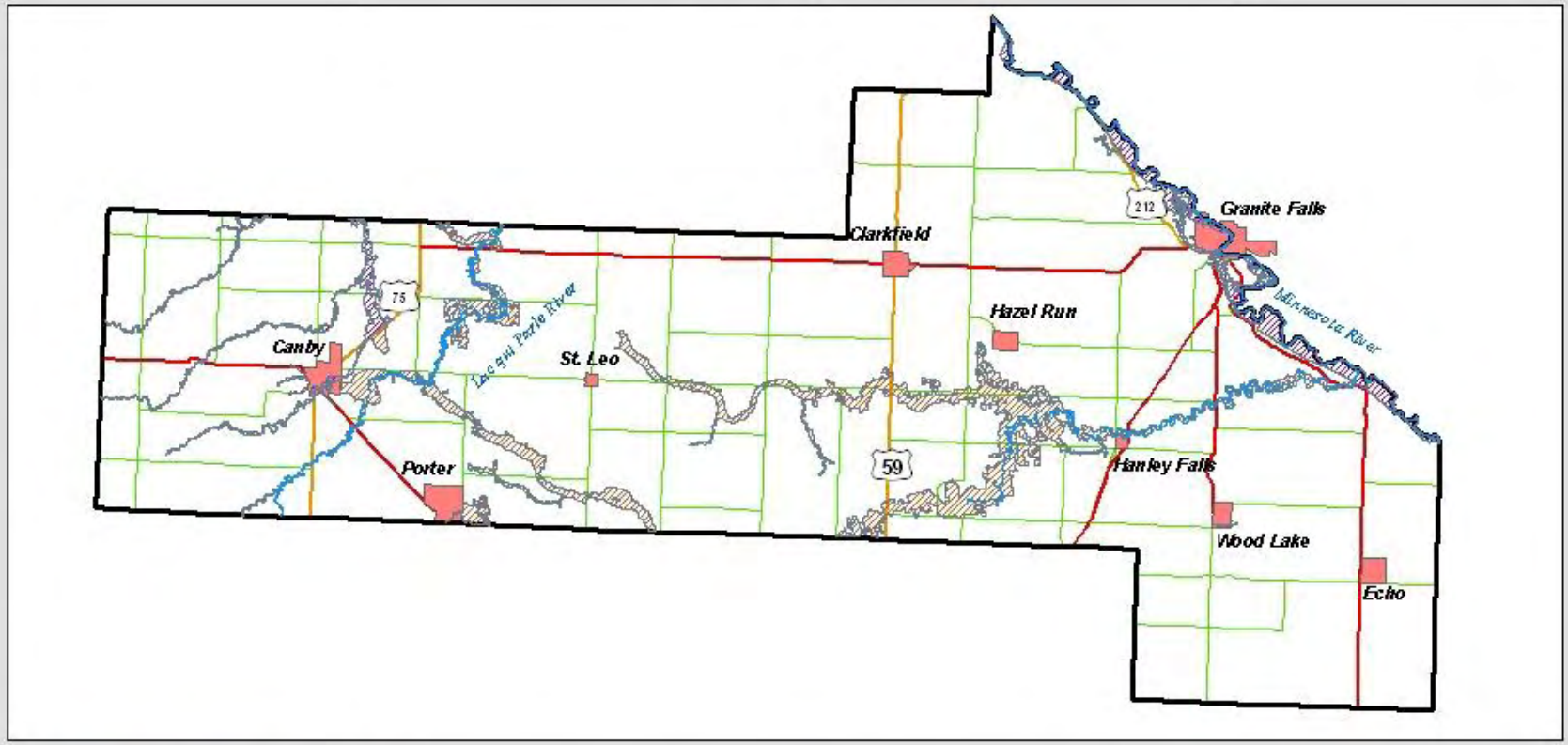
Geographic Area	1997 Flood	2001 Flood	Total
Yellow Medicine County	$2,200,000	$420,305	$2,620,305
Granite Falls	$852,086	$437,115	$1,289,201
Total	**$3,052,086**	**$857,420**	**$3,909,506**

Source: Yellow Medicine County Assessor, 2002 & City of Granite Falls

Figure 5: FEMA Designated Floodplains

Yellow Medicine County

All Hazard Mitigation Plan



Yellow Medicine County

Cities

FEMA DESIGNATED FLOODPLAINS

100-Year Floodplain

500-Year Floodplain

ROADS

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 2.5 5 10 Miles

Map Created By: UMVRDC

Date: 1-31-2010

Data Source: MNDOT Basemap 2000, FEMA

Repetitive Loss Structures.

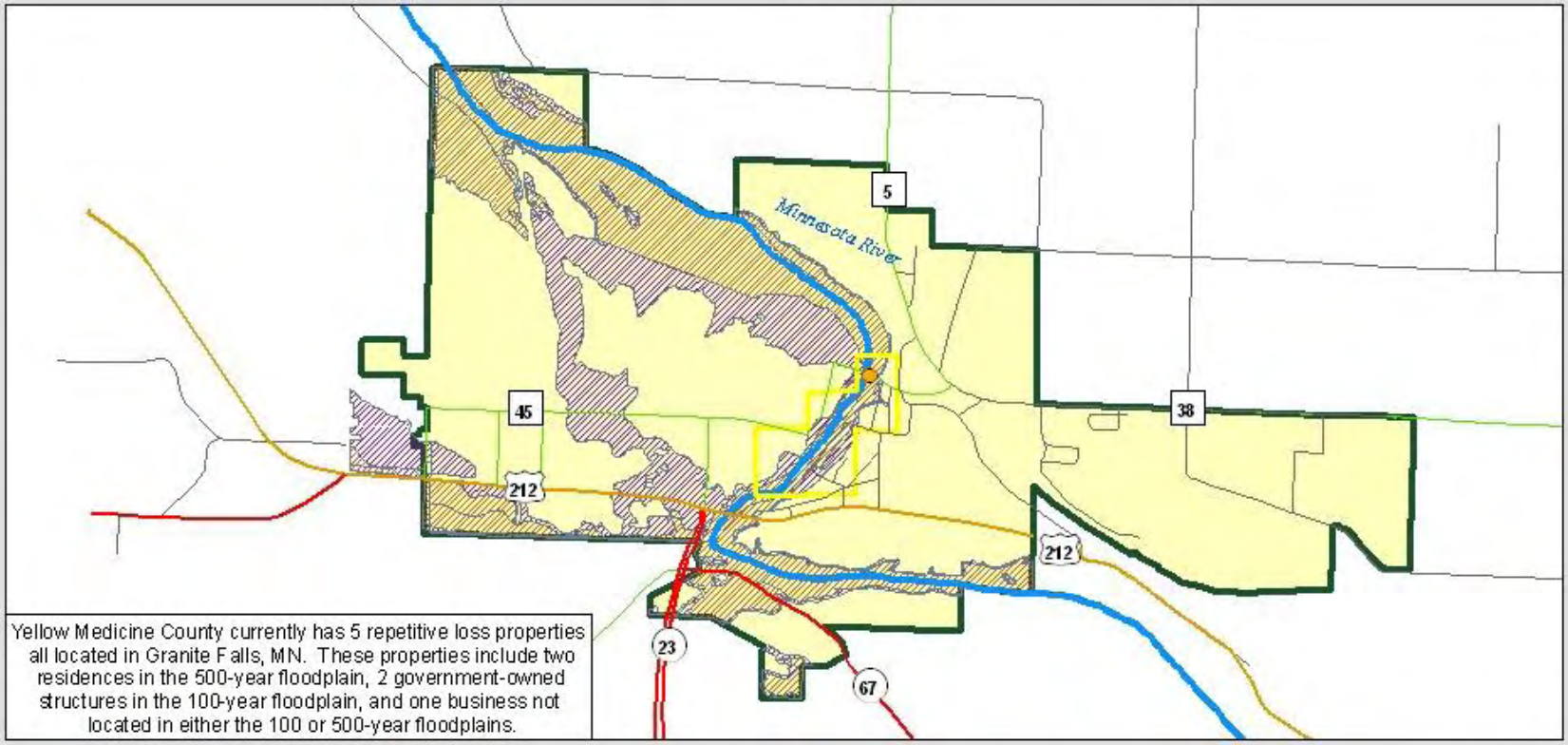
Repetitive loss structures are those structures which have sustained damages on two separate occasions of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within a ten-year time span for which the cost of repairs at the time of the flood meets or exceeds 25 percent of the market value of the structure before the damage occurred. Currently, within Yellow Medicine County, there are five repetitive loss structures all located within Granite Falls, Minnesota. Included in these properties are two residential properties, two government-owned buildings, and one business. The two residential properties are located in the 500-year floodplain and the two government structures are located in the 100-year floodplain. One of the government structures will be moved in the next 18 months. The business is not located in either the 100-year or 500-year floodplains. The address, ownership and location of all repetitive structures are identified by the Yellow Medicine County Planning and Zoning Department, although their specific location will not be identified in this plan. See Figure 6 (page 22) for a visual representation of the general location of Repetitive Loss Properties in Yellow Medicine County.

The general land use trend within the repetitive loss property area is a combination of residential properties and parks/green space in Granite Falls. Unique natural features found in the 100-year floodplain in Granite Falls include the Minnesota River, granite rock outcroppings, parks, and natural prairie wetlands areas. Granite Falls has a floodplain ordinance passed in 1991 that prohibits future development opportunities within the 100-year floodplain. There are currently no development limits in the 500-year floodplain. Granite Falls has actively pursued flood acquisition funding from both FEMA and the MN DNR. The most recent acquisitions have been eight residential properties that were previous repetitive loss properties.

Figure 6: Repetitive Loss Structures

Yellow Medicine County

All Hazard Mitigation Plan



Granite Falls

FEMA DESIGNATED FLOODPLAIN

100 Year Floodplain

500 Year Floodplain

REPETITIVE LOSS STRUCTURES

General Location

Dam

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.25 0.5 1 Miles

Map Created By: UMVRDC

Date: 1-31-2010

Data Source: MNDOT Basemap 2000, FEMA

Wildfires

Wildfires occur throughout the state of Minnesota. According to the Minnesota State Fire Marshal, there are more than 2,000 annual wildfires with an estimated loss of more than $13 million dollars statewide. Yearly occurrences are wildfires started along the railroads and farmland. Two other potential wildfire hazards are along power lines and utility structures and timber bridges. Farm equipments' hot exhaust can also start fields on fire.

Yellow Medicine County currently has 17,540 acres enrolled in CREP, RIM, CRP and the Wetland Reserve Program. These areas are left for wildlife habitat and are not burned on a regular basis. As a result, years of dead grasses accumulate on these lands and are a good fuel for any fire that may start. The Minnesota River Valley and the Wildlife Management Areas also provide an abundance of fuel for wildfires. Wildlife Management Areas occupy approximately 12,000 acres in Yellow Medicine County. Yellow Medicine County currently has 33,070 acres of grasslands and 16,085 acres of forests (See Table 57 below). Figure 7 (page 24), identifies five areas across the county which contain large patches of grasslands (3,998 acres) and forests (4,274 acres). Also, located within the five areas are 147 farmsteads and an additional 87 farmsteads found within a ½ mile of the areas. The general locations are west and south of Canby, between Porter and St. Leo, and northeast and southeast of Granite Falls.

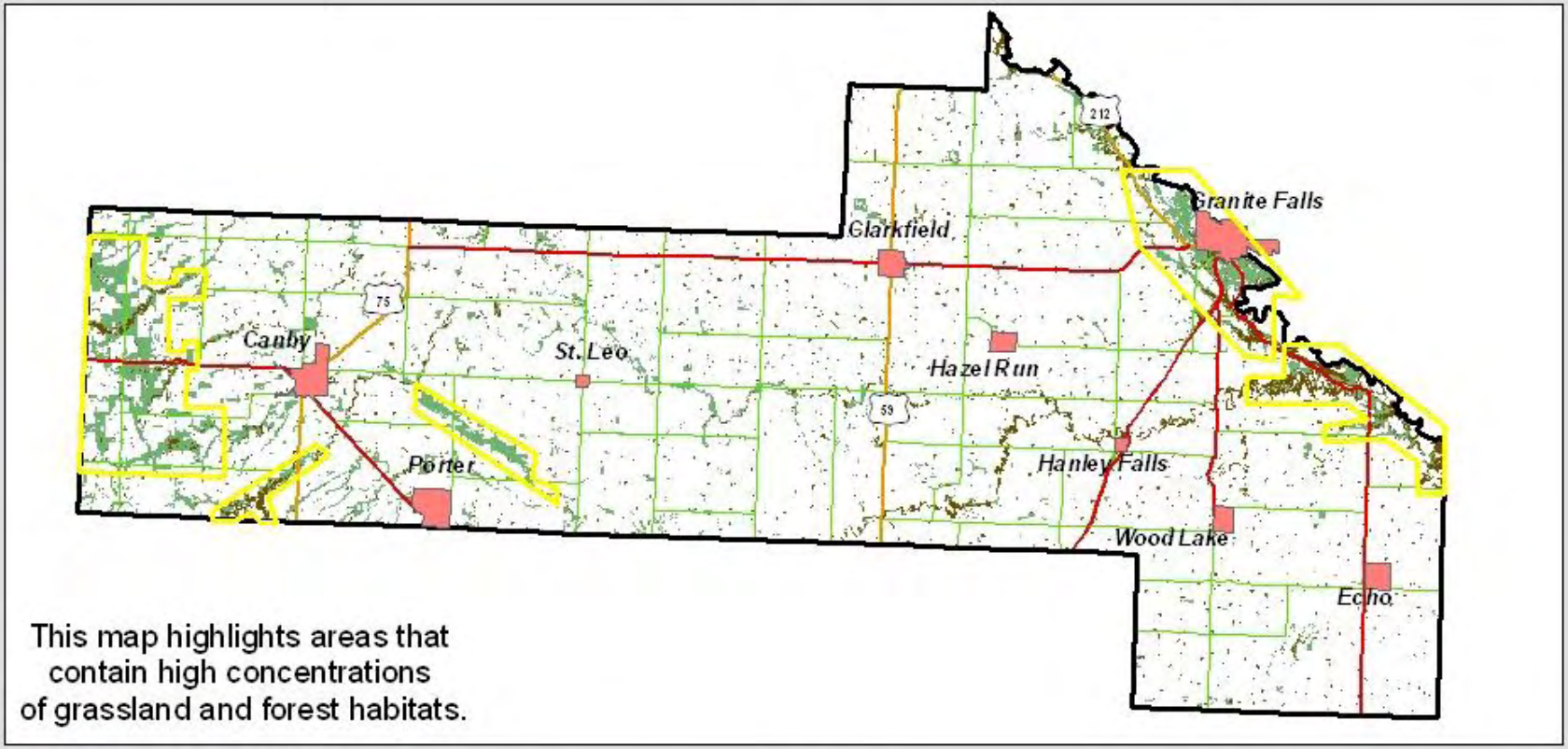
Table 57. YMC General Wildfire Information

Acreages:	**Grasslands**	**Forests**
Acres in "Five Large Patch Areas"	3,998	4,274
Total Acres in County	33,070	16,085
Farmsteads located within:	**Large Patch Areas**	**½ Mile of Large Patch Areas**
Number of Farmsteads	147	234

Figure 7: Areas of Elevated Wildfire Danger

Yellow Medicine County

All Hazard Mitigation Plan



This map highlights areas that contain high concentrations of grassland and forest habitats.

Yellow Medicine County
Elevated Fire Danger
Cities
Forest - Medium / Heavy Fuels
Grassland - Light Fuels

ROADS

County State Aid Highway
MN Trunk Highway
U.S. Highway

N

0 2.5 5 10 Miles

Map Created By: UMVRDC
Date: 1-31-10
Data Source: MNDOT Basemap 2000

Dam Failure

Dam failure is defined as the collapse or failure of an impoundment resulting in downstream flooding. Dam failures can result in loss of life and extensive property damages; and may result from an array of situations, including flood events, poor operation, lack of maintenance and repair and terrorism. Yellow Medicine County has two major dams that could cause detrimental damage to Granite Falls, MN and Canby, MN. A dam failure has not occurred in Yellow Medicine County; however basic risk assessments for Granite Falls and Canby were completed based off Dam Contingency Plans for each city.

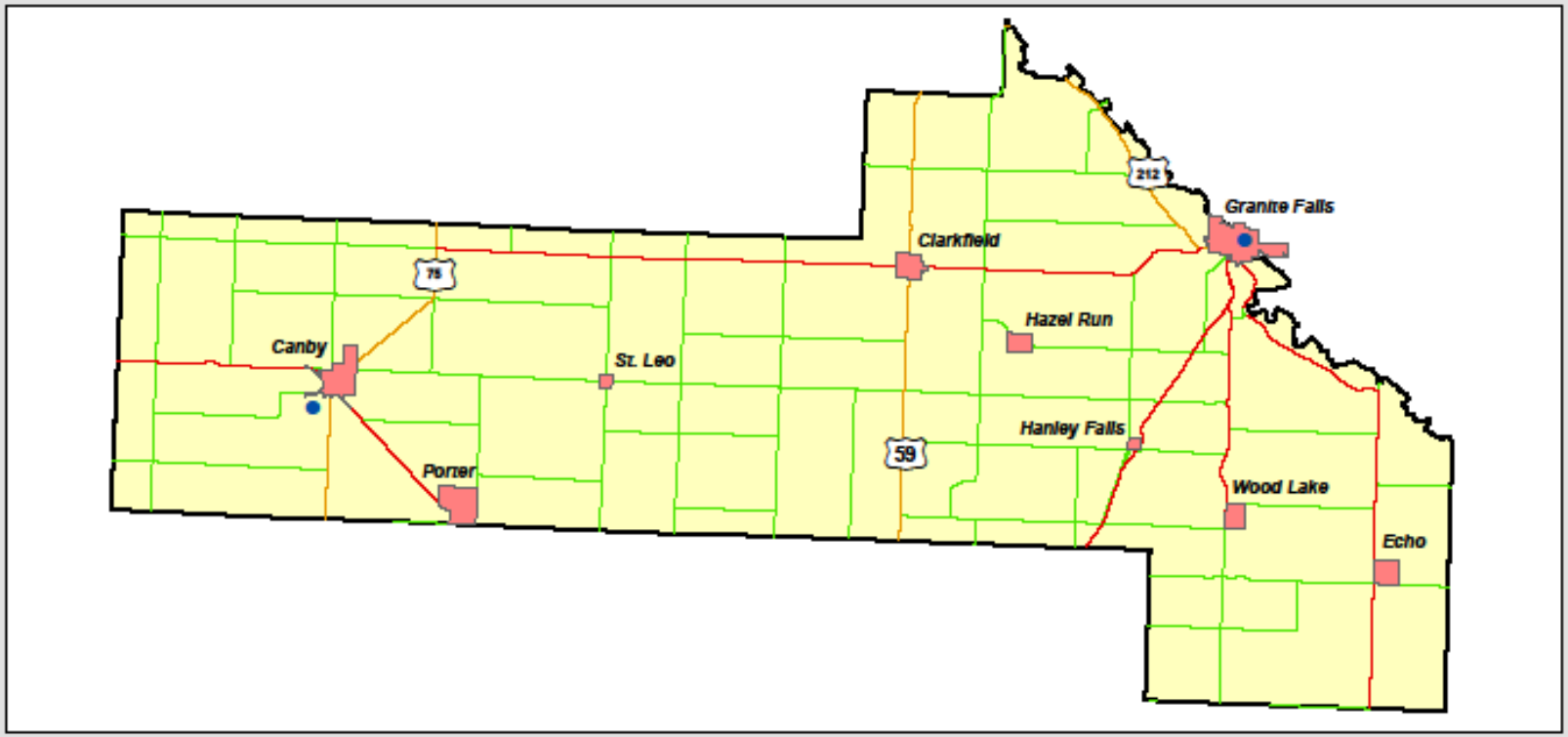
The Del Clarke Dam near Canby is owned and maintained by the Lac qui Parle – Yellow Bank Watershed District and has a spillway for flood events. The Watershed works with the US Army Corps of Engineers and the DNR to comply with all regulations and permits. An emergency contingency plan is in place and is updated annually. It is estimated that the total damage amount of dam failure near Canby would total approximately $32,722,211 and could affect 320 parcels including residences (261), industrial businesses (4), two churches, two hazardous facility sites, and all educational buildings and government-owned utilities. See Figure 11 on page 36 for a visual of the estimated damage area.

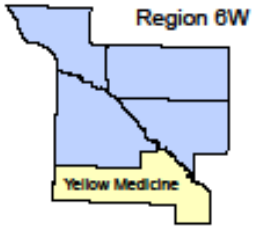
The Granite Falls Dam is a "High Hazard Dam", which means there is potential for loss of human life if failure of the dam should occur. A dam break analysis was performed and was filed with the appropriate state and federal regulatory agencies. Maximum "Sunny Day Failure" was 5.2 feet with a stage increase of one foot or more between Granite Falls Dam and Minnesota Falls Dam. For a dam break at a 15-year event, stage increases were 2.0 feet or less. It is estimated that the total damage amount of dam failure in Granite Falls would total 37 properties, including 27 residences, 7 businesses, 2 government structures, and the Yellow Medicine County Museum, costing approximately $2,637,168 dollars. See Figure 21 on page 65 for a visual of the estimated damage area.

Figure 8: Locations of Dams

Yellow Medicine County

All Hazard Mitigation Plan





Dam

Cities

Yellow Medicine County

ROADS

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 2.5 5 10 Miles

Map Created By: UMVRDC
Date: 1-31-2010
Data Source: MNDOT Basemap 2000

Community-Based Risk Assessments

In order to fully understand the impacts of hazardous events on a community level, individual communities underwent a broad risk assessment. Each community within Yellow Medicine County received a survey and two inventories to gather information to complete the project with the Emergency Manager. The risk assessment survey requested included identification of likely hazards that may affect the community, as well as current land use development trends and the potential of future development. The risk assessment inventories were geared toward identifying vulnerable structures that may be affected by different hazard area boundaries and an inventory of community assets. Sample surveys and inventories are found in Appendix 9. Each community-based risk assessment is divided into four sections: existing development trends, potential of future growth and development, vulnerability assessment of structures by hazard, and an inventory of community assets.

In the original Yellow Medicine County All-Hazard Mitigation Plan, the Local Task Force and public prioritized hazards by risk. Of all hazards identified, three natural hazards were selected to likely occur on a city-wide rather than county-wide basis. These hazards include floods, tornados, and dam failures. Each hazardous event was assigned a hazard boundary. The hazard boundary for floods was the 100-year floodplain. It is important to note that the risk assessments for floods were performed using 1978 digital FIRM maps. Thus, the information for these cities concerning how many structures/parcels may be impact could be incorrect. For the succeeding plan update, Yellow Medicine County will utilize the most updated flood information available as provided by FEMA. The boundary for an F4-F5 Tornado is a half mile radius around a major thoroughfare that crosses into a city. The boundary for a dam failure pertains to a Dam Failure Contingency/Emergency Plan as created by cities that have dams. Communities were asked to perform risk assessments for each hazard type if it applied, which resulted in some communities completing risk assessments for a variety of hazards. Further, the option existed for communities to select a hazard that was not included the top three natural hazards to occur in the city. A map has been provided for each hazard specific to the city, following the risk assessment that estimates the potential loss due to a hazardous event.

General city information for the risk assessments was gathered from the Yellow Medicine County Assessor, who provided broad land use parcel data from 2009. This data contained the total number of parcels within each land use category and a 2009 market rate value for the parcel for all non-exempt entities. All exempt parcels including hospitals, churches, government-owned facilities, and schools, have market values from 2004 as those properties are only assessed once every six years. It is important to note that Yellow Medicine's parcel data does not identify the number of structures per parcel and that utilizing parcel data may over or underestimate the actual number of structure within each community. Further, the market value utilized for the community-based risk assessment is for both the structure and the land, which causes an over-estimation of structure value.

In order to ensure the most consistent relevant information was used for each community, the vulnerability assessment inventory based on hazards was done at the parcel level, unless only a few particular structures were identified by city staff and the market value for those structures were used to provide the most accurate information as possible. In the event that multiple or a

majority of parcels within a land use category that did not allow for intensive identification of structures, the total market value for a land use category was divided by the total number of parcels within that category and multiplied by the number of parcels in the land use category that reside within the hazard area in question. As data issues have been noted above, in the next All-Hazard Mitigation Plan more updated information will be utilized to provide more accurate loss amounts for hazardous events.

The second portion of the risk assessment includes an inventory of community assets for each city in Yellow Medicine County. Cities were asked to provide a list of major employers, vulnerable populations in multi-family housing complexes, historical structures, institutional facilities, Hospitals/Police/Evacuation Center, and schools. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement/content/ and function values. For all exempt properties, the market value was taken from 2004. Each of these asset's locations were identified and placed on all hazard maps. This is to show the connection between hazard boundaries and the location of assets. As mentioned previously, assets tended to vary from community to community; so all assets were categorized into one of seven categories:

- Major Employers (as defined by community)
- Emergency Services (Police, Fire, or Hospital-related structure)
- Historical Structure (as defined by community and State Historic Preservation Office) Institutional Building (government-owned structure, not related to Emergency Services)
- Multi-Family Housing
- Public Facilities (Park, Pool, General Public Asset – in Canby, MN)
- Schools (Educational-related structure).

For the next update of the All-Hazard Mitigation Plan, the market value for exempt properties will be updated with a 2010 values and hopefully have updated square footage amounts. Some properties selected as Community Assets did not have accurate square footage amounts. These properties were identified by UMVRDC staff for the Yellow Medicine County Assessors' Office as properties that need investigation to obtain proper assessment information.

An approximate replacement cost, content value, and function value was generated through the use of FEMA's Understanding Your Risk's Guide, which provided general percentage and rate information to determine the value of community assets in numerous methods. It is important to note that these costs and values are estimates based upon the square footage of the building. The square footage value does not necessarily provide the most accurate view of property. For example a building may be very large, but does not have a great amount of equipment or may be aged. Further a small building may hold a very profitable business/entity that could be newer and updated. Replacement cost is used to determine how much a current building or structure would cost to entirely rebuild the structure. Content value is a function of a percentage of damage applied to the replacement cost and is variable upon land use type. The function value represents the value of a building's use or function that would be lost if the building were damaged or closed.

City of Canby, Minnesota

Existing Development Trends.

According to U.S. Census Bureau, the City of Canby's population is 1,170 people and contains 831 households making it the second largest city in the county. The population trends noted in Chapter 2: Community Profile for the City of Canby illustrated a variable population change. For instance, the largest decrease in population occurred from 1980 to 1990, by 14 percent. The population rebounded in 2000, with an increase of 4 percent at 1,903 people. The number of households followed the same pattern presented with population changes from 1970 to 2008. In the past 10 years Canby's economic situation has remained stable. Growth within Canby has for the most part occurred north of the city, with the addition of agricultural land to the city proper and converting that land to single-family residential. The city had extended its sewer lines north to promote residential growth. Aside from residential development, no other land use changes or redevelopments occurred in Canby in the last 10 years. The City of Canby's general land use category breakdown exists as the following show in Table 58 below.

Table 58. City of Canby – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	851	77.72%
Commercial	151	13.79%
Agricultural	14	1.28%
Government	34	3.11%
Religious	17	1.55%
Industrial	17	1.55%
Education	11	1.00%
Total	**1,095**	**100.00%**

Potential for Future Growth and Development.

Canby's future growth areas for development were identified in the Canby Comprehensive Plan. Areas slated for future annexation and development are located directly north and northwest of the city, currently utilized for agricultural purposes. North of the city, Canby intends to promote future residential development and in the northwest, focus on industrial business growth. Other future prospects for growth include focusing on infill development and converting land in the southeast corner for residential development. The development sites are not specifically located in a hazard area, but would likely be affected by an event that would desolate the entire community or a county-wide hazard event.

Vulnerability Assessment of Structures by Hazard.

Three programs currently occur within the City of Canby; Congregate Dining, Meals on Wheels, and Canby Rides. The city supplies a meeting space for Congregate Dining and provides janitorial and utility services for the program. Canby Rides operates in the both the city and county and is focused on providing transportation for the senior population.

Of the three natural hazards selected as most likely to affect a city, all apply to the City of Canby. Each hazard was assigned a boundary and all structures within that boundary were

identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Canby are defined as follows. Tables 59, 60, and 61 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Canby Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately 95% of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facilities listed in Table 59, include Canby's public hospital, community center, and Fire Hall, and the hazardous facilities are two "industry" businesses. As shown in Table 59 and Figure 9 (following page), the estimated devastation value and area of an F4-F5 tornado is $80,300,160 dollars affecting 963 parcels.

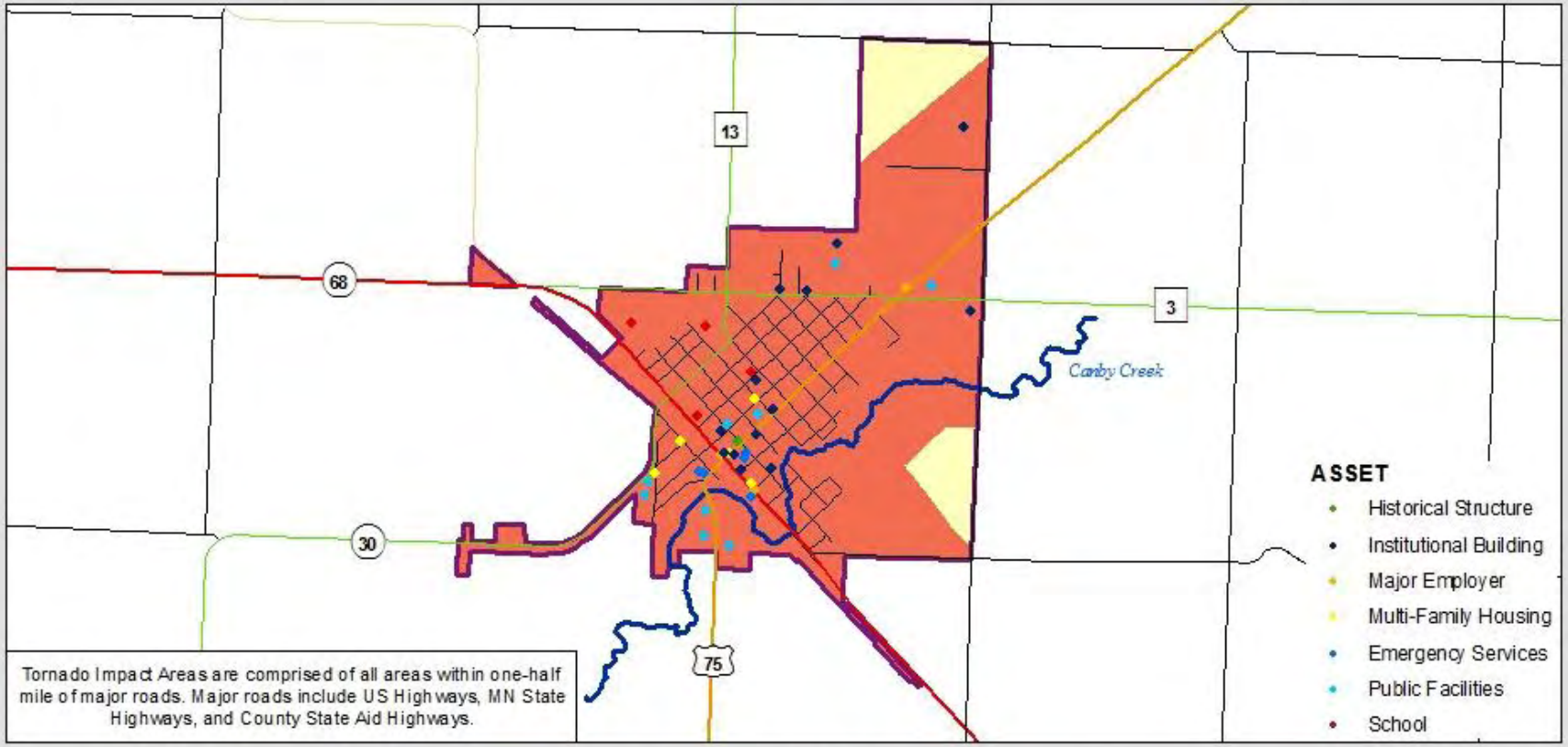
Table 59. Canby Hazard 1: F4-F5 Tornado

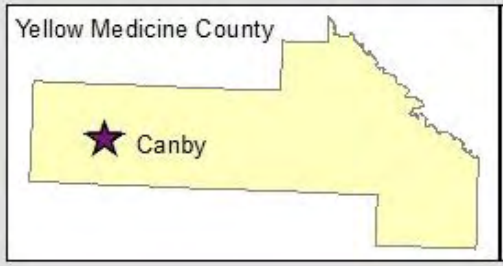
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	806	725	$53,700,500	$48,330,450
Commercial	151	136	$5,301,900	$4,771,710
Industrial	17	15	$1,353,900	$1,218,510
Agricultural	14	13	$668,900	$602,010
Religious/ Non-profit	19	17	$4,096,500	$3,686,850
Government	37	33	$3,600,700	$3,240,630
Education	11	10	$9,803,800	$8,823,420
Utilities	9	8	$1,575,200	$1,417,680
Hazardous Facility	2	2	$475,600	$428,040
Dam	1	1	Unknown	Unknown
Critical Facilities	3	3	$8,645,400	$7,780,860
Total	**1,070**	**963**	**$89,222,400**	**$80,300,160**

Figure 9. Canby Hazard 1: F4-F5 Tornado Event

Yellow Medicine County

All Hazard Mitigation Plan





Canby City Boundary

Tornado Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.25 0.5 1 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Canby Hazard 2. 100-Year Flood Event

The second hazard boundary area was for a 100-year flood event. Currently, the general development located in the 100-year floodplain consists of low/high density residential homes, agricultural land, and some businesses. Approximately 105 residential, 8 commercial, 14 industrial, and one church, government-owned structure and utility, and 1 hazardous facility and critical facility parcels are located in the 100-year floodplain, as shown in Table 60. Canby has a restrictive Floodplain Ordinance that prevents future development in the floodplain. Within the 100-year floodplain, unique natural features present include agricultural land and Lake Sullivan. As shown in Table 60 and Figure 10 (following page), approximately 147 structures and parcels are located in the 100-year floodplain causing a damage amount of $9,724,993 dollars.

Table 60. Canby Hazard 2: 100-Year Flood Event

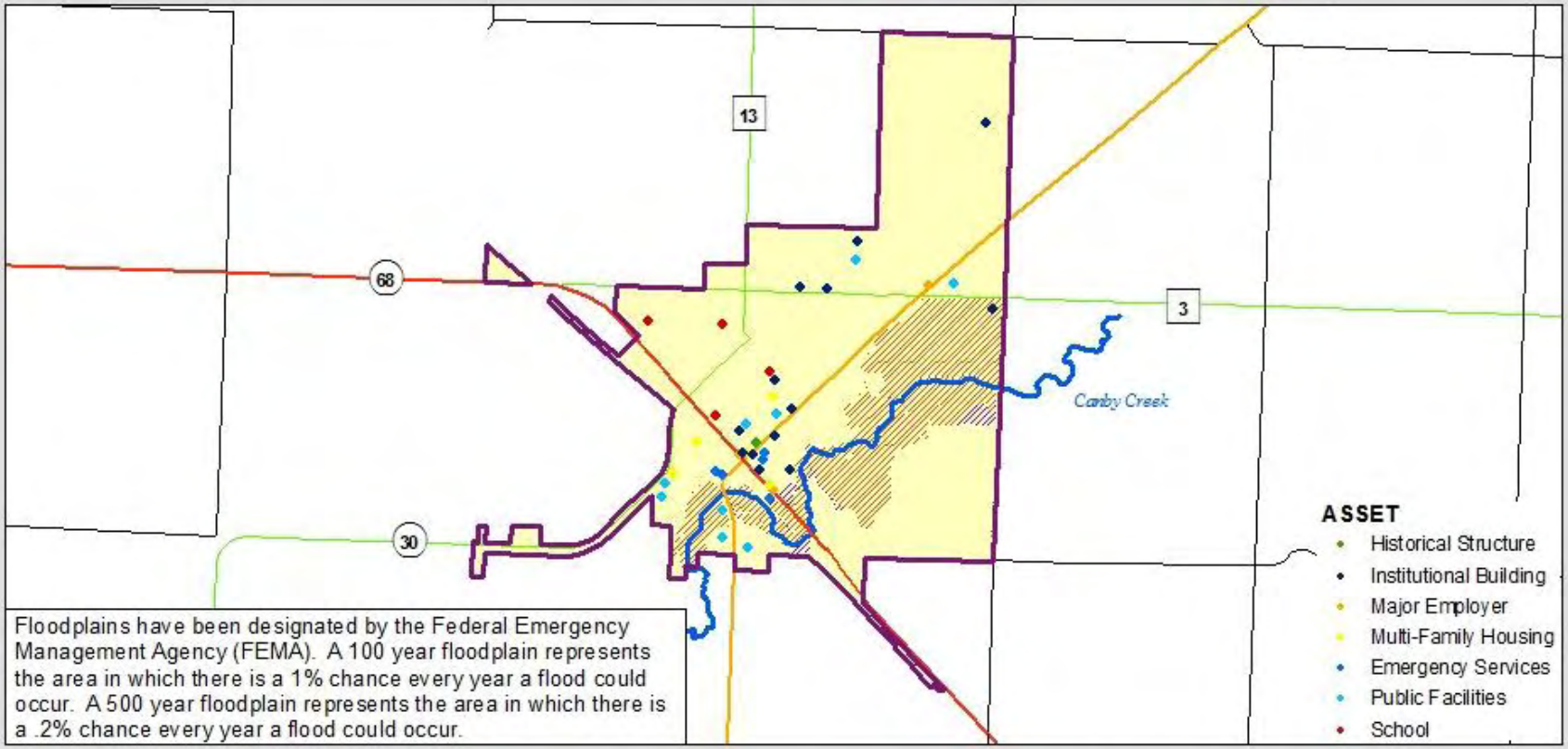
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	806	105	$53,700,500	$6,995,273
Commercial	151	8	$5,301,900	$280,895*
Industrial	17	14	$1,353,900	$1,114,976*
Agricultural	14	14	$668,900	$668,900
Religious/ Non-profit	19	1	$4,096,500	$129,900
Government	37	1	$3,600,700	$97,316*
Education	11	0	$9,803,800	$0
Utilities	9	1	$1,575,200	$175,022*
Hazardous Facility	2	1	$475,600	$134,500
Dam	1	1	Unknown	Unknown
Critical Facilities	3	1	$8,645,400	$189,000
Total	**1,070**	**147**	**$89,222,400**	**$9,724,993**

*Average amount for one parcel, multiplied by number of parcels affected.

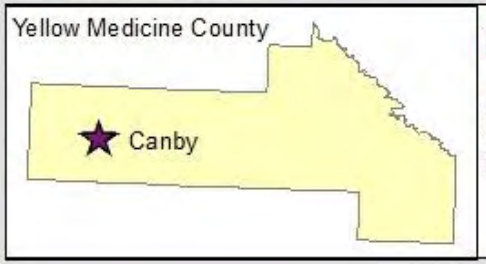
Figure 10. Canby Hazard 2: 100 Year Flood Event

Yellow Medicine County

All Hazard Mitigation Plan



Floodplains have been designated by the Federal Emergency Management Agency (FEMA). A 100 year floodplain represents the area in which there is a 1% chance every year a flood could occur. A 500 year floodplain represents the area in which there is a .2% chance every year a flood could occur.



Canby

FEMA DESIGNATED FLOODPLAIN

100 Year Boundary

500 Year Boundary

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.25 0.5 1 Miles

Map Created By: UMVRDC

Date: 03-01-2010

Data Source: MNDOT Basemap 2000

FEMA

Canby Hazard 3. Dam Failure at "Del Clarke Dam"

The final hazard area concerns a failure of Canby's dam located just outside municipal limits. The Del Clarke Dam near Canby is owned and maintained by the Lac qui Parle – Yellow Bank Watershed District and has a spillway for flood events. The Watershed works with the US Army Corps of Engineers and the DNR to comply with all regulations and permits. In efforts to reduce the likelihood of dam failure, the Yellow Medicine Soil and Water Conservation District completed the Lazarus Dam Project in 2005 increasing the height and length of a levee and also created a "dry dam" that has the potential to hold waters of a 100-year flood event. Another other project occurred in the 1990's when a bridge was removed and two new culverts were placed to control potential flooding. Canby's Flood Warning Contingency Plan describes and illustrates predicted inundated areas from a dam failure which cover approximately 291 residential parcels (those identified to be evacuated during a dam failure event), 25% of the industrial land use area, two churches, all utilities, and hazard facilities. A dam failure could impact a minimum of 320 parcels (Figure 11-following page), amounting to approximately $32,753,581 dollars (Table 61).

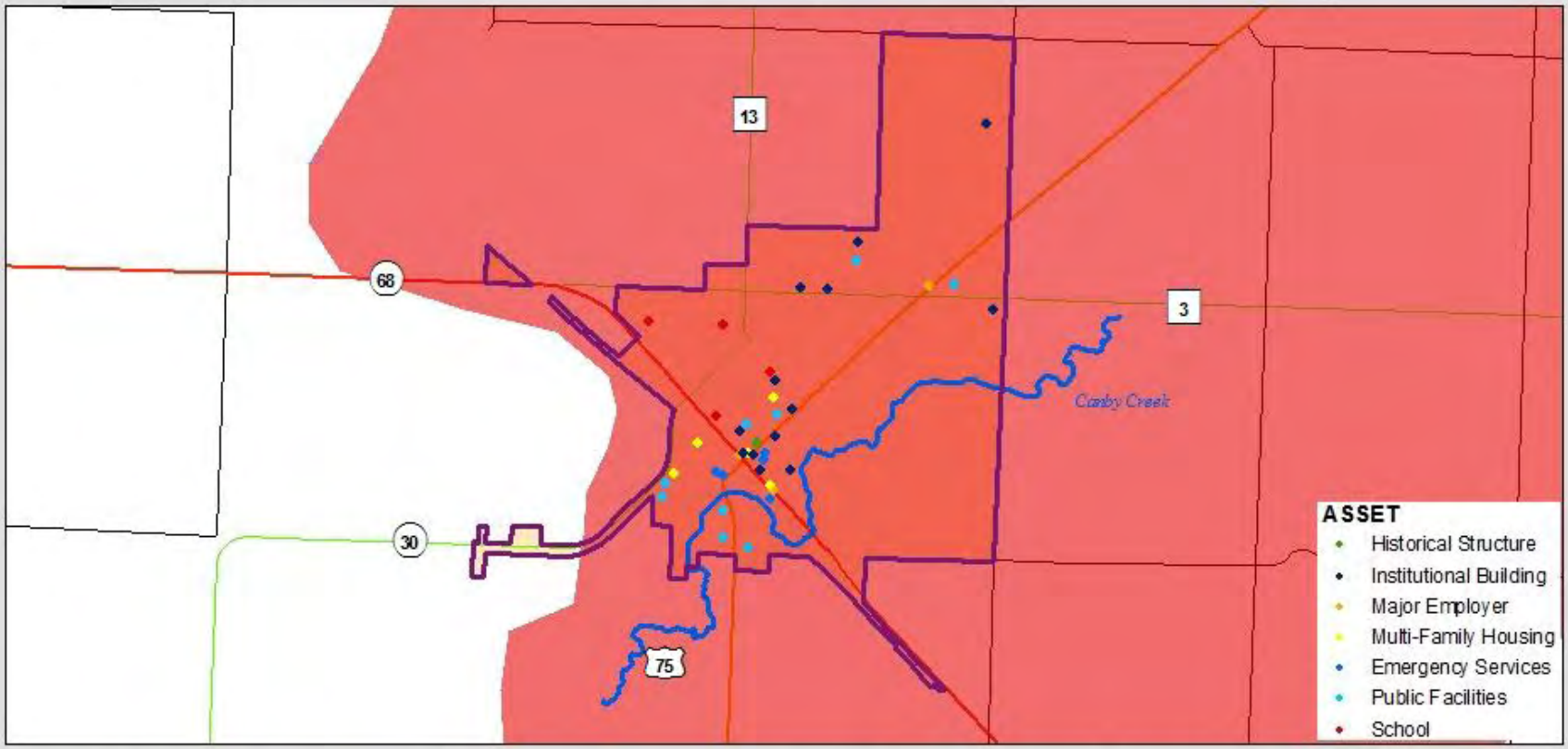
Table 61. Canby Hazard 3: Dam Failure

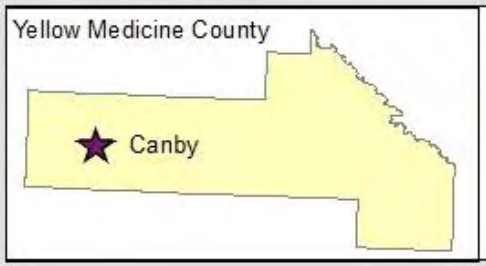
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	806	291	$53,700,500	$19,388,146
Commercial	151	0	$5,301,900	$0
Industrial	17	4	$1,353,900	$318,565
Agricultural	14	0	$668,900	$0
Religious/ Non-profit	19	2	$4,096,500	$1,242,270
Government	37	0	$3,600,700	$0
Education	11	11	$9,803,800	$9,803,800
Utilities	9	9	$1,575,200	$1,575,200
Hazardous Facility	2	2	$475,600	$475,600
Dam	1	1	Unknown	Unknown
Critical Facilities	3	0	$8,645,400	$0
Total	**1,070**	**320**	**$89,222,400**	**$32,753,581**

Figure 11: Canby Hazard 3: Dam Failure

Yellow Medicine County

All Hazard Mitigation Plan





Canby

Dam Failure Impact Area

ROADS

- Township Roads
- County Road
- County State Aid Highway
- MN Trunk Highway
- U.S. Highway

N

0 0.25 0.5 1 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of Canby compiled a list of community assets shown in Table 62, including major employers, vulnerable populations in multi-family housing complexes, institutional facilities, Hospitals/Police/Evacuation Center, and schools. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 62. City of Canby – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Commercial 1	10,200	$78,300	$887,400	$887,400	$438,600
Industry 1*	14,908	$341,100	$1,028,652	$1,542,978	$1,893,316
Industry 2**	27,724	$134,500	$1,912,956	$2,869,434	$3,520,948
Multi-Family Housing					
Apartment 1	Unknown	$318,700	--	--	n/a
Apartment 2	Unknown	$145,000	--	--	n/a
Apartment 3	7,324	$225,300	$717,752	$358,876	n/a
Apartment 4	9,600	$341,400	$940,800	$470,400	n/a
Apartment 5	9,700	$25,200	$950,600	$475,300	n/a
Institutional Buildings					
Hospital/ Nursing Home	69,982	$7,334,600	$10,147,390	$15,221,085	***
City Hall/Community Center / Library	10,308	$659,700	$907,104	$907,104	
Fire Hall	6,000	$189,000	$780,000	$1,170,000	
Catholic Church/Elementary School	18,262	$1,210,900	$2,063,606	$2,063,606	***
Historical Structures					
Lundhoel House	Unknown	$110,000	--	--	n/a
Granier House	2,042	$63,400	$230,746	$230,746	n/a
Schools					
Canby Public Elementary School	64,696	$2,104,300	$5,887,336	$5,887,336	***
Canby High School	104,582	$4,200,000	$9,516,962	$9,516,962	***
MinnWest College	95,148	$3,155,400	$10,942,020	$16,413,030	***

* Indusry 1 includes a bin that can store up to 5,500 cubic feet.
** Industry 2 has a storage tank that can hold up to 14,000 gallons.
*** Data unavailable.

City of Clarkfield, Minnesota

Existing Development Trends.
According to U.S. Census Bureau, the City of Clarkfield's population is 944 people and contains 371 households making it the third largest city in the county. The population trends noted in Chapter 2: Community Profile for the City of Clarkfield illustrated a general decrease in population, however a slight increase in the overall number of households. In the past 10 years Clarkfield's economic situation has remained stable. In 2006, the City annexed two parcels (6.57 and 11.79 acres) of agricultural land, later zoned for industrial development. Two redevelopment projects occurred in 2007, where a 12-acre parcel was converted from a commercial property to a school and Clarkfield's Emergency Service Center was created from a remodeled bus garage. Later in 2009, a swath of agricultural land 400 feet by 1,320 feet (528,000 square feet) was annexed and remains today as agricultural. Aside from two mentioned redevelopment projects, no other land use changes or redevelopments occurred in Clarkfield in the last 10 years. The City of Clarkfield's general land use category breakdown exists as the following show in Table 63 below.

Table 63. City of Clarkfield – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	425	75.89%
Commercial	71	12.68%
Agricultural	18	3.21%
Government	25	4.46%
Religious	7	1.25%
Industrial	7	1.25%
Education	7	1.25%
Total	**560**	**100.00%**

Potential for Future Growth and Development.
Clarkfield's future growth area for development was identified as the south-central portion of the City along new County Highway 24, known as the Industrial Park. The majority of the property (63.7 acres) was purchased and annexed in 1996, with an additional 22.66 acres purchased and annexed in 2005. The purpose of these land purchases was to provide space to build a new county road. Another annexation will occur in the near future will be land located south of the new county road. This development site not specifically located in a hazard area, but would likely be affected by an event that would desolate the entire community or a county-wide hazard event. This land is located one block east of Highway 59 and begins across the street to the south of the railroad tracks.

Vulnerability Assessment of Structures by Hazard.
Of the three natural hazards selected as most likely to affect a city (as defined by Yellow Medicine County and FEMA), two of the hazards do not apply to the City of Clarkfield. Clarkfield does not have 100-year floodplains or a dam, thus the City opted to perform a risk analysis on three potential hazardous events including: tornado, transportation of hazardous materials, and the collapse of the city's water tower. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Clarkfield are defined as follows. Tables 64, 65,

and 66 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Clarkfield Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facilities listed in Table 64, include Clarkfield's public hospital. As shown in Table 64 and Figure 12 (following page), the estimated devastation value and area of an F4-F5 tornado is $33,209,280 dollars affecting 492 parcels.

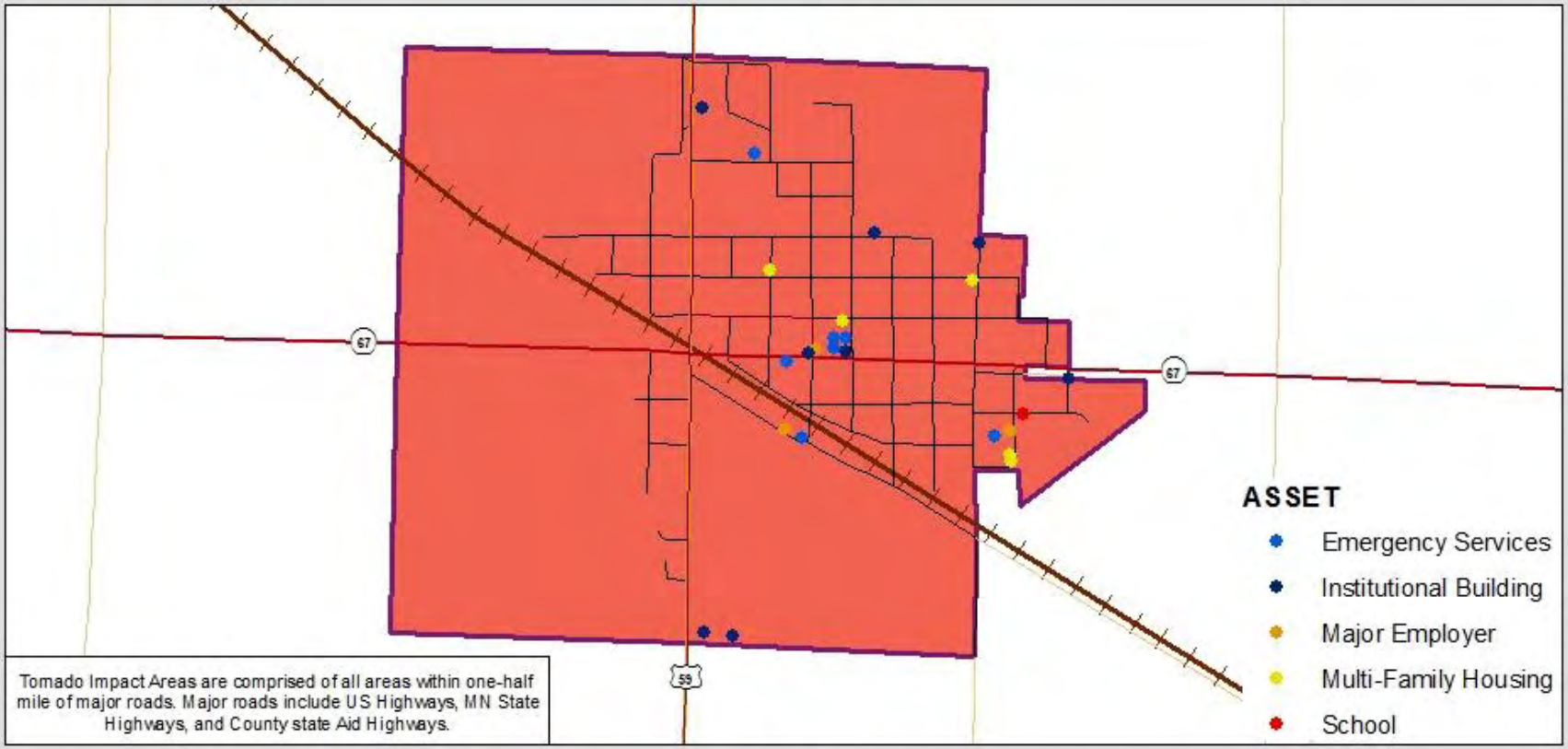
Table 64. Clarkfield Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	405	365	$20,026,700	$18,024,030
Commercial	71	64	$2,534,700	$2,281,230
Industrial	7	6	$2,274,600	$2,047,140
Agricultural	18	16	$1,119,700	$1,007,730
Religious/ Non-profit	7	6	$3,406,400	$3,065,760
Government	25	23	$872,900	$785,610
Education	7	6	$4,660,400	$4,194,360
Utilities	5	5	$594,200	$534,780
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	2	$1,409,600	$1,268,640
Total	**547**	**492**	**$36,899,200**	**$33,209,280**

Figure 12. Clarkfield Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan



Clarkfield Boundary

Tornado Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC

Date: 03-01-2010

Data Source: MNDOT Basemap 2000

Clarkfield Hazard 2. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. Clarkfield has two major transportation routes that intersect in the middle of the city, U.S. Highway 59 and Minnesota Highway 67. As shown in Table 65 and Figure 13 (following page), all commercial, industrial, agricultural, educational, and critical facilities are along a major transportation route. Fewer residential homes are within the two-block area with 328 of 405, totaling to a final predicted devastation of $30,144,900 dollars affecting 468 parcels.

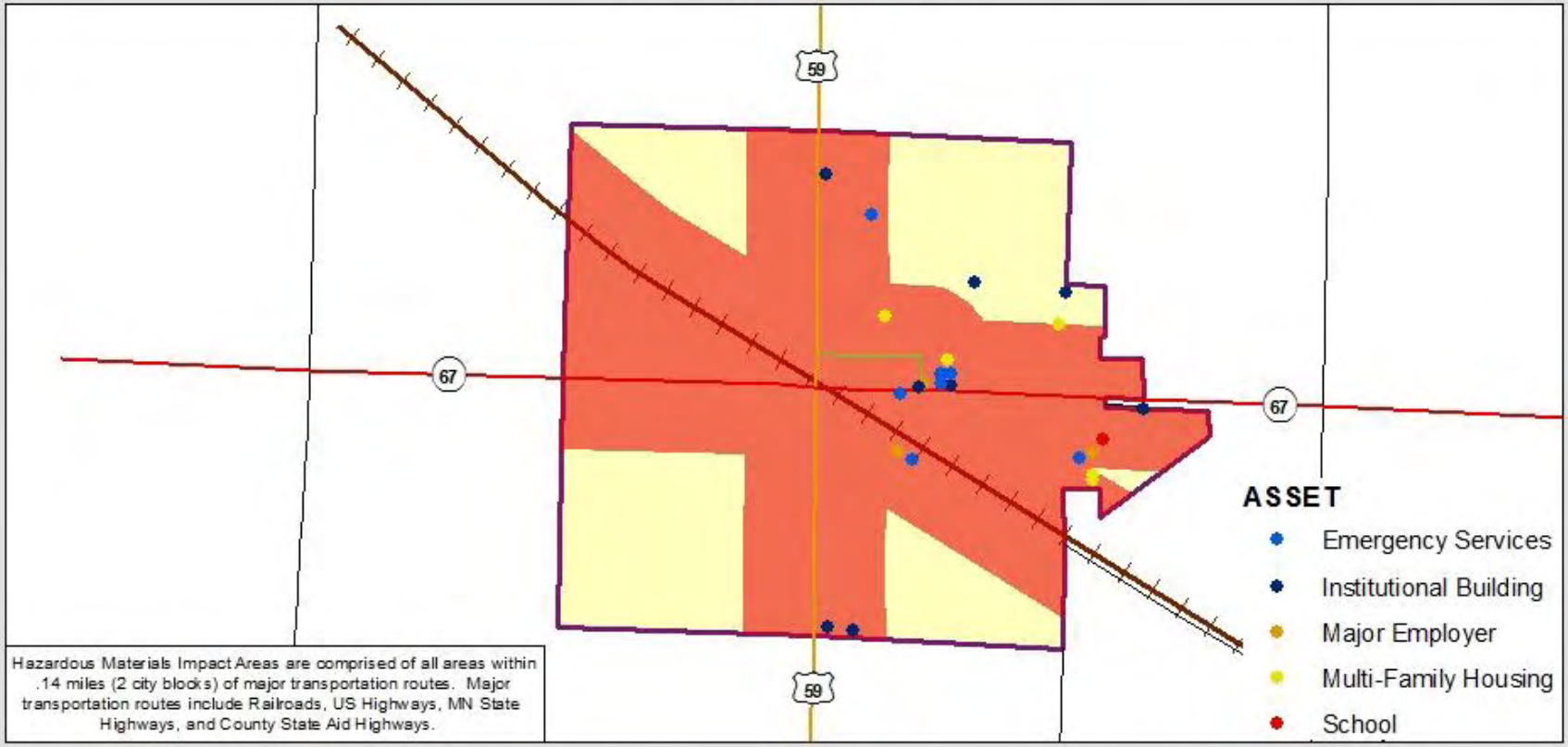
Table 65. Clarkfield Hazard 2: Transportation of Hazardous Materials

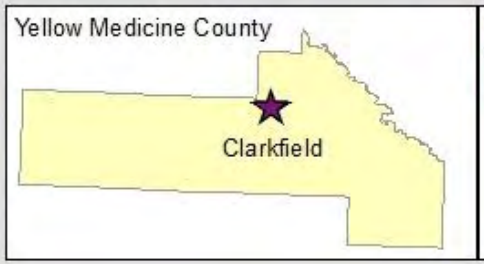
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	405	328	$20,026,700	$13,964,400
Commercial	71	71	$2,534,700	$2,534,700
Industrial	7	7	$2,274,600	$2,274,600
Agricultural	18	18	$1,119,700	$1,119,700
Religious/ Non-profit	7	6	$3,406,400	$3,100,400
Government	25	24	$872,900	$486,900
Education	7	7	$4,660,400	$4,660,400
Utilities	5	5	$594,200	$594,200
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	2	$1,409,600	$1,409,600
Total	**547**	**468**	**$36,899,200**	**$30,144,900**

Figure 13. Clarkfield Hazard 2: Transportation of Hazardous Materials

Yellow Medicine County

All-Hazard Mitigation Planning





Clarkfield Boundary

Hazardous Materials Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Clarkfield Hazard 3. Collapse of Water Tower

The final hazard area concerned a collapse of the city water tower. The tower stands at a height of 160 feet and the potential fall zone was calculated out by 240 feet surrounding the tower. Any structure within this area was included in the hazard area. Twelve structures were found to be in the fall zone of the water tower, eleven of the structures being residential homes and one government facility as indicated on Table 66 and Figure 14 (following page). The total predicted destruction value of a water tower collapse in Clarkfield is $1,324,900 dollars.

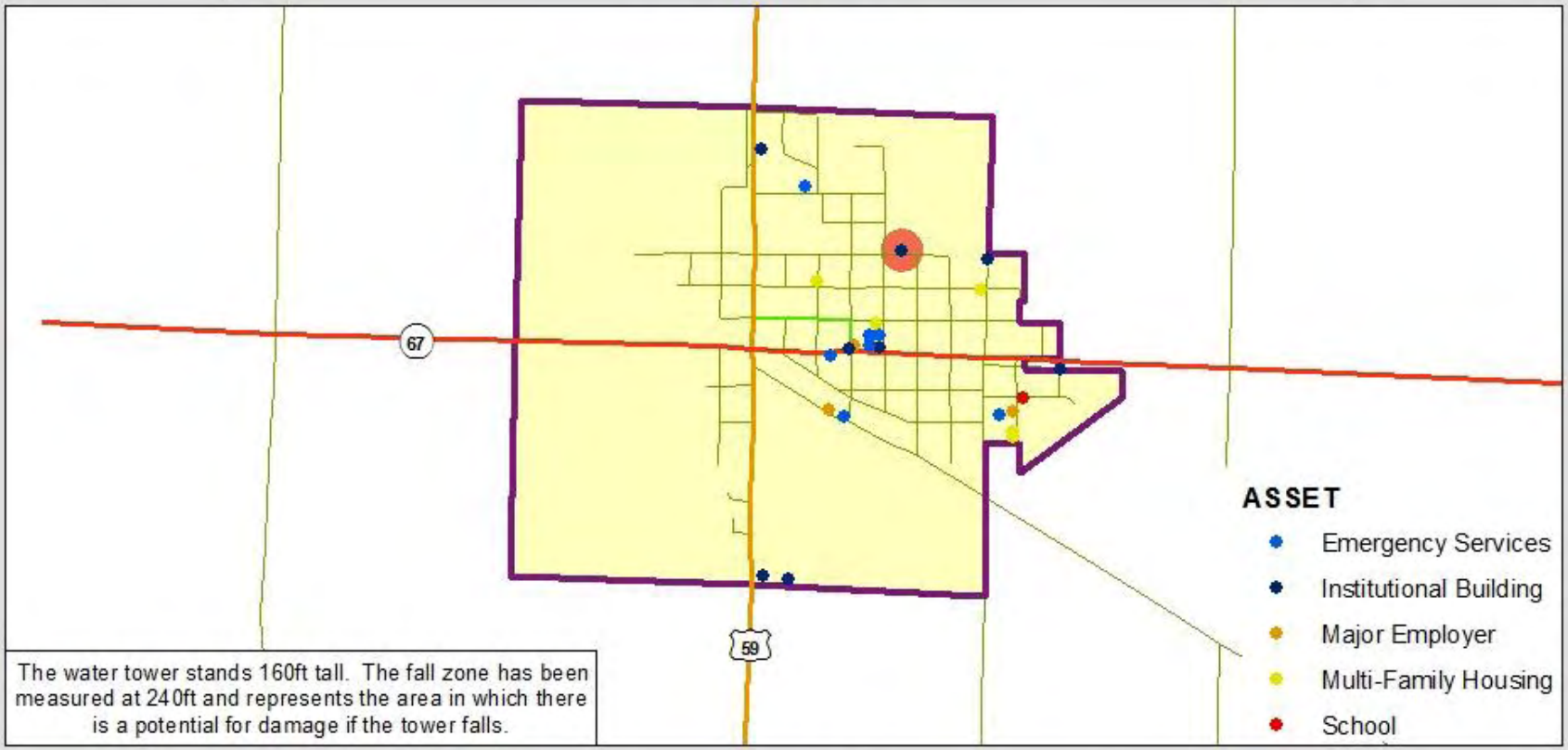
Table 66. Clarkfield Hazard 3: Collapse of Water Tower

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	405	11	$20,026,700	$938,900
Commercial	71	0	$2,534,700	$0
Industrial	7	0	$2,274,600	$0
Agricultural	18	0	$1,119,700	$0
Religious/ Non-profit	7	0	$3,406,400	$0
Government	25	1	$872,900	$386,000
Education	7	0	$4,660,400	$0
Utilities	5	0	$594,200	$0
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$1,409,600	$0
Total	**547**	**12**	**$36,899,200**	**$1,324,900**

Figure 14. Clarkfield Hazard 2: Water Tower Collapse

Yellow Medicine County

All Hazard Mitigation Plan



Clarkfield

Tower Impact Area

FACILITY

Water Tower

ROADS

Township Roads

CSAH

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of Clarkfield compiled a list of community assets shown in Table 67, including major employers, vulnerable populations in multi-family housing complexes, institutional facilities, Hospitals/Police/Evacuation Center, and schools. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 67. City of Clarkfield – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Clarkfield Care Center	22,000	$2,300,000	$1,958,000	$979,000	n/a
Industry 1	1,393,920	$2,564,700	$96,180,480	$144,270,720	$177,027,840
Industry 2	8,000	$39,500	$552,000	$828,000	$1,016,000
Multi-Family Housing					
Valhalla Apartments	24,000	$572,900	$2,352,000	$1,176,000	n/a
EDA Apartments	14,724	$1,000,000	$1,442,952	$721,476	n/a
Institutional Buildings					
City Hall	3,750	$289,500	$330,000	$330,000	n/a
County Government Center	700	$29,000	$61,600	$61,600	n/a
Water Treatment Plant	1,500	$700,000	n/a	n/a	n/a
Wastewater Treatment Plant	2,125,728	$492,805	n/a	n/a	n/a
City Shop	11,250	$216,208	$596,250	$596,250	n/a
Yellow Medicine County Shop	261,360	$51,300	$14,636,160	$14,636,160	n/a
Hospitals/Police/Fire/Evacuation Center					
Emergency Services Building	9,300	$394,000	$1,209,000	$1,813,500	n/a
Police Department	400	$35,000	$52,000	$78,000	$132,840
Medical Clinic	2,500	$39,500	$280,000	$420,000	n/a
Schools					
Charter School	88,427	$177,000	$8,046,857	$8,046,857	*
YME School	Unknown	$4,660,400	Unknown	Unknown	*

* Data Unavailable.

City of Echo, Minnesota

Existing Development Trends.

According to U.S. Census Bureau, the City of Echo's population is 278 and contains 119 households, and is the southern-most community in Yellow Medicine County. The population trends noted in Chapter 2: Community Profile for the City of Echo illustrated a general decrease in population and number of households from 1970 to 2008 estimate, averaging a loss of approximately 9% percent in population and 11% in households every ten years. Throughout the past decade, Echo's economic situation has remained stable and the city has not annexed any land. One redevelopment project occurred in the City converting a bank to a taxation office; however the land use category remained commercial throughout the project. Aside from the redevelopment project, the City of Echo's no land use changes or redevelopments occurred in the last 10 years. The City of Echo's general land use category breakdown exists as the following show in Table 68 below.

Table 68. City of Echo – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	139	66.19%
Commercial	25	11.90%
Agricultural	8	3.81%
Government	18	8.57%
Religious	5	2.38%
Industrial	5	2.38%
Total	**210**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Echo created an intensive Future Growth Map, identifying numerous areas within the City for housing, commercial, industrial, and a future annexation area. It is important to note, that all of the growth areas are located within Echo city limits. The majority of housing growth areas are found in the central and western portion of the City. The location of commercial growth areas are along Second Avenue (Main Street) with five parcels and along South Avenue (County Rd. 1) in the southern portion of the City, abutting the largest industrial growth area along the Chicago and Northwestern Railroad. The final industrial growth area encompasses two large parcels along the railroad in southern Echo. The future annexation area is located west of State Highway 67, which is currently slated for agricultural use. All of the future growth sites are within hazard areas for transportation of hazardous materials and tornados.

Vulnerability Assessment of Structures by Hazard.
The City of Echo has attempted to reduce the vulnerability of special high-risk population, by participating in Meals on Wheels and restructuring the Echo Community Center in 2006, with a handicap-accessible ramp and sidewalk at the entrance of the building.

Of the three natural hazards selected as most likely to affect a city, two of the hazards do not apply to the City of Echo. Echo does not have 100-year floodplains or a dam, thus the City opted to perform a risk analysis on four potential hazardous events including: tornado, transportation of hazardous materials, and structure fire at Farmer's Co-op Grain Elevator of Echo, and a chemical spill at Farmer's Co-op Oil of Echo. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Echo are defined as follows. Tables 69, 70, 71, and 72 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Echo Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The Critical Facilities listed in Table 69, include Echo's Fire Hall and City Office/Community Center and the Hazardous Facilities include storage buildings for fertilizers and oil. As shown in Table 69 and Figure 15 (following page), the estimated devastation value of an F4 or F5 tornado is $8,755,020 dollars affecting 182 parcels.

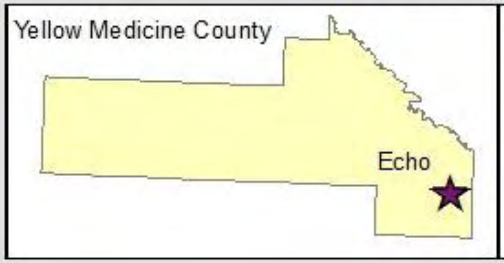
Table 69. Echo Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	131	118	$4,629,000	$4,166,100
Commercial	25	23	$1,310,400	$1,179,360
Industrial	4	4	$389,200	$350,280
Agricultural	9	8	$1,877,000	$1,689,300
Religious/ Non-profit	5	5	$480,900	$432,810
Government	16	14	$163,900	$147,510
Education	2	2	$319,700	$287,730
Utilities	4	4	$186,700	$168,030
Hazardous Facility	4	4	$22,300	$20,070
Dam	0	0	$0	$0
Critical Facilities	2	2	$348,700	$313,830
Total	**202**	**182**	**$9,727,800**	**$8,755,020**

Figure 15: Echo Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan



Echo City Boundary

Tornado Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC

Date: 03-01-2010

Data Source: MNDOT Basemap 2000

Echo Hazard 2. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. State Highway 67 runs vertically through the center of Echo. As shown in Table 70 and Figure 16 (following page): 24 of 131 home parcels, 11 of 25 commercial business parcels, two churches, and all industrial business parcels are located along a major transportation route. The total amount of predicted devastation is $2,958,208 dollars affecting 65 parcels. This amounts to 32 percent of parcels and 30 percent of the total City value.

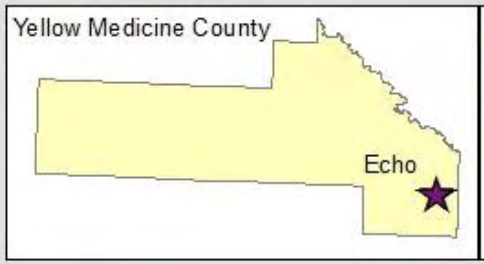
Table 70. Echo Hazard 2: Transportation of Hazardous Materials

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	131	24	$4,629,000	$848,061.07
Commercial	25	11	$1,310,400	$576,576
Industrial	4	4	$389,200	$389,200
Agricultural	9	2	$1,877,000	$417,111.11
Religious/ Non-profit	5	2	$480,900	$192,360
Government	16	16	$163,900	$163,900
Education	2	0	$319,700	$0
Utilities	4	0	$186,700	$0
Hazardous Facility	4	4	$22,300	$22,300
Dam	0	0	$0	$0
Critical Facilities	2	2	$348,700	$348,700
Total	**202**	**65**	**$9,727,800**	**$2,958,208**

Figure 16: Echo Hazard 2: Transportation of Hazardous Materials

Yellow Medicine County

All-Hazard Mitigation Planning



Echo City Boundary

Hazardous Materials Impact Area

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

Railroad

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Echo Hazard 3. Structure Fire at Farmer's Co-op Grain Elevator

The third hazard area concerned a structure fire at Farmer's Co-op Grain Elevator of Echo. The hazard area for the structure fire is a two-block radius surrounding the grain elevator and any structure within this area was included. Twenty-seven structures were found to be in the structure fire hazard area of the grain elevator, including five residences, nine businesses, a church and two agricultural buildings; in addition to all of the hazardous and critical facilities as indicated on Table 71 and Figure 17 (following page). The total predicted destruction value of a structure fire on the grain elevator in Echo is $1,921,914 dollars, approximately 20 percent of the total City value.

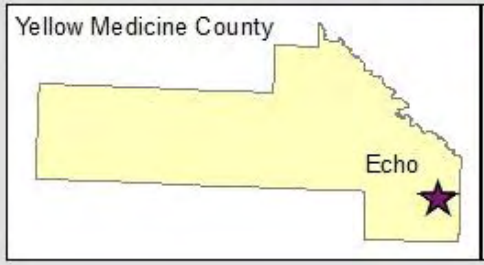
Table 71. Echo Hazard 3: Structure Fire at Farmer's Co-op Grain Elevator of Echo

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	131	5	$4,629,000	$176,679.39
Commercial	25	9	$1,310,400	$471,744
Industrial	4	4	$389,200	$389,200
Agricultural	9	2	$1,877,000	$417,111.11
Religious/ Non-profit	5	1	$480,900	$96,180
Government	16	0	$163,900	$0
Education	2	0	$319,700	$0
Utilities	4	0	$186,700	$0
Hazardous Facility	4	4	$22,300	$22,300
Dam	0	0	$0	$0
Critical Facilities	2	2	$348,700	$348,700
Total	**202**	**27**	**$9,727,800**	**$1,921,914**

Figure 17: Echo Hazard 3: Structure Fire at Farmer's Co-op Grain Elevator of Echo

Yellow Medicine County

All-Hazard Mitigation Planning



Echo City Boundary

Fire Impact Area

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

Railroad

N

0 0.1 0.2 0.4 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Echo Hazard 4. Chemical Spill at Farmer's Co-op Oil

The fourth and final hazard area concerned a chemical spill at Farmer's Co-op Oil of Echo. The hazard area for the chemical spill is a two-block radius surrounding the structure and any additional structure within this area was included. Nineteen structures were found to be in the structure fire hazard area of Farmer's Co-op Oil, including four residences, seven businesses, two agricultural buildings; in addition to all of the hazardous and critical facilities as indicated on Table 72 and Figure 18 (following page). The total predicted destruction value of a structure fire on the grain elevator in Echo is $1,475,902 dollars, approximately 15 percent of the total City value.

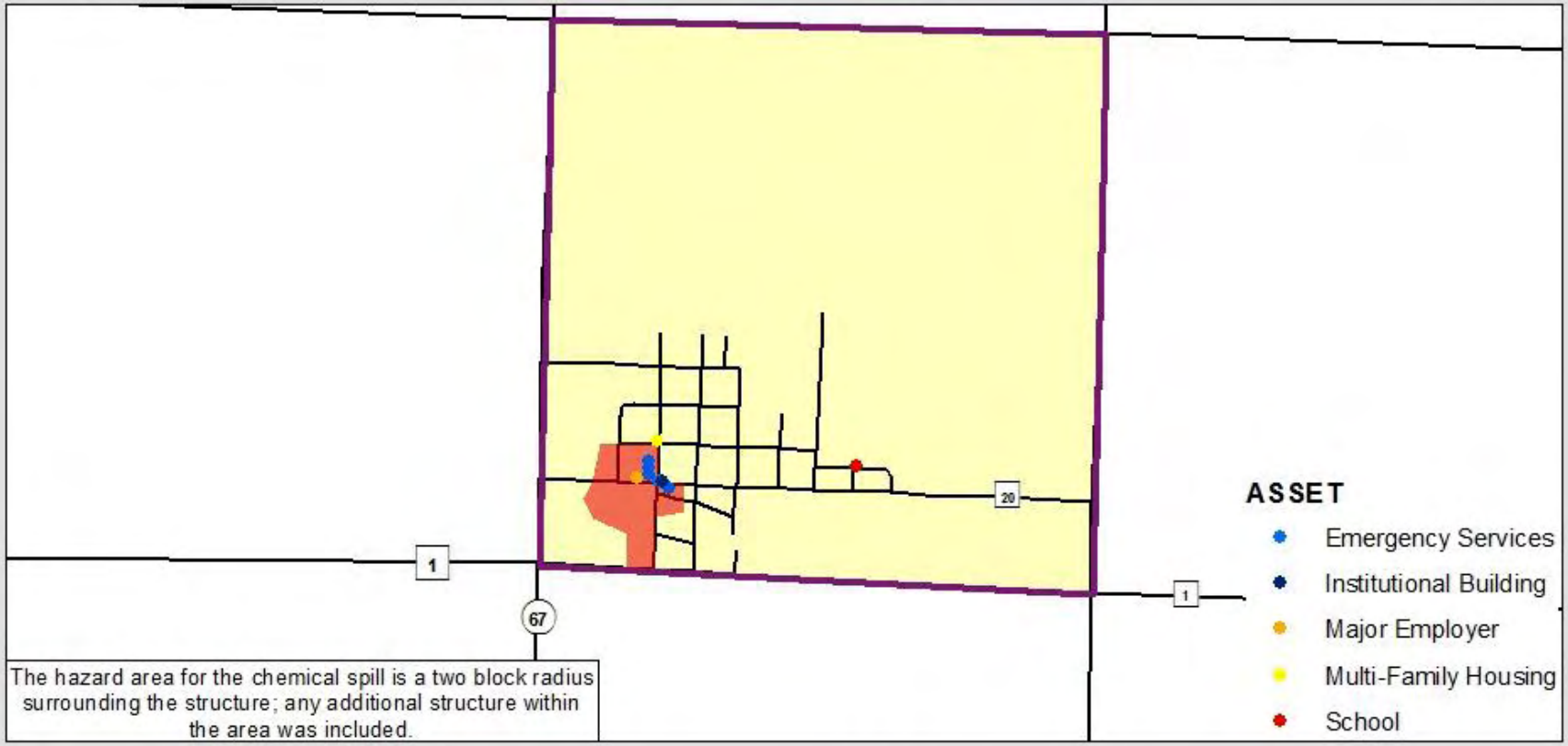
Table 72. Echo Hazard 4: Chemical Spill at Farmer's Co-op Oil

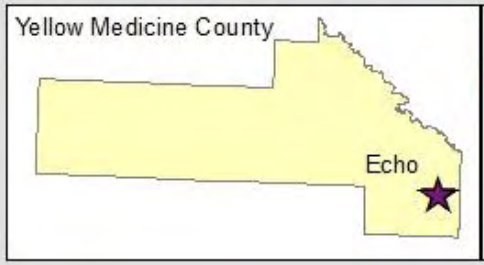
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	131	4	$4,629,000	$141,343.51
Commercial	25	3	$1,310,400	$157,248
Industrial	4	4	$389,200	$389,200
Agricultural	9	2	$1,877,000	$417,111.11
Religious/ Non-profit	5	0	$480,900	$0
Government	16	0	$163,900	$0
Education	2	0	$319,700	$0
Utilities	4	0	$186,700	$0
Hazardous Facility	4	4	$22,300	22300
Dam	0	0	$0	$0
Critical Facilities	2	2	$348,700	$348,700
Total	**202**	**19**	**$9,727,800**	**$1,475,902**

Figure 18: Echo Hazard 4: Chemical Spill at Farmer's Co-op Oil

Yellow Medicine County

All-Hazard Mitigation Planning





Echo City Boundary

Chemical Spill Impact Area

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

Railroad

N

0 0.1 0.2 0.4 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.

The City of Echo compiled a list of community assets shown in Table 73, including major employers, vulnerable populations in multi-family housing complexes, institutional facilities (Critical Facilities), and schools. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 73. City of Echo – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1*	27,734	$327,906	$1,913,646	$2,870,469	$3,522,218
Multi-Family Housing					
Apartment 1	6,240	$204,500	$611,520	$305,760	n/a
Institutional Buildings					
Echo Community Center/City Offices	4,560	$405,865	$405,865	$405,865	**
Echo Fire Hall	4,000	$422,775	$422,775	$422,775	**
Schools					
Echo Charter School	29,312	$319,700	$2,667,392	$2,667,392	**

*Industry 1also includes a 2,800 cubic foot structure, five tanks with total capacity of 21,500 gallons, and three storage bins with a total maximum capacity of 13,880 bushels. Market value includes the values for all of these additional structures.

**Data Unavailable.

City of Granite Falls, Minnesota

Existing Development Trends.

According to U.S. Census Bureau, the City of Granite Falls population is 2,908 and contains 1,336 households, making it the largest city in Yellow Medicine County and the county seat. The population trends noted in Chapter 2: Community Profile for the City of Granite Falls illustrated a general decrease in population and number of households from 1980 to 2008 estimate, with a 10 percent population loss from 1980-1990, and another decrease from 2000 to 2008 of 5 percent.

Throughout the past decade, Granite Falls annexed 20 acres of land converting agricultural land to both industrial and residential land uses. The new industrial land was utilized to build a new ethanol plant for the City. The city has had many redevelopment projects, especially in the 100-year floodplain were commercial businesses were acquired, removed and relocated; in addition to residences that now act as green space. Some commercial facilities have been redeveloped into governmental buildings and a project took place at the airport through 500 foot runway extension in 2005. The most recent project was in 2009, with the relocation of the Granite Falls City Hall from out of the 100-year floodplain into downtown Granite Falls. The general trend for Granite Falls resides in commercial and residential development. The City of Granite Falls general land use category breakdown exists as the following show in Table 74 below.

Table 74. City of Granite Falls – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	1,310	73.55%
Commercial	182	10.22%
Agricultural	46	2.58%
Government	77	4.32%
Religious/Charitable	18	1.01%
Education	8	0.45%
Industrial	12	0.67%
Total	**1,781**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Granite Falls Comprehensive Plan identifies growth areas east of the City along County Road 38 for a future industrial park. On the western edge of the City, a combination of high density residential and commercial development is hoped to occur within the Stony Run Addition. Neither of these proposed development sites are within 100-year floodplains. The dominant trend of future development within the City focuses on industrial with some commercial and high density residential.

Vulnerability Assessment of Structures by Hazard.
The City of Granite Falls has attempted to reduce the vulnerability of special high-risk population, by continually improving accessibility with new projects every other year. Another project partially funded by the City is the Living at Home Block Nurse program. This program provides services to seniors that are unable to leave their homes. In 2004, the Skyline Vista Apartments were built to increase the supply of Section 8 and market-rate apartments within the City. The Skyline Vista Apartments are not located in the 100-year floodplain.

All of the three natural hazards selected as most likely to affect a city, apply to the City of Granite Falls. The City opted to perform a risk analysis on four potential hazardous events including: tornado, 100-year flood, dam failure, and the transportation of hazardous materials. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Granite Falls are defined as follows. Tables 75, 76, 77, and 78 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Granite Falls Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The Critical Facilities listed in Table 75, include a hospital, clinic, Fire Hall, Law Enforcement Center, Kilowatt Community Center, Granite Falls' Fire Hall and City Office/Community Center and the Hazardous Facility includes the ethanol plant. As shown in Table 75 and Figure 19 (following page), the estimated devastation value of an F4-F5 tornado is $191,727,660 dollars affecting 1,490 parcels.

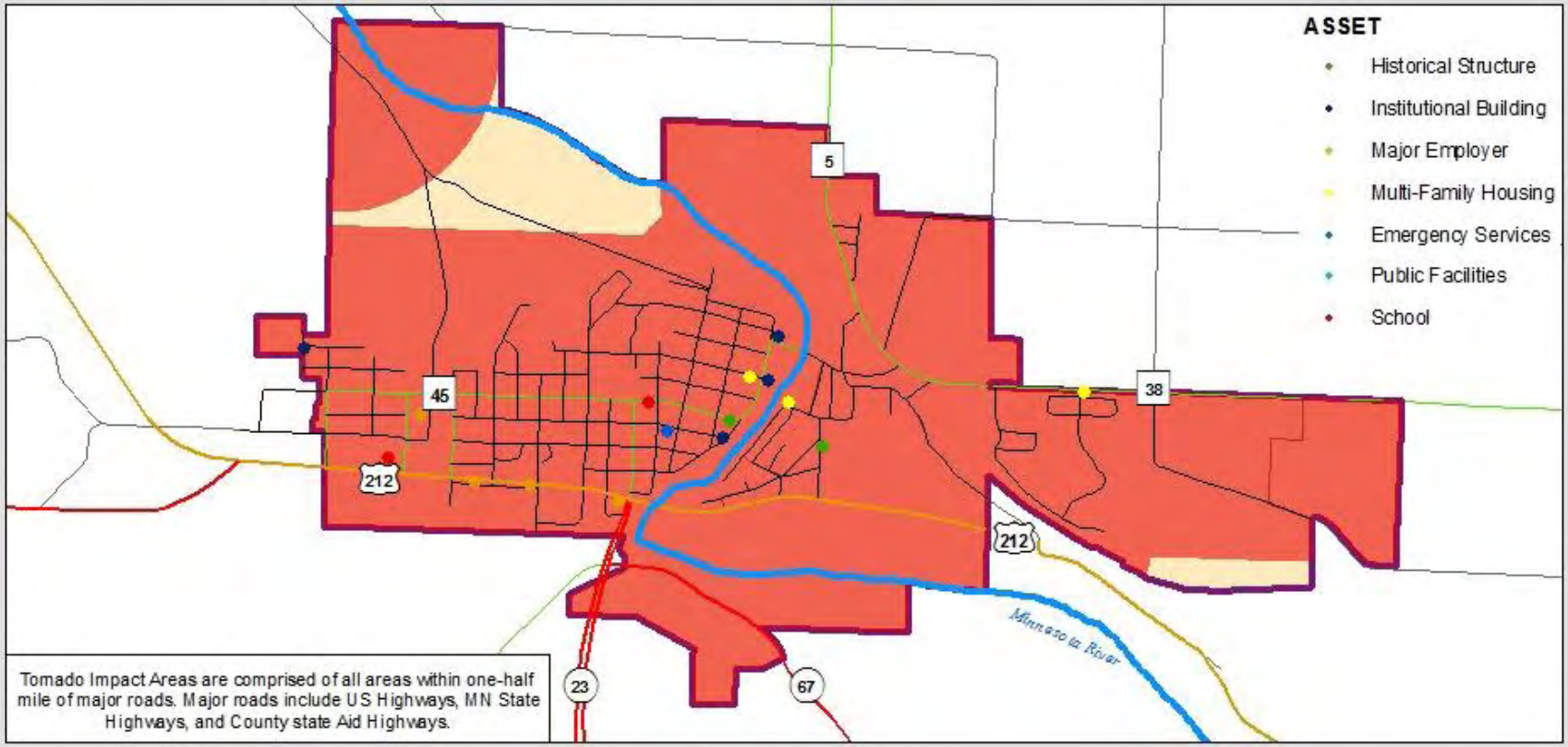
Table 75. Granite Falls Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	1,290	1,161	$73,649,000	$66,284,100
Commercial	182	164	$17,258,200	$15,532,380
Industrial	11	10	$15,062,200	$13,555,980
Agricultural	46	41	$1,610,300	$1,449,270
Religious/ Non-profit	18	16	$7,415,100	$6,673,590
Government	76	68	$14,037,800	$12,634,020
Education	8	7	$50,352,100	$45,316,890
Utilities	11	10	$3,271,300	$2,944,170
Hazardous Facility	1	1	$10,577,000	$9,519,300
Dam	1	1	$300,000	$300,000
Critical Facilities	12	11	$19,464,400	$17,517,960
Total	**1,656**	**1,490**	**$212,997,400**	**$191,727,660**

Figure 19: Granite Falls Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan



Granite Falls City Boundary

Tornado Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.2 0.4 0.8 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Granite Falls Hazard 2. 100-Year Flood Event

The third hazard area concerned a structure fire at Farmer's Co-op Grain Elevator of Granite Falls. The hazard area for the 100-year flood is the 100-year floodplain as determined by FEMA's Flood Insurance Rate Maps from 1978. There are no future development opportunities within the 100-year floodplain, due to a Floodplain Ordinance passed in Granite Falls in 1991. In the past seven years, approximately $15 million dollars have been spent removing structures from the floodplain within city limits. Eighty-eight parcels were found to be in the 100-year floodplain including 64 residential structures, 22 commercial properties, Yellow Medicine County Museum, and a dam as shown in Table 76 and Figure 20 (following page). The total predicted destruction value of a 100-year flood event in Granite Falls is $6,121,960 dollars, approximately 3 percent of the total City value.

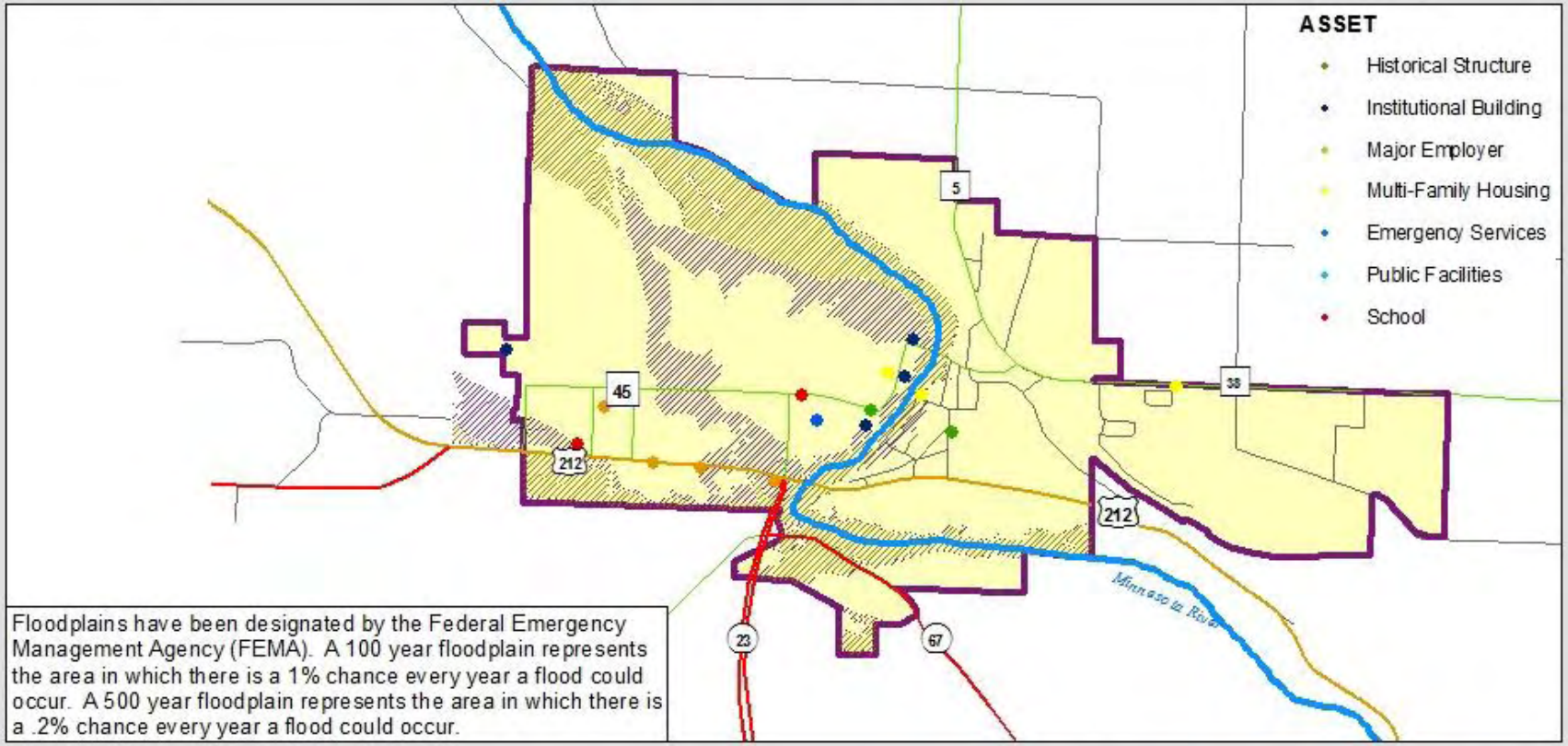
Table 76. Granite Falls Hazard 2: 100-Year Flood Event

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	1,290	64	$73,649,000	$3,653,904
Commercial	182	22	$17,258,200	$2,086,156
Industrial	11	0	$15,062,200	$0
Agricultural	46	0	$1,610,300	$0
Religious/ Non-profit	18	0	$7,415,100	$0
Government	77	1	$14,037,800	$81,900
Education	8	0	$50,352,100	$0
Utilities	10	0	$3,271,300	$0
Hazardous Facility	1	0	$10,577,000	$0
Dam	1	1	$300,000	$300,000
Critical Facilities	12	0	$19,464,400	$0
Total	**1,656**	**88**	**$212,997,400**	**$6,121,960**

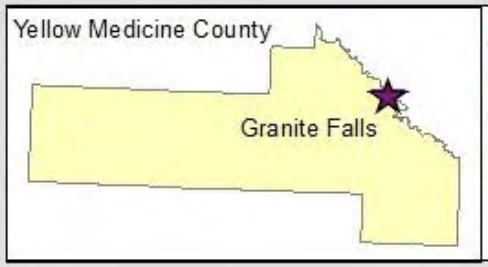
Figure 20: Granite Falls Hazard 2: 100-Year Flood Event

Yellow Medicine County

All Hazard Mitigation Plan



Floodplains have been designated by the Federal Emergency Management Agency (FEMA). A 100 year floodplain represents the area in which there is a 1% chance every year a flood could occur. A 500 year floodplain represents the area in which there is a .2% chance every year a flood could occur.



Granite Falls City Boundary

FEMA DESIGNATED FLOODPLAIN

100 Year Boundary

500 Year Boundary

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.25 0.5 1 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000
FEMA

Granite Falls Hazard 3. Dam Failure at "Granite Falls Dam"

The fourth hazard area concerned a dam failure at the Granite Falls Dam located in the downtown section of the city. The Granite Falls Dam is a "High Hazard Dam", which means there is potential for loss of human life if failure of the dam should occur. A dam break analysis was performed and was filed with the appropriate state and federal regulatory agencies. Maximum "Sunny Day Failure" was 5.2 feet with a stage increase of one foot or more between Granite Falls Dam and Minnesota Falls Dam. For a dam break at a 15-year event, stage increases were 2.0 feet or less. The Water Department of Granite Falls created an Emergency Plan for the Granite Falls Dam. In the event of a dam failure, thirty-eight structures (shown below in Table 77) are on the "Downstream Residents Notification List." This includes 27 residences, seven commercial properties, three government properties, and the dam itself. The total predicted destruction value of a dam failure event in Granite Falls is $2,637,168 dollars, approximately 1.2% percent of the total City value. A visual is on Figure 21(following page).

Table 77. Granite Falls Hazard 3: Dam Failure at "Granite Falls Dam"

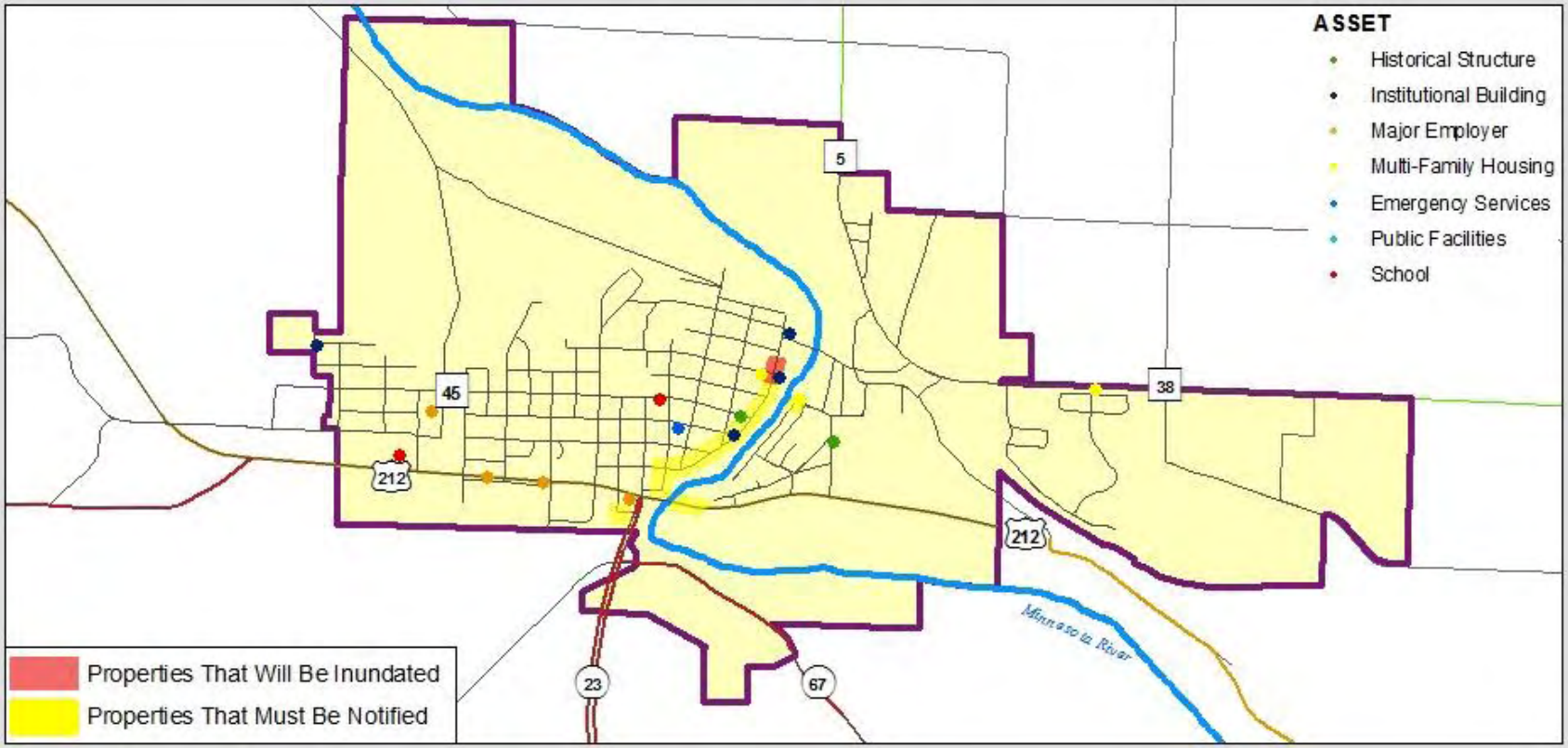
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	1,290	27	$73,649,000	$1,541,491
Commercial	182	7	$17,258,200	$663,777
Industrial	11	0	$15,062,200	$0
Agricultural	46	0	$1,610,300	$0
Religious/ Non-profit	18	0	$7,415,100	$0
Government	77	3	$14,037,800	$131,900*
Education	8	0	$50,352,100	$0
Utilities	10	0	$13,848,300	$0
Hazardous Facility	1	0	$0	$0
Dam	1	1	$300,000	$300,000
Critical Facilities	12	0	$19,464,400	$0
Total	**1,656**	**38**	**$212,997,400**	**$2,637,168**

* This value includes the Yellow Medicine County Museum and an estimated value of $50,000 for a public Bath House (shelter) and a Park Shelter.

Figure 21: Granite Falls Hazard 3: Dam Failure at "Granite Falls Dam"

Yellow Medicine County

All-Hazard Mitigation Planning



Granite Falls City Boundary

ROADS

- Township Roads
- County State Aid Highway
- MN Trunk Highway
- U.S. Highway

N

0 0.2 0.4 0.8 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Granite Falls Hazard 4. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. As shown in Table 78: 903 of 1,290 homes, 88% of commercial businesses, and all industrial, utility, critical facilities, and agricultural structures are located along a major transportation route. The total amount of predicted devastation is $173,884,422 dollars affecting 1,236 parcels shown in Figure 22 (following page). This amounts to approximately 75 percent of the total number of parcels and 82 percent of the total City value.

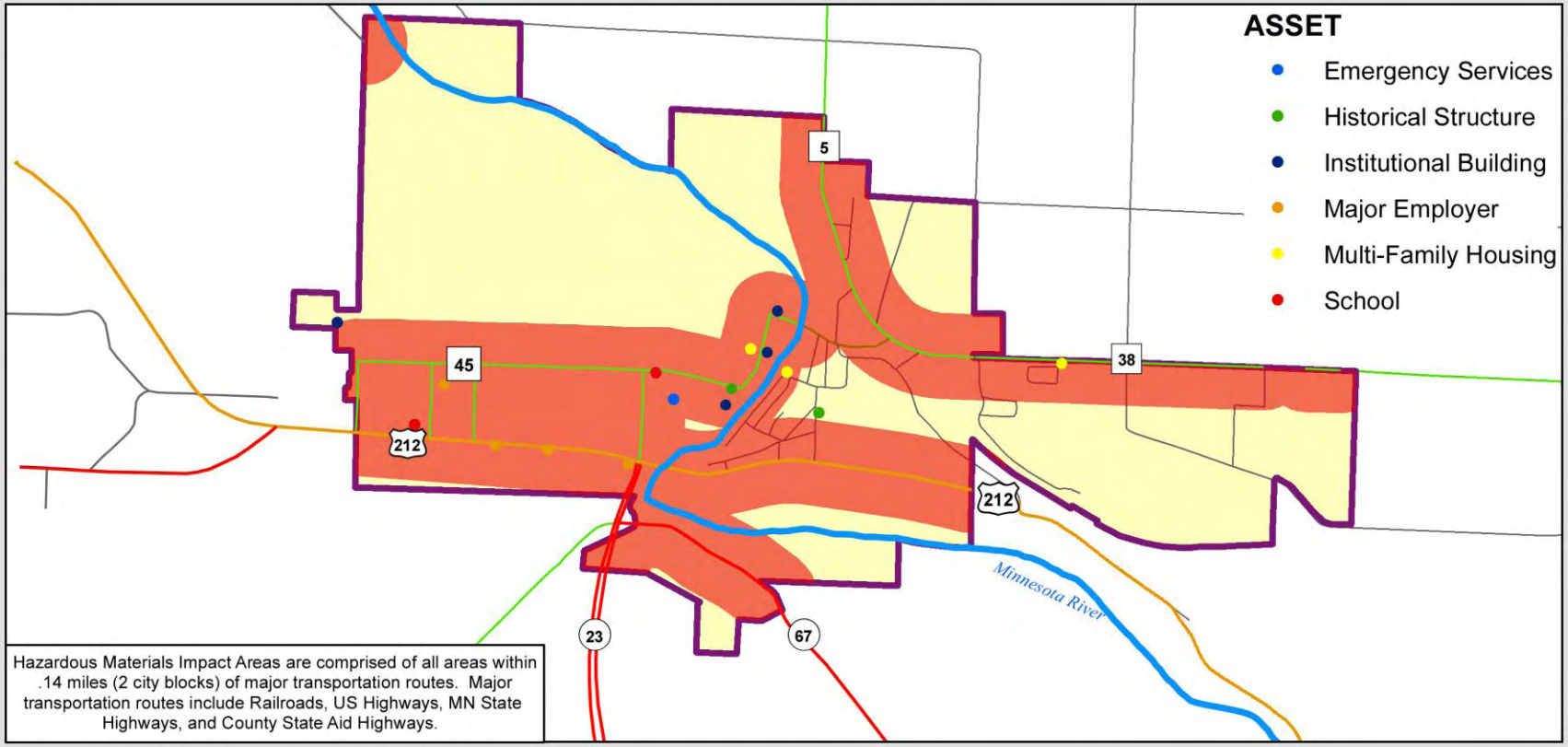
Table 78. Granite Falls Hazard 4: Transportation of Hazardous Materials

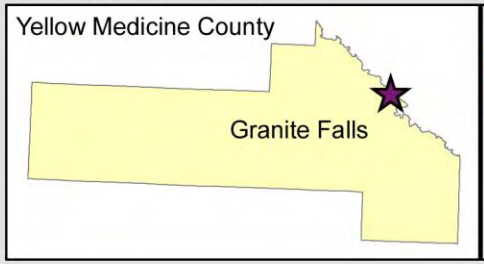
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	1,290	903	$73,649,000	$51,554,300
Commercial	182	160	$17,258,200	$15,172,044
Industrial	11	11	$15,062,200	$15,062,200
Agricultural	46	46	$1,610,300	$1,610,300
Religious/ Non-profit	18	15	$7,415,100	$6,179,250
Government	76	70	$14,037,800	$12,929,553
Education	8	6	$50,352,100	$37,764,075
Utilities	11	11	$3,271,300	$3,271,300
Hazardous Facility	1	1	$10,577,000	$10,577,000
Dam	1	1	$300,000	$300,000
Critical Facilities	12	12	$19,464,400	$19,464,400
Total	**1,656**	**1,236**	**$212,997,400**	**$173,884,422**

Figure 22: Granite Falls Hazard 4: Transportation of Hazardous Materials

Yellow Medicine County

All-Hazard Mitigation Planning





Granite Falls City Boundary

Hazardous Materials Impact Area

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.2 0.4 0.8 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of Granite Falls compiled a list of community assets shown in Table 79, including major employers, vulnerable populations in multi-family housing complexes, institutional facilities (Critical Facilities), and schools. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values (where information available and applicable).

Table 79. City of Granite Falls – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1	218,974	$2,414,200	$15,109,206	$15,109,206	$27,809,698
Industry 2	17,636	$277,000	$1,198,047	$1,797,070	$2,205,101
Industry 3	132,161	$574,200	$9,119,109	$13,678,663	$16,784,447
Granite Falls Energy LLC/Ethanol Plant	201,683	$10,577,000	$17,1748,104	$17,1748,104	n/a
Multi-Family Housing					
Apartment 1	44,208	$1,918,800	$4,332,384	$2,166,192	n/a
Apartment 2	31,430	$958,700	$3,080,140	$1,540,070	n/a
Apartment 3	28,300	$1,135,700	$2,773,400	$1,386,700	n/a
Historical Structures					
Weaver House	912	$44,200	$103,056	$103,056	n/a
Andrew Vollstead Museum	3,275	$81,900	$370,075	$370,075	n/a
School Facilities					
YME Schools	244,393	$35,524,800	$22,239,763	$22,239,763	n/a
MN West Community & Technical College	97,548	$14,427,300	$11,218,020	$16,827,030	n/a
Institutional Buildings					
Hospital	Unknown	$10,007,200	Unknown	Unknown	*
Fire Hall/City Garage	12,498	$469,000	$1,099,824	$1,649,736	$2,094,481
Project Turnabout	Unknown	$5,080,500	Unknown	Unknown	*
Granite Falls City Hall	Unknown	Unknown	Unknown	Unknown	$2,094,481
Kilowatt Community Center	Unknown	$3,000,000	Unknown	Unknown	*

*Data Unavailable.

City of Hanley Falls, Minnesota

Existing Development Trends.

According to U.S. Census Bureau, the City of Hanley Falls population is 285 and contains 110 households. The population trends noted in Chapter 2: Community Profile for the City of Hanley Falls illustrates an interesting demographic shift from 1990 to 2000, with a population increase of 3% from 246 to 323 and decreases from 2000-2005 (278 persons) and from 2005-2008 (10 persons). The overall number of households from 1980 to 2008, has remained relatively stable shifting between 117 (1980) to 110 (1990-2008).

Throughout the past decade, Hanley Falls economic situation has remained stable and the city has not annexed any land. Two land developments occurred turning vacant commercial zoned land into a municipal water treatment plant in March of 2007 and a Fire Hall in 2009. Finally, in the past three years two parcels of agricultural land were converted to residences. Hanley Falls has two small areas of 100-year floodplains located within city limits. The land use associated with the floodplains is agricultural and no future development is slated for the floodplain areas. The City of Hanley Falls general land use category breakdown exists as the following show in Table 80 below.

Table 80. City of Hanley Falls – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	139	73.16%
Commercial	19	10.00%
Agricultural	2	1.05%
Government	23	12.11%
Religious	5	2.63%
Industrial	2	1.05%
Total	**190**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Hanley Falls has designated two areas for future growth. Industrial growth is slated to occur south of the City with housing supported west of Hanley Falls. The City is currently built out and new lands will be necessary to encourage future development. All of the future sites are within the tornado hazard area.

Vulnerability Assessment of Structures by Hazard.

The City of Hanley Falls has attempted to reduce the vulnerability of special high-risk population, by participating in a "Meal Site" that provides food for residents and discounted food for senior citizens. The "Meal Site" is run by Hanley Falls' citizens and the City donates to help fund the program. Lastly, the Hanley Falls Fire Halls has been handicap-accessible for community meetings and voting.

Of the three natural hazards selected as most likely to affect a city, one of the hazards does not apply to the City of Hanley Falls. Hanley Falls does not have a dam, thus the City opted to perform a risk analysis on four potential hazardous events including: tornado, 100-year flood,

stormwater runoff – flood event, and a rupture of an exposed pipeline crossing the Minnesota River. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Hanley Falls are defined as follows. Tables 81, 82, 83, and 84 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Hanley Falls Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facilities listed in Table 81, include Hanley Falls Fire Hall and Hanley Falls City Office/Community Center and the Hazardous Facilities include a storage building that contains farm chemical barrels. As shown in Table 81 and Figure 23 (following page), the estimated devastation value of an F4 or F5 tornado is $7,106,940 dollars affecting 166 parcels.

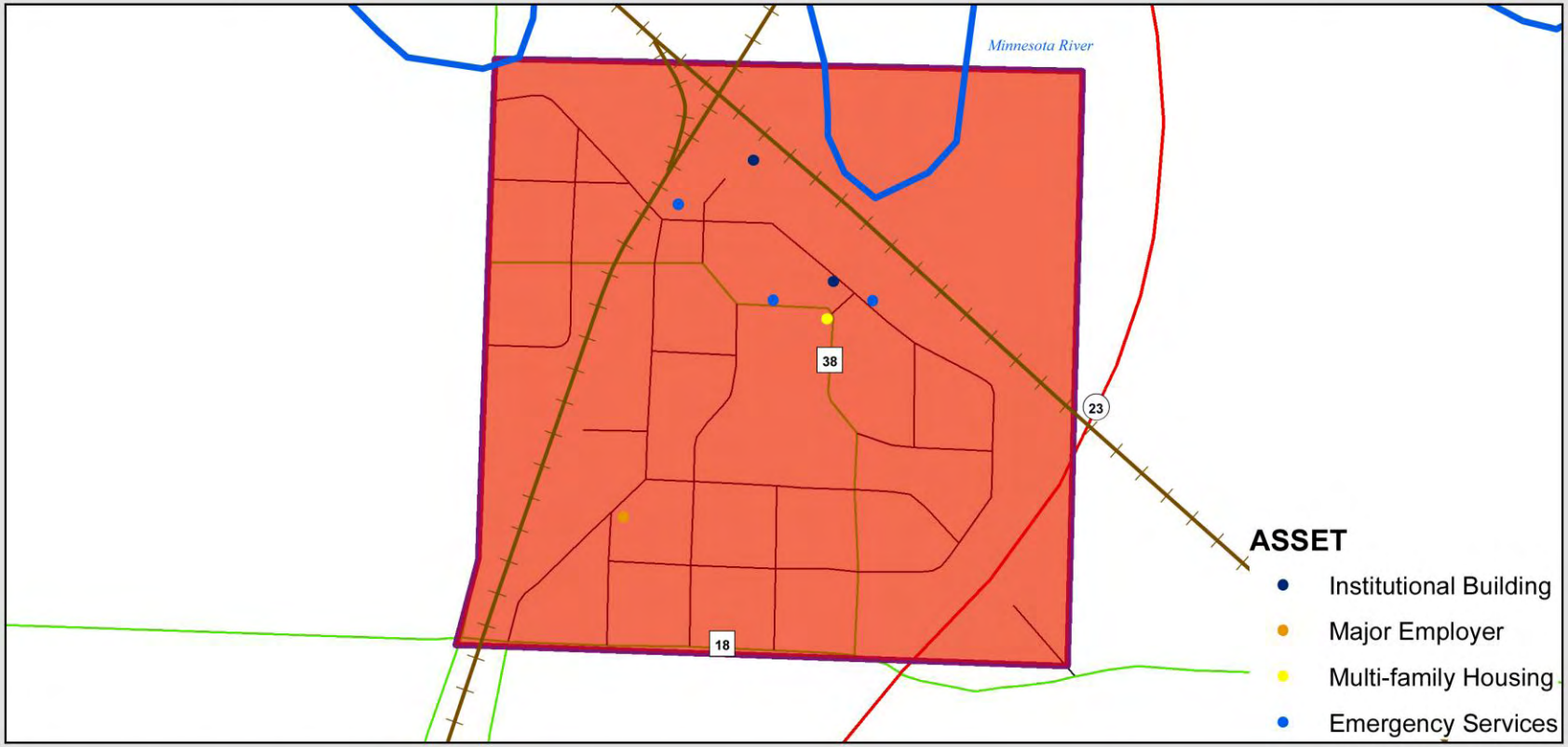
Table 81. Hanley Falls Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	124	112	$5,075,700	$4,568,130
Commercial	19	17	$109,000	$98,100
Industrial	2	2	$11,700	$10,530
Agricultural	2	2	$127,600	$114,840
Religious/ Non-profit	5	5	$448,400	$403,560
Government	23	21	$806,500	$725,850
Education	0	0	$0	$0
Utilities	6	5	$514,300	$462,870
Hazardous Facility	1	1	$303,400*	$273,060
Dam	0	0	$0	$0
Critical Facilities	2	2	$500,000	$450,000
Total	**184**	**166**	**$7,896,600**	**$7,106,940**

Figure 23: Hanley Falls Hazard 1: F4-F5 Tornado

Yellow Medicine County

All-Hazard Mitigation Planning



Hanley Falls City Boundary

Tornado Impact Area

ROADS

Township Roads

County State-Aid Highways

MN Trunk Highway

U.S. Highway

Railroads

N

0 0.1 0.2 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Hanley Falls Hazard 2. 100-Year Flood Event

The second hazard boundary area was for a 100-year flood. The boundaries used to determine the 100-year floodplains were obtained from FEMA's Flood Insurance Rate Maps. Approximately 1.1 acres are located within Hanley Falls. The floodplain's land use is currently agricultural cropland and contains no structures, with no future development prospects. As shown in Table 82 and Figure 24 (following page), no structures are located within the 100-year floodplain and a 100-year flood would cause no fiscal damage to the City of Hanley Falls.

Table 82. Hanley Falls Hazard 2: 100-Year Flood Event

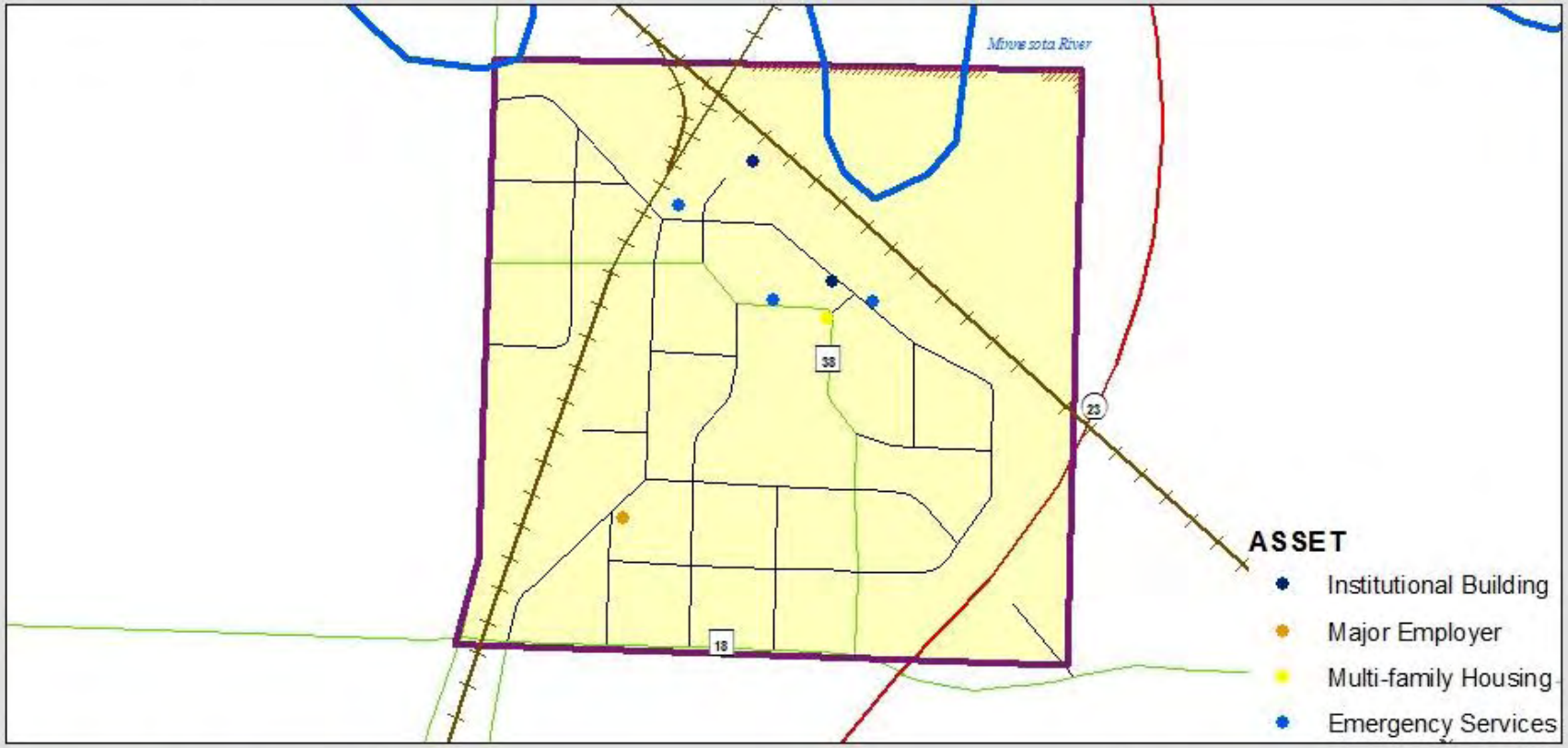
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	124	0	$5,075,700	$0
Commercial	19	0	$109,000	$0
Industrial	2	0	$11,700	$0
Agricultural	2	0	$127,600	$0
Religious/ Non-profit	5	0	$448,400	$0
Government	23	0	$806,500	$0
Education	0	0	$0	$0
Utilities	6	0	$514,300	$0
Hazardous Facility	1	0	$303,400*	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$500,000	$0
Total	**184**	**0**	**$7,896,600**	**0**

*Value for the individual storage tank was unavailable, this is for the entire Farmers Co-op Business.

Figure 24: Hanley Falls Hazard 2: 100-Year Flood Event

Yellow Medicine County

All-Hazard Mitigation Planning



Hanley Falls City Boundary

FEMA DESIGNATED FLOODPLAIN

100 Year Boundary

ROADS

Township Roads

County State-Aid Highways

MN Trunk Highway

U.S. Highway

Railroads

N

0 0.1 0.2 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000
FEMA

Hanley Falls Hazard 3. Stormwater Runoff – Flood Event

The third hazard area concerns stormwater runoff that may cause a potential flood event within Hanley Falls. This potential hazard has become a threat to the City due to an increase of impervious surfaces and the inability of current ditches to handle the generated stormwater. When a 2-3 inch rain event occurs, a four million bushel building drains the water into the ditch at 100,000 gallons per minute; which quickly overloads the system and causes standing water. Five structures were found to be in the "flood area" surrounding the storage building and ditch which includes one residence and four government-owned buildings as shown on Figure 25 (following page). The four government structures include the Water Treatment Center, two wells, and a lift station tally $650,000, as shown in Table 83. The total predicted destruction value of a flood event due to stormwater runoff in Hanley Falls is $690,933 dollars, approximately 9 percent of the total City value.

Table 83. Hanley Falls Hazard 3: Stormwater Runoff - Flood Event

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	124	1	$5,075,700	$40,933
Commercial	19	0	$109,000	$0
Industrial	2	0	$11,700	$0
Agricultural	2	0	$127,600	$0
Religious/ Non-profit	5	0	$448,400	$0
Government	23	4	$806,500	$650,000
Education	0	0	$0	$0
Utilities	6	0	$514,300	$0
Hazardous Facility	1	0	$303,400*	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$500,000	$0
Total	**181**	**5**	**$7,896,600**	**$690,933**

*Value for the individual storage tank was unavailable, this is for the entire Farmers Co-op Business.

Figure 25: Hanley Falls Hazard 3: Stormwater Runoff - Flood Event

Yellow Medicine County

All-Hazard Mitigation Planning

Hanley Falls City Boundary

Storm Water Impact Area

FACILITY

- Water Treatment Plant
- Well
- Fire Department

ROADS

- Township Roads
- County State-Aid Highways
- MN Trunk Highway
- U.S. Highway
- Railroads

N

0 15 30 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Hanley Falls Hazard 4. Rupture of Exposed Pipeline

The fourth and final hazard area concerned a rupture of an exposed pipeline that crosses the Minnesota River, just outside Hanley Falls' city limits. The pipeline is owned by Magellan, previously discussed in Chapter 3: Hazard Inventory, and routinely carries liquid substances include jet fuel, diesel fuel, and natural gas. The pipeline is able to transport approximately 1,200 pounds per square inch. The hazard area for the rupture/explosion is a two-block radius surrounding the structure and any additional structure within this area was included. Twenty-six structures were found including twenty-five residences and one commercial business as indicated on Table 84 and Figure 26 (following page). The total predicted destruction value of an exposed pipeline rupture in Hanley Falls totals $1,093,958 dollars, approximately 14 percent of the total City value.

Table 84. Hanley Falls Hazard 4: Rupture of Exposed Pipeline

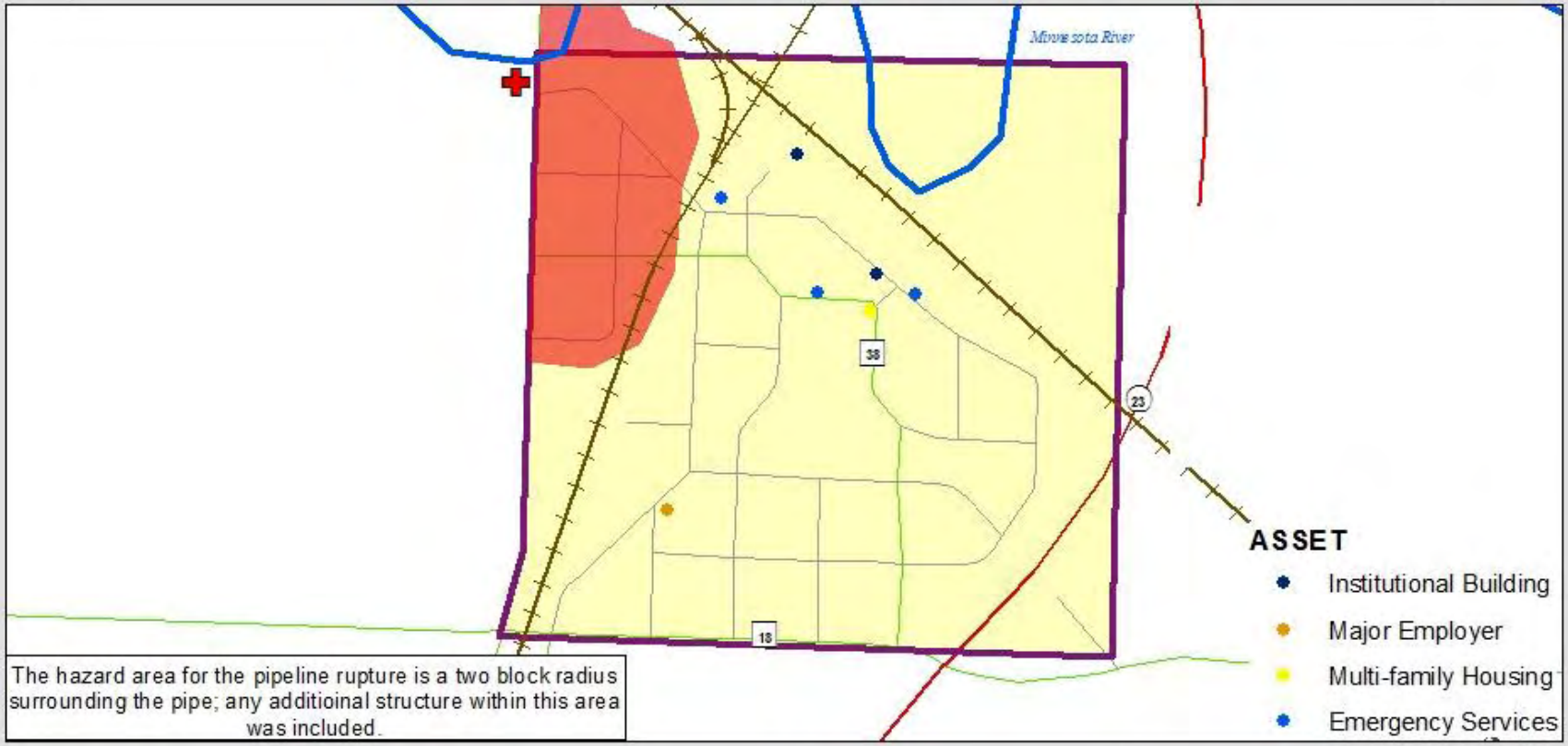
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	124	25	$5,075,700	$1,064,258
Commercial	19	1	$109,000	$29,700
Industrial	2	0	$11,700	$0
Agricultural	2	0	$127,600	$0
Religious/ Non-profit	5	0	$448,400	$0
Government	23	0	$806,500	$0
Education	0	0	$0	$0
Utilities	6	0	$514,300	$0
Hazardous Facility	1	0	$303,400*	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$500,000	$0
Total	**184**	**26**	**$7,896,600**	**$1,093,958**

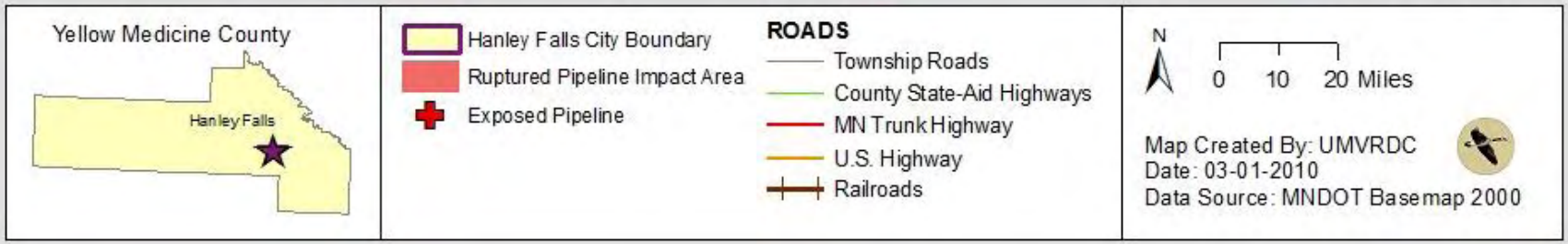
*Value for the individual storage tank was unavailable, this is for the entire Farmers Co-op Business.

Figure 26: Hanley Falls Hazard 4: Rupture of Exposed Pipeline

Yellow Medicine County

All-Hazard Mitigation Planning





Inventory of Community Assets.

The City of Hanley Falls compiled a list of community assets shown in Table 85, including major employers, vulnerable populations in multi-family housing complexes, historical structures, and institutional facilities (Critical Facilities). The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values (when data is available).

Table 85. City of Hanley Falls – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1*	47,628	$303,400*	$3,286,332	$4,929,498	$6,048,756
Commercial 1	7,416	$65,800	$645,192	$645,192	$222,480
Commercial 2	17,680	$29,700	$1,626,560	$1,626,560	$530,400
Multi-Family Housing					
12-Unit Low Income Apartments	8,830	$51,900	$865,340	$432,670	n/a
Historical Structures					
Yellow Medicine County Machinery Museum	7,330	$168,000	$828,290	$828,290	n/a
Institutional Buildings					
Hanley Falls Community Center/City Hall	960	$80,600	$84,480	$84,480	$257,305
Hanley Falls Fire Hall	7,800	$180,600	$686,400	$686,400	$70,407
Hanley Falls Water Treatment Center	600	$44,000	$52,800	$52,800	$257,305

*Industry 1 includes seven bins totaling 40,000 bushels, 80,000 bushels, 135,900 bushels, 39,200 bushels, 2,020 bushels, 20,000 bushels, and 190,350 bushels. Also included are two bins of 45 tons and 25 tons, and one container that can store up to 35,200 cubic feet.

City of Hazel Run, Minnesota

Existing Development Trends.

According to U.S. Census Bureau 2008 population estimate, the City of Hazel Run's population is 55 and contains 26 households. The population trends noted in Chapter 2: Community Profile for the City of Hazel Run illustrated a general decrease in population and number of households from 1970 to 2008 estimate, with the greatest population losses occurring from 1970 to 1980 (19%), and from 1990 to 2000 (21%). The population appears to have stabilized from 2000 to 2008, with a minor loss of 3 percent. Throughout the past decade, Hazel Run's economic situation has remained stable as the city has not annexed any land, nor have any development/redevelopment projects occurred. The City of Hazel Run's general land use category breakdown exists as the following show in Table 86 below.

Table 86. City of Hazel Run – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	35	48.61%
Commercial	11	15.28%
Agricultural	12	16.67%
Government	8	11.11%
Religious	4	5.56%
Total	**72**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Hazel Run does not have a specific future growth plan. Rather, the community is more focused on citizen and business retention. Generally, the City would like to increase population and housing units, as well as create new business opportunities; however that is not the focal drive for the future.

Vulnerability Assessment of Structures by Hazard.

The City of Hazel Run has attempted to reduce the vulnerability of special high-risk population, by increasing handicap-accessibility on community buildings. In 2004, the City built a handicap-accessible ramp, bathroom, and installed doors on City Hall; with later renovations in 2008 installing a curb cut increasing access from the street to City Hall.

Of the three natural hazards selected as most likely to affect a city, two of the hazards do not apply to the City of Hazel Run. Hazel Run does not have 100-year floodplains or a dam, thus the City opted to perform a risk analysis on three potential hazardous events including: tornado, transportation of hazardous materials, and structure fire at Farmer's Co-op Grain Elevator of Hazel Run. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Hazel Run are defined as follows, Tables 87, 88, and 89 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Hazel Run Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The Critical Facilities listed in Table 87, include Hazel Run's Fire Hall and City Hall. As shown in Table 87 and Figure 27 (following page), the estimated devastation value of an F4 or F5 tornado is $2,894,130 dollars affecting 59 parcels.

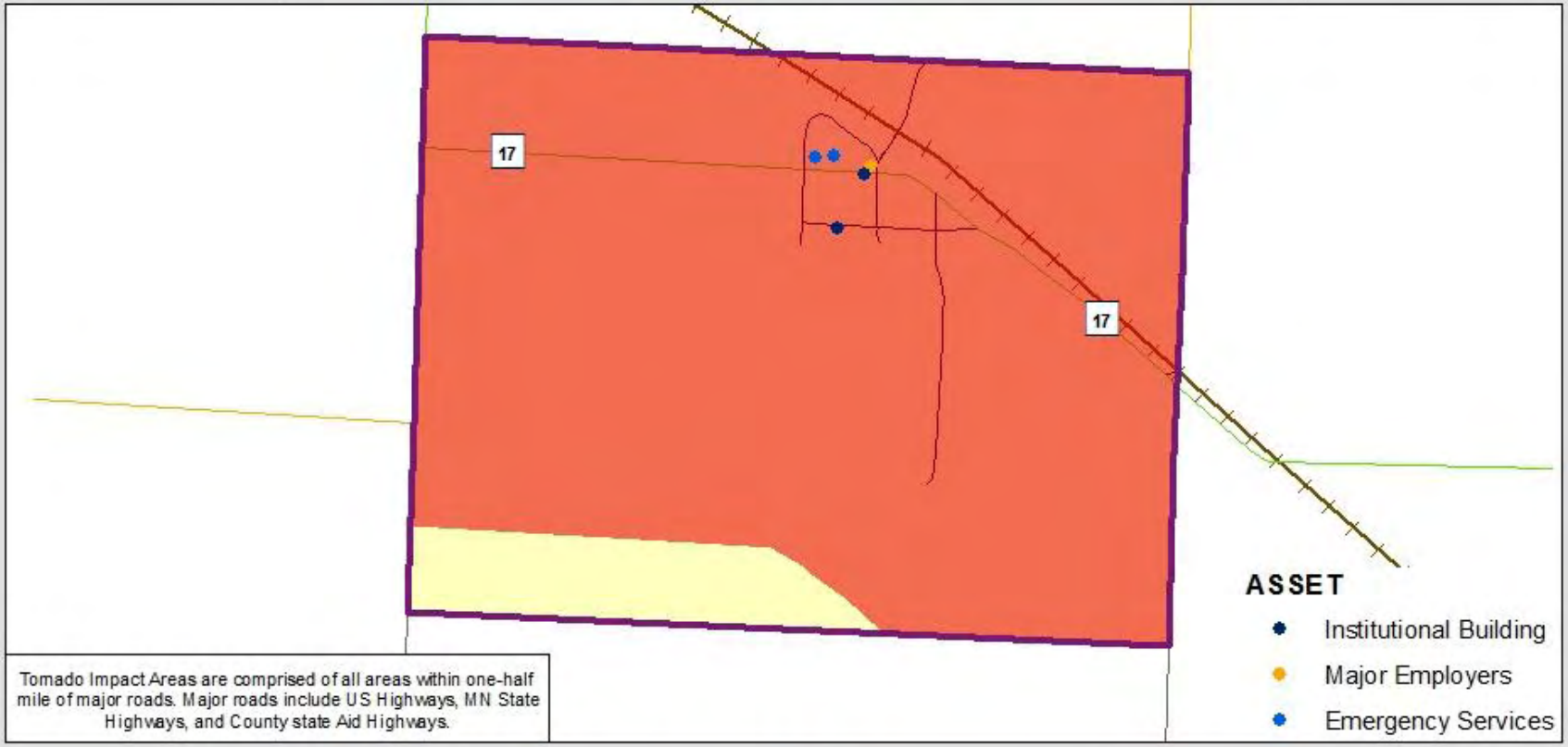
Table 87. Hazel Run Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	30	27	$1,048,600	$943,740
Commercial	11	10	$79,100	$71,190
Industrial	0	0	$0	$0
Agricultural	12	11	$1,524,600	$1,372,140
Religious/ Non-profit	4	4	$472,300	$425,070
Government	4	4	$6,600	$5,940
Education	0	0	$0	$0
Utilities	2	2	$74,000	$66,600
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	2	$10,500	$9,450
Total	**65**	**59**	**$3,215,700**	**$2,894,130**

Figure 27: Hazel Run Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan



Hazel Run City Boundary

Tornado Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.1 0.2 0.4 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Hazel Run Hazard 2. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. As shown in Table 88: 4 of 30 residential parcels and all commercial, agricultural, religious, government, utility, and critical facility parcels are within a two-block radius of County Highway 17. The total amount of predicted devastation is $2,306,913 dollars affecting 39 parcels, shown on Figure 28 (following page). This amounts to approximately 72 percent of the total City value and 60 percent of the total number of parcels in the City.

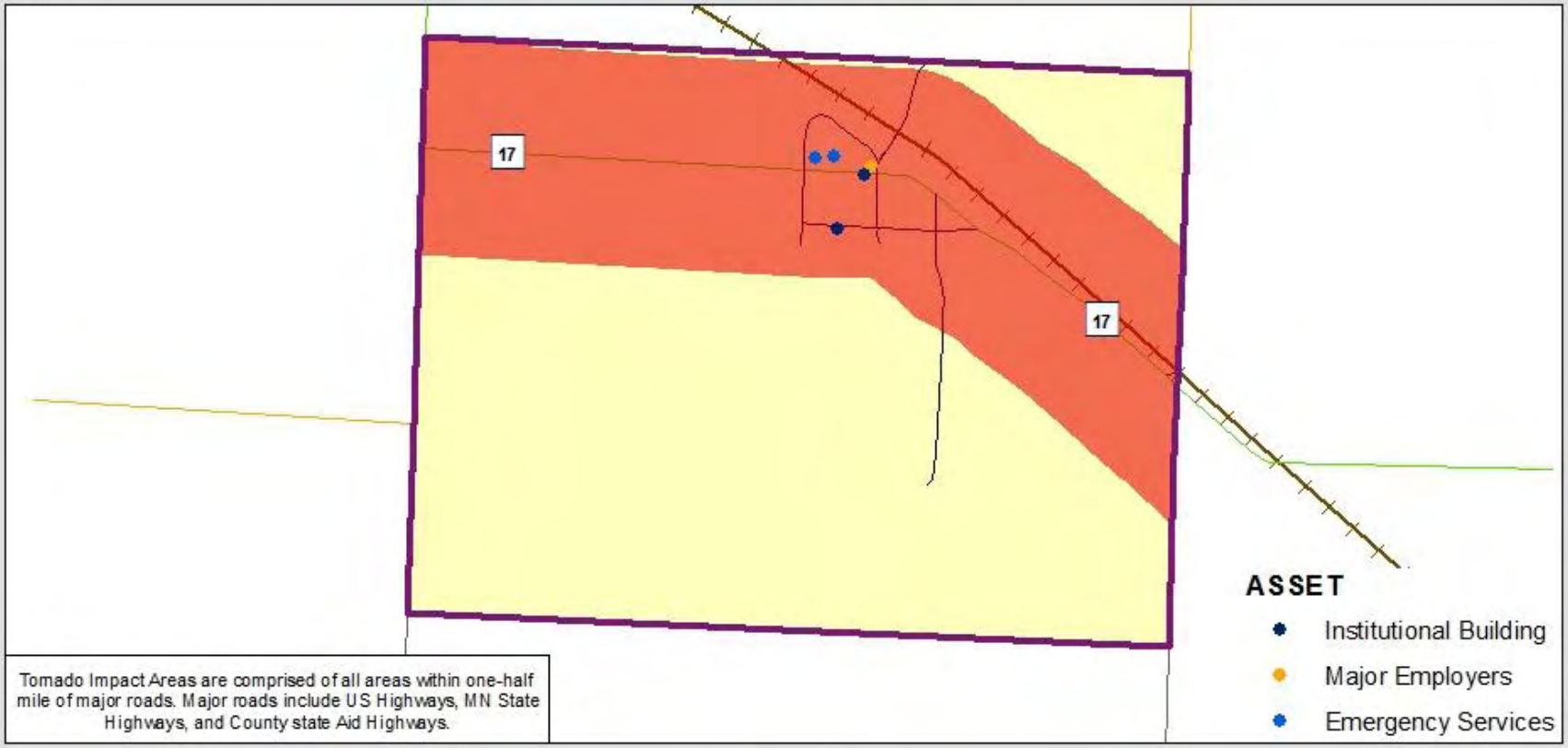
Table 88. Hazel Run Hazard 2: Transportation of Hazardous Materials

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	30	4	$1,048,600	$139,813
Commercial	11	11	$79,100	$79,100
Industrial	0	0	$0	$0
Agricultural	12	12	$1,524,600	$1,524,600
Religious/ Non-profit	4	4	$472,300	$472,300
Government	4	4	$6,600	$6,600
Education	0	0	$0	$0
Utilities	2	2	$74,000	$74,000
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	2	$10,500	$10,500
Total	**65**	**39**	**$3,215,700**	**$2,306,913**

Figure 28: Hazel Run Hazard 2: Transportation of Hazardous Materials

Yellow Medicine County

All Hazard Mitigation Plan



Hazel Run Hazard 3. Destruction of Grain Elevator

The third hazard area concerned destruction of Hazel Run's Grain Elevator. The hazard area for the structure fire is a two-block radius surrounding the grain elevator and any structure within this area was included. Twenty-nine parcels were found to be in the hazard area of the grain elevator, including four residences and all commercial and utility parcels as indicated on Table 89 and Figure 29 (following page). The total predicted destruction value of the Grain Elevator in Hazel Run is $292,913 dollars, approximately 9 percent of the total City value.

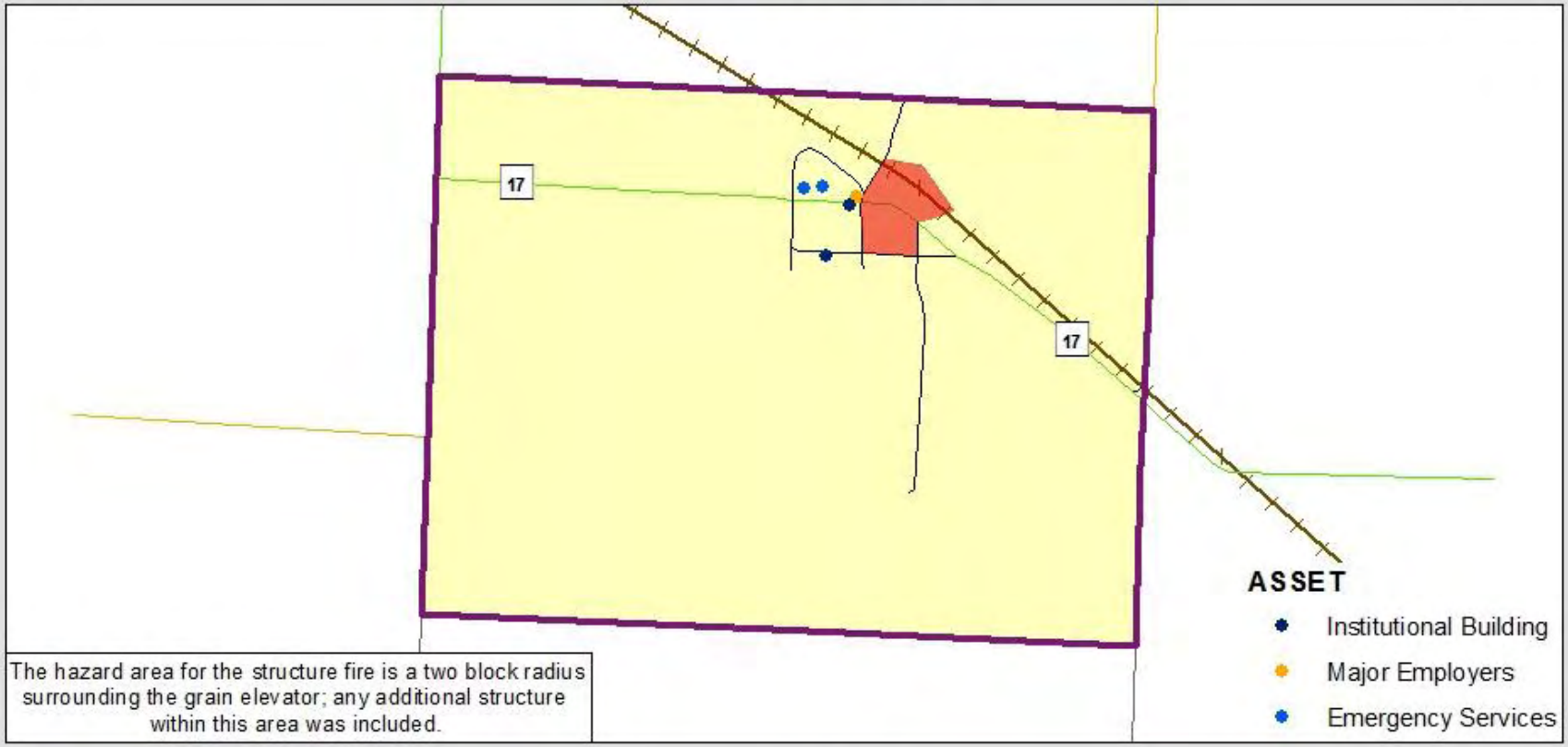
Table 89. Hazel Run Hazard 3: Destruction of Grain Elevator

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	30	4	$1,048,600	$139,813
Commercial	11	11	$79,100	$79,100
Industrial	0	0	$0	$0
Agricultural	12	0	$1,524,600	$0
Religious/ Non-profit	4	0	$472,300	$0
Government	6	0	$6,600	$0
Education	0	0	$0	$0
Utilities	2	2	$74,000	$74,000
Hazardous Facility	0	0	$0	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$10,500	$0
Total	**67**	**29**	**$3,215,700**	**$292,913**

Figure 29: Hazel Run Hazard 3: Destruction of Grain Elevator

Yellow Medicine County

All-Hazard Mitigation Planning



Hazel Run City Boundary

Hazardous Materials Impact Area

ROADS

Township Roads

County State Aid Highway

MN Trunk Highway

U.S. Highway

Railroad

N

0 0.1 0.2 0.4 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of Hazel Run compiled a list of community assets shown in Table 90, including major employers, and institutional facilities (Critical Facilities and churches). The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 90. City of Hazel Run – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Commercial 1	9,901*	$44,800	$683,169	$683,169	$425,743
Institutional Buildings					
Hazel Run City Hall	Unknown	$4,500	Unknown	Unknown	**
Hazel Run Fire Hall	Unknown	$600	Unknown	Unknown	**
Hazel Run Evangelical Lutheran Church	Unknown	$400,000	Unknown	Unknown	**

*Hazel Run Lumberyard includes five pole sheds, three buildings, and a tank with a total capacity of 4,200 gallons. Market value includes the values for all above structures.
**Data Unavailable.

City of Porter, Minnesota

Existing Development Trends.

According to U.S. Census Bureau 2008, the City of Porter population is 163 and contains 78 households. The population trends noted in Chapter 2: Community Profile for the City of Porter illustrates a steady decrease from 1980 to 2008, with the first large decrease from 210 persons to 190 (10.5%) from 1990 to 2000. The second decrease occurred from 2000 to the estimated population in 2008, from 190 to 163 (14.3%). The overall number of households from 1980 to 2008 has remained relatively stable shifting between 88 (1980-2000) to 78 (2005-2008).

Throughout the past decade, Porter economic situation has remained stable and the city has not annexed any land. Two land redevelopments projects took place in the past five years. A residential home was converted to industrial use, by the company S.M.I. Hydraulics and another residential home became commercial, courtesy of A-Z Recycling Company. Two development projects within the city recently completed concern additions to the Fire Hall in 2009 and the Community Center in 2006-2007. Porter has a small strip of land designated as 100-year floodplain surrounding the creek (North Branch of Yellow Medicine River) that runs through the town in the southeastern corner, with the dominant land use of agriculture and no future development is slated for the floodplain area. The City of Porter general land use category breakdown exists as the following show in Table 91 below.

Table 91. City of Porter – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	109	69.43%
Commercial	21	13.38%
Agricultural	12	7.64%
Government	20	12.66%
Religious	2	1.27%
Industrial	4	2.55%
Total	**157**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Porter has designated three areas designated for future growth, all within existing city limits. Industrial growth is slated to occur east of current residential housing. This land is in two pieces that would be connected to the city road grid with an additional road heading east. The City intends to support residential growth west of current residential housing, south of CSAH 68 and currently owns this portion of land have an easement in place for a future residential street. None of this future development is located in hazard areas defined later in this section, aside from a potential tornado event.

Vulnerability Assessment of Structures by Hazard.

The City of Porter has attempted to reduce the vulnerability of special high-risk population, by participating in "Meals on Wheels" run by Prairie 5 through Yellow Medicine County. Other actions to reduce vulnerability include the Fire Hall expansion by increasing handicap accessibility through safety lighting, repavement of a handicap parking stall, and an ADA

bathroom. The Fire Hall acts as the site for city voting and city council meetings, with the ability to accommodate all populations.

Of the three natural hazards selected as most likely to affect a city, one of the hazards does not apply to the City of Porter. Porter does not have a dam, thus the City opted to perform a risk analysis on three potential hazardous events including: tornado, 100-year flood, and a dike failure. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Porter are defined as follows. Tables 92, 93, and 94 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Porter Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facilities listed in Table 92, include Porter Fire Hall and Porter Community Center and the Hazardous Facilities include an anhydrous ammonia tank*, and two other "industry" businesses. As shown in Table 92 and Figure 30 (following page), the estimated devastation value of an F4-F5 tornado is $7,850,070 dollars affecting 148 parcels.

Table 92. Porter Hazard 1: F4-F5 Tornado

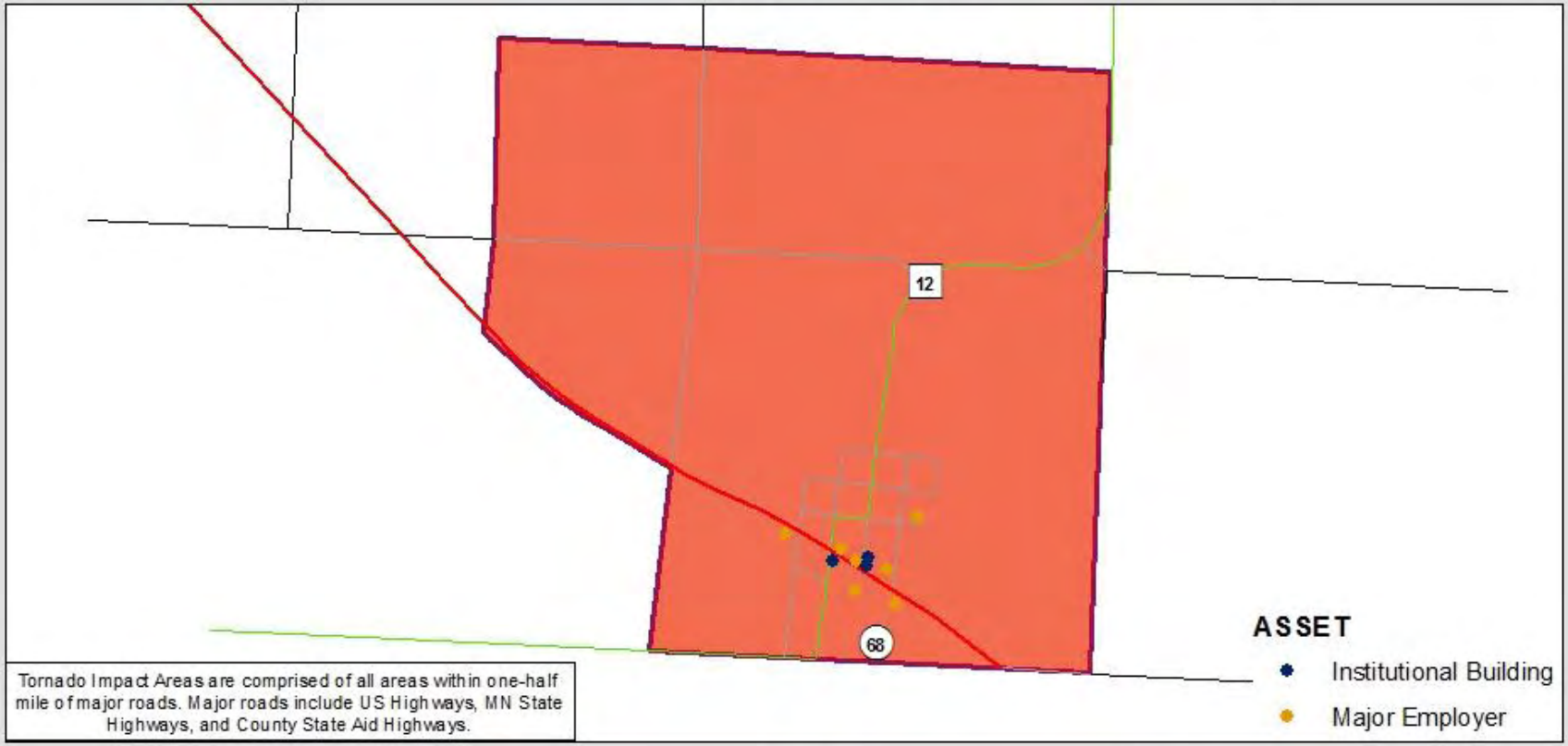
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	103	93	$3,858,300	$3,472,470
Commercial	19	17	$382,900	$344,610
Industrial	0	0	$0	$0
Agricultural	12	11	$3,079,800	$2,771,820
Religious/ Non-profit	2	2	$2,500	$2,250
Government	20	18	$162,700	$146,430
Education	0	0	$0	$0
Utilities	3	3	$181,100	$162,990
Hazardous Facility	3	3	$958,300	$862,470
Dam	0	0	$0	$0
Critical Facilities	2	2	$96,700	$87,030
Total	**164**	**148**	**$8,722,300**	**$7,850,070**

* The value was unavailable for the tank, thus the entire value of the Porter Elevator was utilized.

Figure 30: Porter Hazard 1: F4-F5 Tornado

Yellow Medicine County

All-Hazard Mitigation Planning



Porter City Boundary

Tornadao Impact Area

ROADS

Municipal Roads

County Road

Township Roads

County State Aid Highway

MN Trunk Highway

N

0 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Porter Hazard 2. 100-Year Flood Event

The second hazard boundary area was for a 100-year flood event. The boundaries used to determine the 100-year floodplains were obtained from FEMA's Flood Insurance Rate Maps. Approximately 14 acres are located within Porter. The floodplain's land use is currently agricultural cropland and contains no structures, with no future development prospects. Other natural features within the 100-year floodplain include the North Branch of Yellow Medicine River (creek) and a dike. As shown in Table 93 and Figure 31 (following page), no structures are located within the 100-year floodplain and a 100-year flood would cause no fiscal damage to the City of Porter.

Table 93. Porter Hazard 2: 100-Year Flood Event

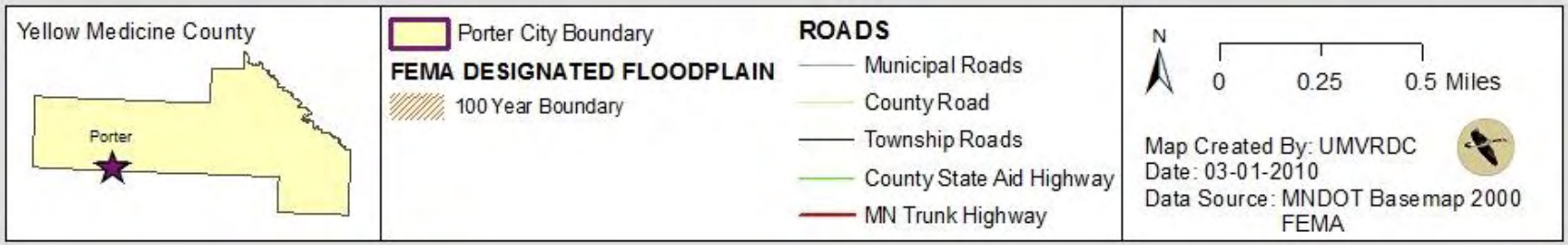
Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	103	0	$3,858,300	$0
Commercial	19	0	$382,900	$0
Industrial	0	0	$0	$0
Agricultural	12	0	$3,079,800	$0
Religious/ Non-profit	2	0	$2,500	$0
Government	20	0	$162,700	$0
Education	0	0	$0	$0
Utilities	3	0	$181,100	$0
Hazardous Facility	3	0	$958,300	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$96,700	$0
Total	**164**	**0**	**$8,722,300**	**$0**

Figure 31: Porter Hazard 2: 100-Year Flood Event

Yellow Medicine County

All-Hazard Mitigation Planning

Floodplains have been designated by the Federal Emergency Management Agency (FEMA). A 100 year floodplain represents the area in which there is a 1% chance every year a flood could occur. A 500 year floodplain represents the area in which there is a .2% chance every year a flood could occur.



Porter Hazard 3. Dike Failure

The third hazard area concerns a dike failure located east of city limits that acts as a barrier to the Yellow Medicine River 100-year floodplains. If a breech occurred, it was assumed that all parcels, and their associated structures, would be impacted. It was estimated that the damage would not be absolute, thus percentages were used to approximate damage amounts. It was assumed that residential, government, and critical facilities would have an impact of 25 percent (basement flooding and insulation replacement); commercial, industrial, agricultural, and hazardous facilities would have an impact of 30 percent; and utilities an impact of 10 percent. These percentages were multiplied against the total value amount found in the $ in Community column in Table 94 below to determine the value in hazard area. The total predicted destruction value of a flood event due to a dike failure in Porter is $2,333,785 dollars, approximately 27 percent of the total City value. A visual interpretation is provided in Figure 32 (following page).

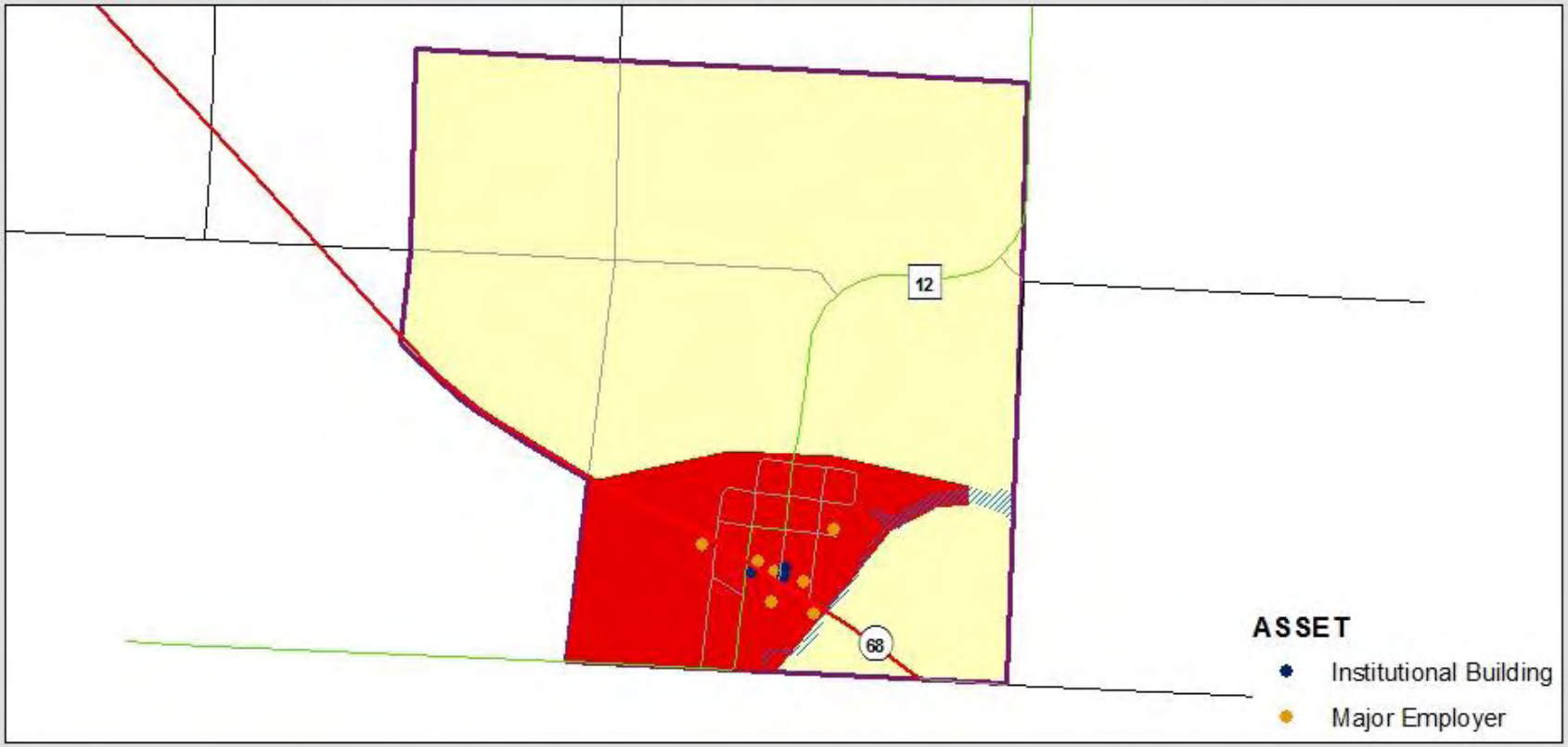
Table 94. Porter Hazard 3: Dike Failure

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	103	103	$3,858,300	$964,575
Commercial	19	19	$382,900	$114,870
Industrial	0	0	$0	$0
Agricultural	12	12	$3,079,800	$923,940
Religious/ Non-profit	2	2	$2,500	$625
Government	20	20	$162,700	$0
Education	0	0	$0	$0
Utilities	3	3	$181,100	$18,110
Hazardous Facility	3	3	$958,300	$287,490
Dam	0	0	$0	$0
Critical Facilities	2	2	$96,700	$24,175
Total	**164**	**164**	**$8,722,300**	**$2,333,785**

Figure 32: Porter Hazard 3: Dike Failure

Yellow Medicine County

All-Hazard Mitigation Planning



Inventory of Community Assets.
The City of Porter compiled a list of community assets shown in Table 95, including major employers and institutional facilities (Critical Facilities). The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values (when data is available).

Table 95. City of Porter – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1	97,940	$851,500	$6,561,980	$6,561,980	$2,938,200
Industry 2*	22,922	$165,400*	$1,581,618	$2,372,427	$2,911,094
Commercial 1	3,600	$134,600	$313,200	$313,200	$108,000
Commercial 2	3,072	$12,000	$205,824	$205,824	$92,160
Commercial 3	1,200	$43,900	$80,400	$80,400	$36,000
Commercial 4	3,600	$106,800	$241,200	$241,200	$108,000
Institutional Buildings					
Fire Hall	7,100	$75,500	$624,800	$937,200	$45,950
Community Center	6,000	$21,200	$528,000	$528,000	$780
Porter Post Office	400	$42,900	$35,200	$35,200	**

* Industry 2 includes ten storage bins with capacities of 31,000 bushels, 50,000 bushels, 60,000 bushels, 1,000 bushels, 113,940 bushels, 113940 bushels, 40,000 bushels, 50,000 bushels, 50,000 bushels, and 15,000 bushels. Also included in this value is one bin that can store up to 10,000 cubic feet and one 15,000 gallon tank.
** Data unavailable.

City of St. Leo, Minnesota

Existing Development Trends.

According to U.S. Census Bureau 2008 population estimate, the City of St. Leo's population is 91 and contains 49 households. The population trends noted in Chapter 2: Community Profile for the City of St. Leo illustrated a general decrease in population and number of households from 1970 to 2008 estimate, with the greatest population losses occurring from 1980 to 1990 (24%), and from 2000 to 2008 (14%). The number of households appeared to have stabilized from 1980 to 2008, with an overall loss of eight units. Throughout the past decade, St. Leo's economic situation has remained stable as the city has not annexed any land, nor have any development/redevelopment projects occurred. The City of St. Leo's general land use category breakdown exists as the following show in Table 96 below.

Table 96. City of St. Leo – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	54	71.05%
Commercial	6	7.89%
Agricultural	6	7.89%
Government	9	11.84%
Religious	1	1.32%
Total	**76**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of St. Leo does not have a specific future growth plan. Rather, the community is more focused on citizen and business retention. Generally, the City would like to increase population and housing units, as well as create new business opportunities; however that is not the focal drive for the future.

Vulnerability Assessment of Structures by Hazard.

The City of St. Leo has attempted to reduce the vulnerability of special high-risk population, by participating in the Meals on Wheels program supplying seniors for the past two years.

Of the three natural hazards selected as most likely to affect a city, two of the hazards do not apply to the City of St. Leo. St. Leo does not have 100-year floodplains or a dam, thus the City opted to perform a risk analysis on three potential hazardous events including: tornado, transportation of hazardous materials, and an ammonia leak from a fertilizer storage tank. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for St. Leo are defined as follows, tables 97, 98, and 99 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

St. Leo Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facility listed in Table 97, is St. Leo's Community Center/Fire Hall and the Hazardous Facility is a fertilizer storage tank. As shown in Table 97 and Figure 33 (following page), the estimated devastation value of an F4-F5 tornado is $3,459,780 dollars affecting 67 structures.

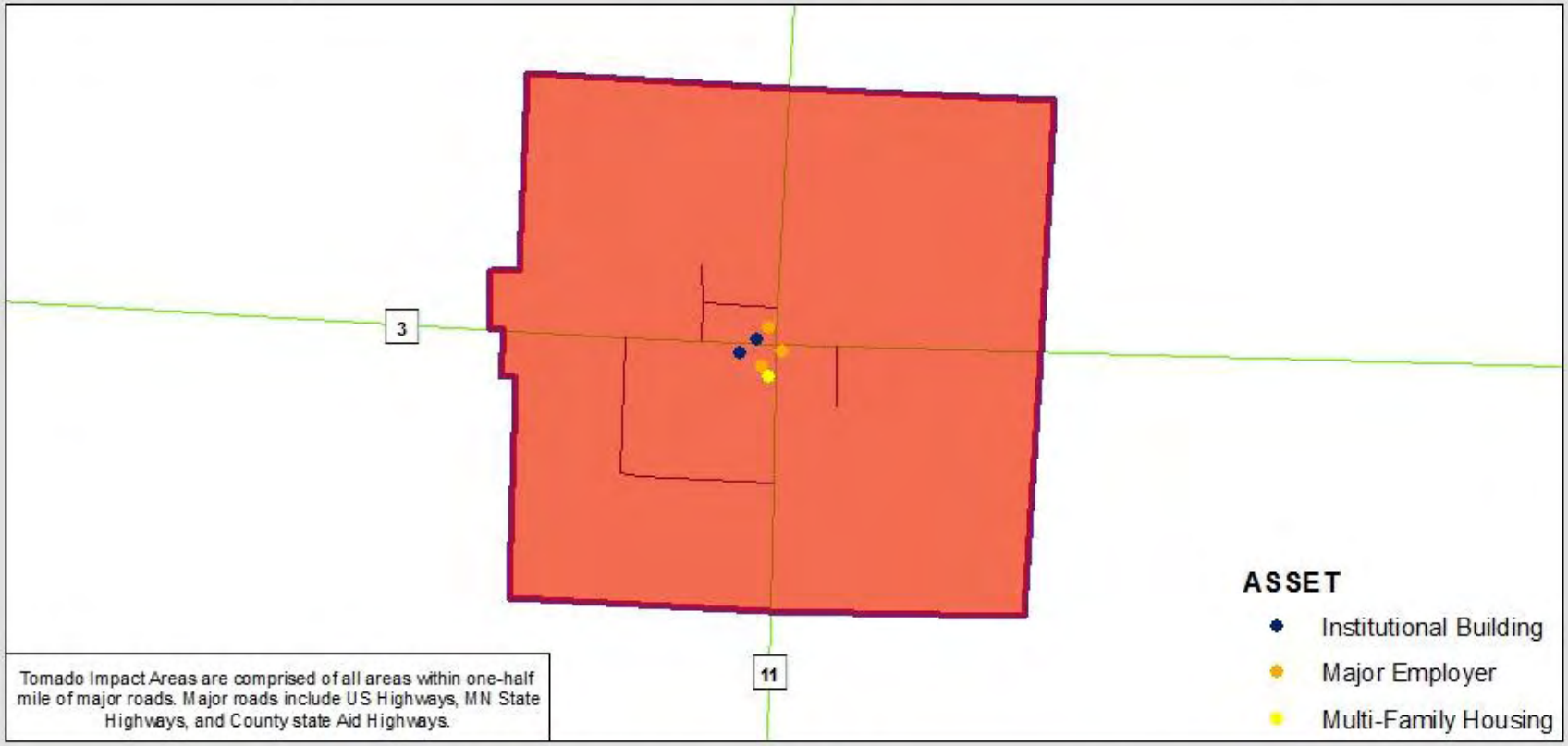
Table 97. St. Leo Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	51	46	$1,955,200	$1,759,680
Commercial	6	5	$83,600	$75,240
Industrial	0	0	$0	$0
Agricultural	5	5	$623,500	$561,150
Religious/ Non-profit	1	1	$926,600	$833,940
Government	8	7	$143,300	$128,970
Education	0	0	$0	$0
Utilities	1	1	$52,000	$46,800
Hazardous Facility	1	1	$12,500	$11,250
Dam	0	0	$0	$0
Critical Facilities	1	1	$47,500	$42,750
Total	**74**	**67**	**$3,844,200**	**$3,459,780**

Figure 33: St. Leo Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan



St Leo City Boundary

Tornado Impact Area

ROADS

- Township Roads
- County Road
- County State Aid Highway
- MN Trunk Highway
- U.S. Highway

N

0 0.05 0.1 0.2 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

St. Leo Hazard 2. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. As shown in Table 98, all structures within St. Leo would be affected by a transportation route as the community is bisected by two major roads (County Highway 3 and County Highway 11). The total amount of predicted devastation is $3,844,200 dollars affecting 74 structures (Figure 34-following page).

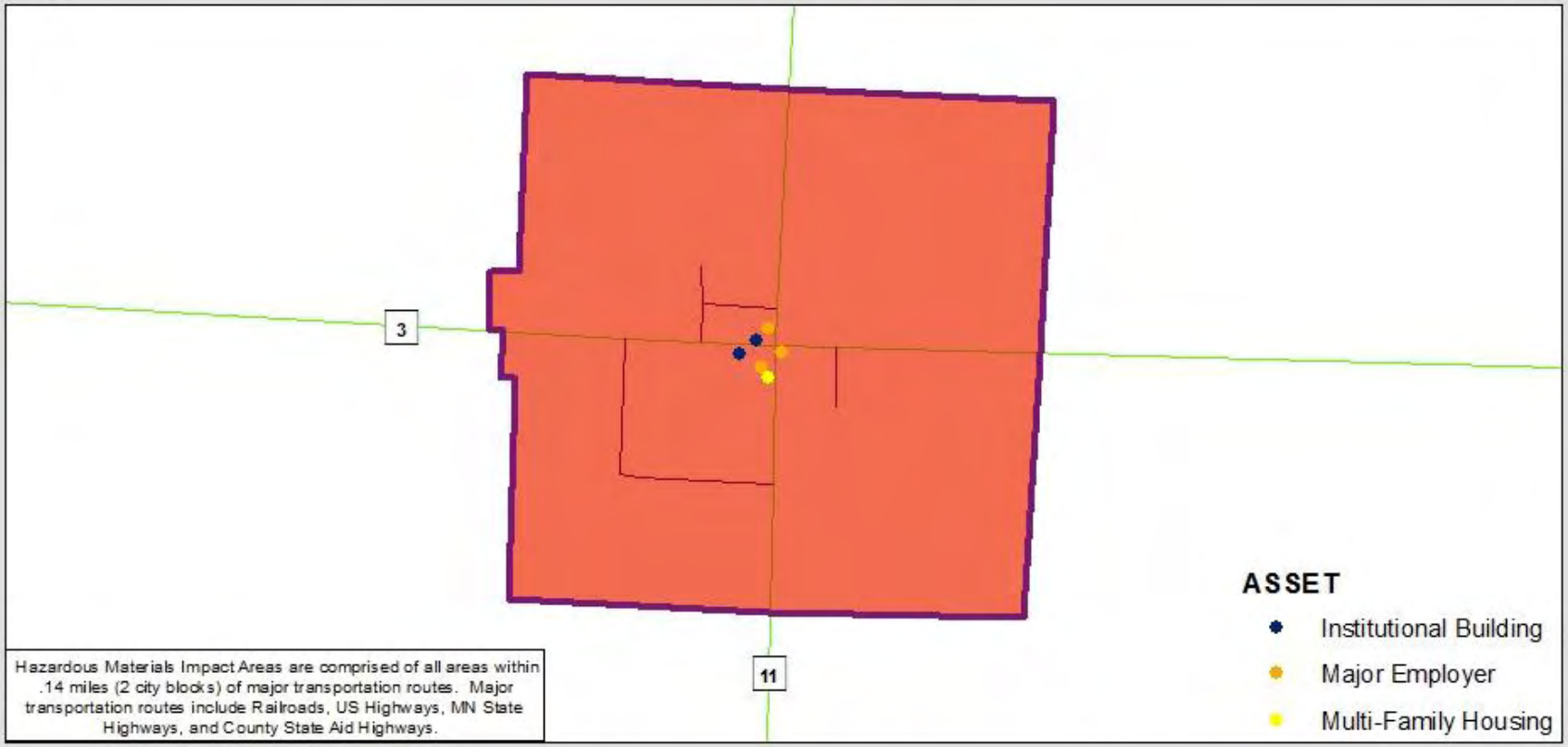
Table 98. St. Leo Hazard 2: Transportation of Hazardous Materials

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	51	51	$1,955,200	$1,955,200
Commercial	6	6	$83,600	$83,600
Industrial	0	0	$0	$0
Agricultural	5	5	$623,500	$623,500
Religious/ Non-profit	1	1	$926,600	$926,600
Government	8	8	$143,300	$143,300
Education	0	0	$0	$0
Utilities	1	1	$52,000	$52,000
Hazardous Facility	1	1	$12,500	$12,500
Dam	0	0	$0	$0
Critical Facilities	1	1	$47,500	$47,500
Total	**74**	**74**	**$3,844,200**	**$3,844,200**

Figure 34: St. Leo Hazard 2: Transportation of Hazardous Materials

Yellow Medicine County

All Hazard Mitigation Plan



St. Leo Hazard 3. Ammonia leak from WestCon Fertilizer Storage Tank

The third hazard area concerned an ammonia leak from a fertilizer storage tank. The hazard area for this hazard was based on a historical event, where three residential homes retained physical damage from an ammonia leak. The total predicted destruction value of an ammonia leak in St. Leo is $115,012 dollars, approximately 3 percent of the total City value, shown in Table 99. This particular event affected no person; however, pending wind speed and direction an ammonia leak could cause much human causality (Figure 35 – following page).

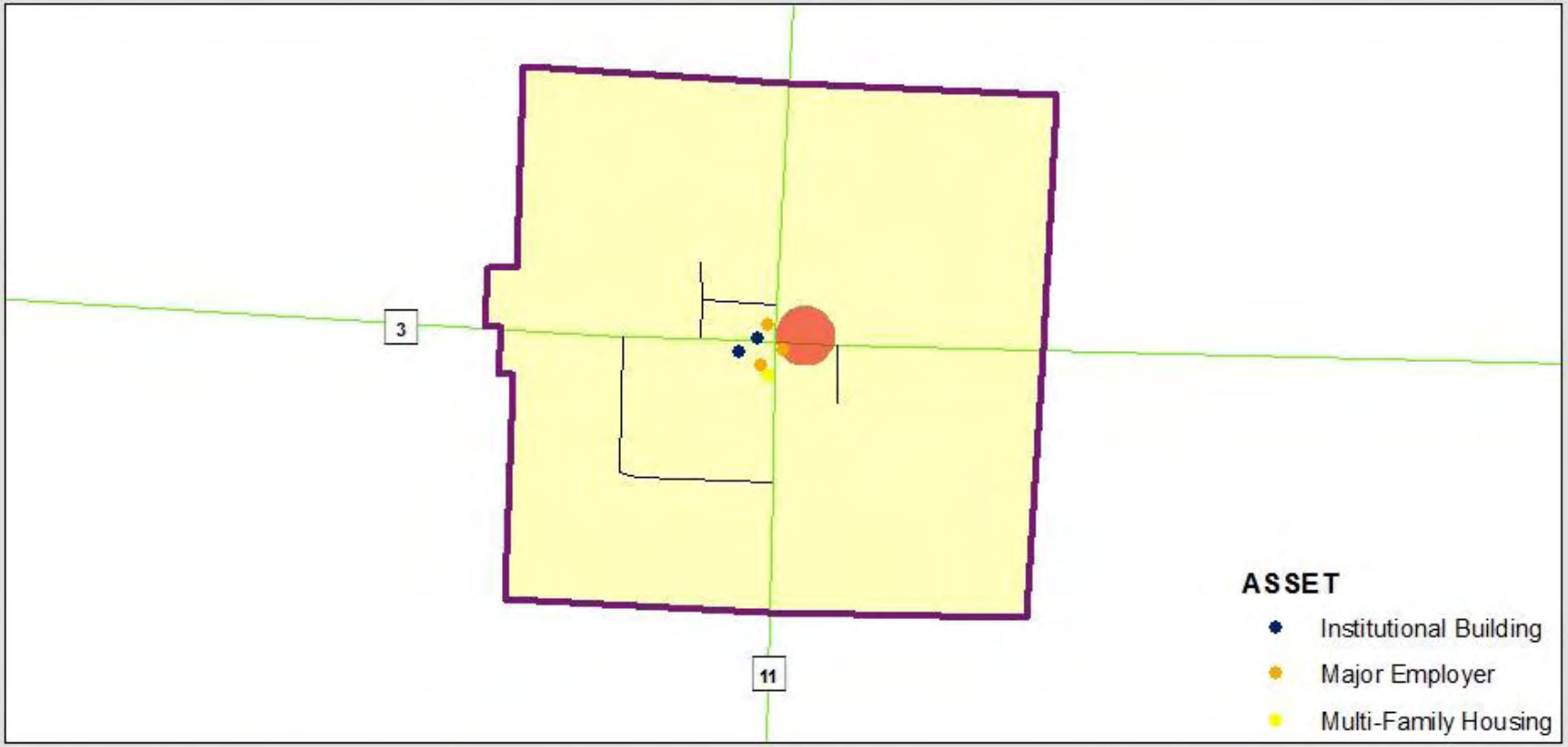
Table 99. St. Leo Hazard 3: Ammonia leak from WestCon Fertilizer Storage Tank

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	51	3	$1,955,200	$115,012
Commercial	6	0	$83,600	$0
Industrial	0	0	$0	$0
Agricultural	5	0	$623,500	$0
Religious/ Non-profit	1	0	$926,600	$0
Government	8	0	$143,300	$0
Education	0	0	$0	$0
Utilities	1	0	$52,000	$0
Hazardous Facility	1	0	$12,500	$0
Dam	0	0	$0	$0
Critical Facilities	1	0	$47,500	$0
Total	**74**	**3**	**$3,844,200**	**$115,012**

Figure 35: St. Leo Hazard 3: Ammonia leak from WestCon Fertilizer Storage Tank

Yellow Medicine County

All Hazard Mitigation Plan



St Leo City Boundary

Ammonia Leak Impact Area

ROADS

Township Roads

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.05 0.1 0.2 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of St. Leo compiled a list of community assets shown in Table 100, including major employers, vulnerable populations in multi-family housing complexes, and institutional facilities (Critical Facilities and church). The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 100. City of St. Leo – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1*	8,780	$46,400	$228,280	$228,280	$782,740
Commercial 1	1,108	$21,400	$74,236	$74,236	$33,240
Commercial 2	2,573	$60,000	$136,369	$136,369	$110,639
Multi-Family Housing Complex					
St. Leo Housing	3,270	$204,500	$320,460	n/a	n/a
Institutional Buildings					
St. Leo Community Center/Fire Hall	3,330	$47,500	$293,040	$439,560	$9,000
Church of St. Leo	**	$921,100	**	**	$97,600

*Industry 1 also has a 2,880 cubic foot structure, as well as seven tanks with a total capacity of 41,500 gallons. The values for these structures are included in the 2009 market value price.
**Data Unavailable.

City of Wood Lake, Minnesota

Existing Development Trends.

According to U.S. Census Bureau 2008 population estimate, the City of Wood Lake's population is 381 and contains 175 households. The population trends noted in Chapter 2: Community Profile for the City of Wood Lake illustrated a "peaks and valley" population change from 1970 to 2008. From 1980 to 1990, the population decreased by 3%, followed by an increase of 7% in the following decade, with a final decrease of 13% from 2000 to the estimated 2008 population count. Throughout the past decade, Wood Lake's economic situation has remained stable as the City has not annexed any land, nor have any development/redevelopment projects occurred. The City of Wood Lake's general land use category breakdown exists as the following show in Table 101 below.

Table 101. City of Wood Lake – Land Use Category Allotments

Land Use Type	Parcel Count	Percent of Area
Residential	196	69.50%
Commercial	34	12.06%
Agricultural	16	5.67%
Government	25	8.87%
Religious	5	1.77%
Industrial	6	2.13%
Total	**282**	**100.00%**

Source: Yellow Medicine County Assessor, 2009

Potential for Future Growth and Development.

The City of Wood Lake has two specified areas for future growth and development projects. The city has planned a commercial and industrial growth area north of the city and intends to replace an empty school within the south-central portion of the City to a residential housing development and commercial development along Highway 274.

Vulnerability Assessment of Structures by Hazard.

The City of Wood Lake has attempted to reduce the vulnerability of special high-risk population, by participating in the Meals on Wheels program supplying seniors and serviced by the City of Echo.

Of the three natural hazards selected as most likely to affect a city, two of the hazards do not apply to the City of Wood Lake. Wood Lake does not have 100-year floodplains or a dam, thus the City opted to perform a risk analysis on three potential hazardous events including: tornado, transportation of hazardous materials, and an ammonia leak from a fertilizer storage tank. Each hazard was assigned a boundary and all structures within that boundary were identified and assessed by Yellow Medicine County Assessor 2009 market values. Hazard areas for Wood Lake are defined as follows, tables 102, 103, and 104 display the potential total number of structures that may be affected by the mentioned hazards within the defined hazard areas, in addition to a predicted devastation amount provided by 2009 assessed market values.

Wood Lake Hazard 1. F4 – F5 Tornado

According to the National Weather Service, an acceptable method to estimate damage from a F4 or F5 tornado in a small community would be to model the situation after the event that occurred in Greensburg, Kansas with a population of approximately 1,500 people. The devastation was vast, totaling around $250 million dollars – approximately ninety-five percent of the city was ruined. To model an F4 or F5 tornado, the National Weather Service suggested approximating that ninety percent of each land use category be considered demolished and totaling those losses for a final prediction of devastation, produced by 2009 market values. The critical facilities listed in Table 102, are Wood Lake's Community Center and Fire Hall and the Hazardous Facility is a 30,000 gallon anhydrous/ammonia fill station tank. As shown in Table 102 and Figure 36 (following page), the estimated devastation value of an F4- F5 tornado is $12,971,250 dollars affecting 244 structures.

Table 102. Wood Lake Hazard 1: F4-F5 Tornado

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	184	166	$9,342,300	$8,408,070
Commercial	34	31	$796,900	$717,210
Industrial	5	5	$1,222,900	$1,100,610
Agricultural	15	14	$1,313,800	$1,182,420
Religious/ Non-profit	5	5	$503,400	$453,060
Government	23	21	$686,200	$617,580
Education	0	0	$0	$0
Utilities	2	2	$61,600	$55,440
Hazardous Facility	1	1	$14,400	$12,960
Dam	0	0	$0	$0
Critical Facilities	2	2	$471,000	$423,900
Total	**271**	**244**	**$14,412,500**	**$12,971,250**

Figure 36: Wood Lake Hazard 1: F4-F5 Tornado

Yellow Medicine County

All Hazard Mitigation Plan

Wood Lake City Boundary

Tornado Impact Area

ROADS

- Township Road
- County Road
- County State Aid Highway
- MN Trunk Highway
- U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Wood Lake Hazard 2. Transportation of Hazardous Materials

The second hazard boundary area was for the transportation of hazardous materials. The specific hazardous materials were not identified and could potentially take form as a solid, liquid, or gas and each have the ability to affect structure differently, thus any structure within a two-block area around any major transportation route including state/county highways and railroads was identified. As shown in Table 103 and Figure 37 (following page), 131 of 184 residential parcels would be affected in addition to all commercial, industrial, agricultural businesses, and government-owned parcels. The total amount of predicted devastation is $11,721,511 dollars affecting 218 structures, approximately 80 percent of the city's total value.

Table 103. Wood Lake Hazard 2: Transportation of Hazardous Materials

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	184	131	$9,342,300	$6,651,311
Commercial	34	34	$796,900	$796,900
Industrial	5	5	$1,222,900	$1,222,900
Agricultural	15	15	$1,313,800	$1,313,800
Religious/ Non-profit	5	5	$503,400	$503,400
Government	23	23	$686,200	$686,200
Education	0	0	$0	$0
Utilities	2	2	$61,600	$61,600
Hazardous Facility	1	1	$14,400	$14,400
Dam	0	0	$0	$0
Critical Facilities	2	2	$471,000	$471,000
Total	**271**	**218**	**$14,412,500**	**$11,721,511**

Figure 37: Wood Lake Hazard 2: Transportation of Hazardous Materials

Yellow Medicine County

All Hazard Mitigation Plan

Wood Lake City Boundary

Hazardous Materials Impact Area

ROADS

Township Road

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC

Date: 03-01-2010

Data Source: MNDOT Basemap 2000

Wood Lake Hazard 3. Anhydrous/Ammonia leak from Fill Station Tank

The third hazard area concerned an anhydrous/ammonia leak from a fill station tank. The hazard area for this hazard was not specifically defined, due to the past historical events. In the past ten years, at least two ammonia leaks have occurred within Wood Lake. Each time, the Fire Department blocked off roads and waited for wind to clear the area. No structures retained any damage, which is illustrated in Table 104 below and Figure 38 (following page); however, pending wind speed and direction an ammonia leak could cause much human causality.

Table 104. Wood Lake Hazard 3: Anhydrous/Ammonia leak from Fill Station Tank

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	184	0	$9,342,300	$0
Commercial	34	0	$796,900	$0
Industrial	5	0	$1,222,900	$0
Agricultural	15	0	$1,313,800	$0
Religious/ Non-profit	5	0	$503,400	$0
Government	23	0	$686,200	$0
Education	0	0	$0	$0
Utilities	2	0	$61,600	$0
Hazardous Facility	1	0	$14,400	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$471,000	$0
Total	**271**	**0**	**$14,412,500**	**$0**

Figure 38: Wood Lake Hazard 3: Anhydrous/Ammonia leak from Fill Station Tank

Yellow Medicine County

All Hazard Mitigation Plan

Wood Lake City Boundary

Ammonia Leak Impact Area

ROADS

- Township Road
- County Road
- County State Aid Highway
- MN Trunk Highway
- U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC
Date: 03-01-2010
Data Source: MNDOT Basemap 2000

Wood Lake Hazard 4. 100-Year Flood Event

The final hazard boundary area was for a 100-year flood event. The boundaries used to determine the 100-year floodplains were obtained from FEMA's Flood Insurance Rate Maps. Approximately 12.7 acres are located within Wood Lake. The floodplain's land use is currently agricultural cropland and contains no structures, with no future development prospects. As shown in Table 105 and Figure 39 (following page), no structures are located within the 100-year floodplain and a 100-year flood would cause no fiscal damage to the City of Wood Lake.

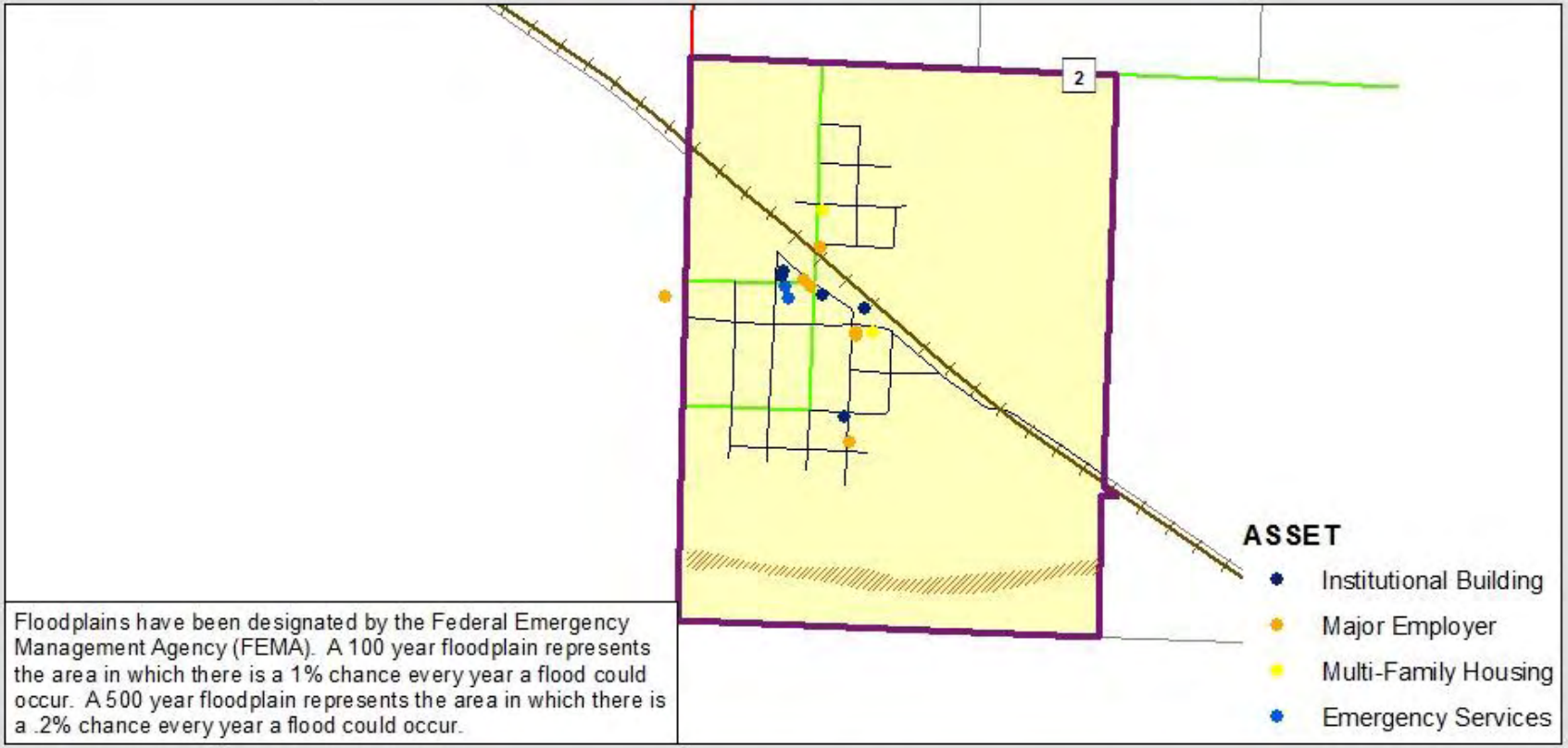
Table 105. Wood Lake Hazard 4: 100-Year Flood Event

Type of Parcel	Number of Parcels		Value of Parcels	
	# in Community	# in Hazard Area	$ in Community	$ in Hazard Area
Residential	184	0	$9,342,300	$0
Commercial	34	0	$796,900	$0
Industrial	5	0	$1,222,900	$0
Agricultural	15	0	$1,313,800	$0
Religious/ Non-profit	5	0	$503,400	$0
Government	23	0	$686,200	$0
Education	0	0	$0	$0
Utilities	2	0	$61,600	$0
Hazardous Facility	1	0	$14,400	$0
Dam	0	0	$0	$0
Critical Facilities	2	0	$471,000	$0
Total	**271**	**0**	**$14,412,500**	**$0**

Figure 39: Wood Lake 4: 100-Year Flood Event

Yellow Medicine County

All Hazard Mitigation Plan



Floodplains have been designated by the Federal Emergency Management Agency (FEMA). A 100 year floodplain represents the area in which there is a 1% chance every year a flood could occur. A 500 year floodplain represents the area in which there is a .2% chance every year a flood could occur.

Wood Lake City Boundary

FEMA DESIGNATED FLOODPLAIN

100-Year Floodplain

ROADS

Township Road

County Road

County State Aid Highway

MN Trunk Highway

U.S. Highway

N

0 0.125 0.25 0.5 Miles

Map Created By: UMVRDC

Date: 03-01-2010

Data Source: MNDOT Basemap 2000

Inventory of Community Assets.
The City of Wood Lake compiled a list of community assets shown in Table 106, including major employers, vulnerable populations in multi-family housing complexes, and institutional facilities. The inventory includes the 2009 market value of all non-exempt assets, and estimated replacement values, content values, and function values.

Table 106. City of Wood Lake – Inventory of Community Assets

Name of Asset	Building Size (Sq.Ft)	Market Value ($)	Replacement Value ($)	Content Value ($)	Function Value ($)
Major Employers					
Industry 1*	43,138	$957,600	$1,121,588	$1,121,588	$3,580,454
Commercial 1	12,912	$196,000	$684,336	$684,336	$555,216
Commercial 2	14,818	$105,100	$785,354	$785,354	$637,174
Commercial 3	2,280	$55,400	$298,680	$298,680	$98,040
Commercial 4	6,935	$54,900	$464,645	$464,645	$208,050
Commercial 5	1,040	$7,900	$69,680	$69,680	$31,200
Professional Service 1	3,776	$79,600	$570,176	$570,176	n/a
Multi-Family Housing Complex					
Apartment 1	15,000	$159,800	$1,470,000	n/a	n/a
Apartment 2	1,716	$81,700	$168,168	n/a	n/a
Institutional Buildings					
Wood Lake Community Center	Unknown	$229,000	**	**	**
Wood Lake Fire Hall	Unknown	$242,000	**	**	**
Methodist Episcopalian Church	Unknown	$70,000	**	**	**
St. John's Lutheran Church	Unknown	$292,000	**	**	**

*Industry 1 also includes two structures with total capacity of 1,013,400 bushels, three structures of 790,200 cubic feet, 400 linear feet, and 280 tons, and a 30,000 gallon tank.
** Data unavailable.