

All-Hazards Mitigation Plan

FOR

Tri-Basin Natural Resources District

Prepared by

Olsson Associates

DRAFT

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**FEMA-1674-DR-NE-XXXX
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Tri-Basin NRD All-Hazards Mitigation Plan

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INTRODUCTION

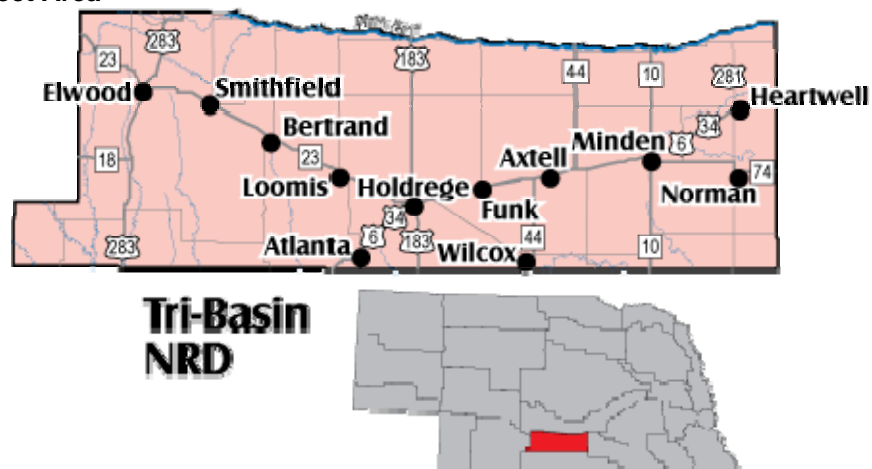
The Tri-Basin Natural Resources District (Tri-Basin NRD) is one of the 23 natural resources districts (NRDs) that were created in 1972 in the state of Nebraska. The NRDs have broad legislative authorities for the protection of natural resources within the state. Their key responsibilities include flood control, soil conservation, groundwater quality and quantity protection, and groundwater management. The Tri-Basin NRD consists of Gosper, Kearney, and Phelps counties in south central Nebraska, with their office headquarters located in Holdrege. Tri-Basin NRD is unique because it includes portions of three different river basins: the Republican, the Platte, and the Little Blue.

According to the Nebraska Association of Resources Districts, the Tri-Basin consists of 12 communities, has a population of 18,772 (U.S. Census 2000), and a total area of 974,720 acres.

Within these three counties, 33 entities were identified in the project application as being potential participants in the plan, including natural resources districts, communities, school districts, colleges, townships, rural water projects, health facilities, and fire departments. See Figure 1 for a map depicting the project area. Please see “Planning Process” to obtain further information on the entities that signed resolutions agreeing to participate in the planning process.

The purpose of this plan is to ensure that each participating community is eligible to obtain federal funding under the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance (FMA) program. Through this plan, Tri-Basin has determined the hazards affecting the area, determined the risks these hazards present to the respective communities, developed mitigation goals, and identified feasible mitigation activities for the participating entities.

Figure 1. Project Area



PLANNING PROCESS

The planning effort for the Tri-Basin All-Hazards Mitigation Plan began in 2007, with Tri-Basin submitting their application for funding to complete the Plan. They were awarded funding in 2008 and an engineering consultant was procured for to help draft the plan. Olsson Associates in Holdrege, Nebraska, was awarded the project in 2008. The grant application was approved by the Nebraska Emergency Management Agency (NEMA) and the Federal Emergency Management Agency (FEMA) in April of 2008, officially beginning the planning process.

The project team was established to reflect chain of command and communication procedures. The project team consists of the Tri-Basin Manager, John Thorburn, Olsson Associates staff, and the county emergency management directors, Jeff England (Kearney County) and Patrick Gerdes (Gosper County and Phelps County). The Nebraska Department of Natural Resources (NDNR) and NEMA also provided assistance in the planning process. The planning team was assembled using personnel from each area that was familiar with the local hazards and capable of generating public interest in the project.

The planning team determined the public meeting dates, times, and locations. The General Manager attended all the public meetings and the county emergency managers attended the public meeting in their respective counties. There were three (3) public meetings for the first set of meetings, one for each county. Community representatives were invited to attend the public meetings through e-mails, telephone calls, letters, and signs posted in public places. Representatives were encouraged to attend the meeting in their counties, or in an adjacent county, if they had a scheduling conflict. The first public meetings were held in March of 2009. Press releases were sent to the local newspapers to inform the public of the meeting dates and locations. A pre-meeting survey form also was sent out to the representatives. The dates and locations of these meetings were as follows:

- March 27 – Kearney County (Minden)
- April 2 – Phelps County (Holdrege)
- April 9 – Gosper County (Elwood)

Each of the first public meetings followed the same agenda, starting with a presentation prepared by Steve McMaster with NDNR. Group discussions and break-out sessions were scheduled to allow the entity representatives opportunities to ask questions and discuss the information presented. Survey forms, nearly identical to those sent by mail, were handed out as representatives arrived, and they were asked to fill them out during the group discussion portions of the presentation. These forms were crucial in providing Olsson Associates with the background information on the hazards that threaten each entity. The goal of the planning team was to ensure everyone was given ample opportunity to participate in the plan, whether through public meetings or mailings. At the conclusion of each meeting the attendees were notified that a copy of the presentation would be available by contacting Olsson Associates or Tri-Basin.

A second set of public meetings was held in June 2010...

Below is a list of the key personnel involved in the planning process. To view records of the representatives that attended the public meetings, please see the public meeting sign in sheets available in the appendices for each county.

Planning Team

John Thorburn, General Manager – Tri-Basin NRD
 Patrick Gerdes, Gosper and Phelps Counties Emergency Management
 Jeff England, Kearney County Emergency Management
 Steve McMaster, Natural Resources Planner – Nebraska Department of Natural Resources
 Sheila Hascall, Hazard Mitigation Officer – Nebraska Emergency Management Agency

Table 1. Entity Requirement List					
Community Name	Signed Resolution of Participation	Attended Public Meeting #1 and/or Completed Public Input Forms Regarding Hazards of Concern	Attended Public Meeting #2 and/or completed STAPLEE Form	Submitted One or More Mitigation Projects	Adopted Plan
Natural Resources District					
Tri-Basin NRD	x	x			
Gosper County					
Gosper County	x	x			
Village of Elwood	x	x			
Portion of Johnson Lake – Sanitary Improvement District	x				
Elwood Public Schools	x	x			
Kearney County					
Kearney County	x	x			
City of Minden	x	x			
Village of Axtell	x	x			
Village of Heartwell	x	x			
Village of Norman	x	x			
Village of Wilcox	x	x			
Axtell Community Schools	x	x			
Minden Public Schools	x	x			
Wilcox-Hildreth Public Schools	x	x			
Minden Volunteer Fire Department					
Wilcox Rural Fire District					
Axtell Volunteer Fire & Rescue Department					
Kearney County Health Services					
Minden Airport Authority					
Kearney County Airport Authority					

Table 1. Entity Requirement List (Continued)					
Community Name	Signed Resolution of Participation	Attended Public Meeting #1 and/or Completed Public Input Forms Regarding Hazards of Concern	Attended Public Meeting #2 and/or completed STAPLEE Form	Submitted One or More Mitigation Projects	Adopted Plan
Phelps County					
Phelps County	x	x			
City of Holdrege	x	x			
Village of Atlanta	x	x			
Village of Bertrand	x	x			
Village of Funk	x	x			
Village of Loomis	x	x			
Central Public Power and Irrigation District	x				
Bertrand Public Schools					
Holdrege Public Schools					
Loomis Public Schools					
Educational Service Unit 11					
Phelps County Airport Authority					
Holdrege Airport Authority					
Central Community College - Holdrege					
Phelps Memorial Health Center					

To meet the guidelines established by the planning team, each entity was required to turn in a signed resolution, a STAPLEE form, and a project identification sheet. If those three forms were submitted, the entity was considered to be a part of the planning effort. In all, 20 different entities turned in the necessary paperwork and met the requirements to have their entity represented in the plan.

One might note that townships were not documented as eligible entities to participate in the plan. This is because the Emergency Management Directors indicated that there are no townships in Gosper County. In Phelps County, the townships are to dissolve within the next 12 months. Within Kearney County, only one township is active and it functions solely to operate the library in Axtell. All other responsibilities of the townships are placed with their respective Counties. Therefore, the Counties will also have hazard mitigation responsibilities on behalf of the townships for purposes of this Plan and projects that may result.

Existing Plans, Studies, Reports, and Technical Information

In addition to obtaining public opinion on the hazards threatening the project area, it also was important to incorporate any existing information into the plan documenting potential hazards or threats in the area. To obtain this information, Olsson Associates worked with the Tri-Basin and NDNR to determine any existing plans, studies, reports, or other technical information that would be beneficial to include in this plan.

The following is a list of the information obtained from the Tri-Basin and NDNR.

- State of Nebraska Hazard Mitigation Plan
- Gosper County Local Emergency Operations Plan
- Kearney County Local Emergency Operations Plan
- Phelps County Local Emergency Operations Plan
- Kearney County Zoning Regulations
- Kearney County Comprehensive Plan

FEMA Flood Insurance Studies (FIS) were available for one (1) county and ten (10) communities in the project area. The pertinent information acquired from each is summarized in the flooding portion of Section 1.0 for each county. The FIS available for the project area include the counties and communities listed below.

Gosper County (#310438)

- Village of Elwood (#310365)
- Village of Smithfield (#310131)

Kearney County

- City of Minden (#310389)
- Village of Axtell (#310344)
- Village of Heartwell
- Village of Norman (#310506)
- Village of Wilcox

Phelps County

- City of Holdrege (#310173)
- City of Loomis (#310524)
- Village of Atlanta (#310521)
- Village of Bertrand (#310522)
- Village of Funk (#310523)

The documents listed above were incorporated into the plan. The FIS and other FEMA documents were used as a base for the flood risk portion of the plan. Using the information in the FIS documents, Olsson Associates was able to do a thorough risk assessment for flooding throughout the project area and determine potential projects with the help of local officials. Local Emergency Operations Plans (LEOPs) were used to identify potential projects as well. Geographical Information System (GIS) databases were developed to determine areas where structures are located within FEMA designated floodplains; communities, or structures located near dams; locations of wastewater treatment facilities; locations of tornadoes strikes within the project area; and historic districts within the communities. Any information regarding infrastructure within the project area that was provided to Olsson Associates also was incorporated into the GIS database when possible.

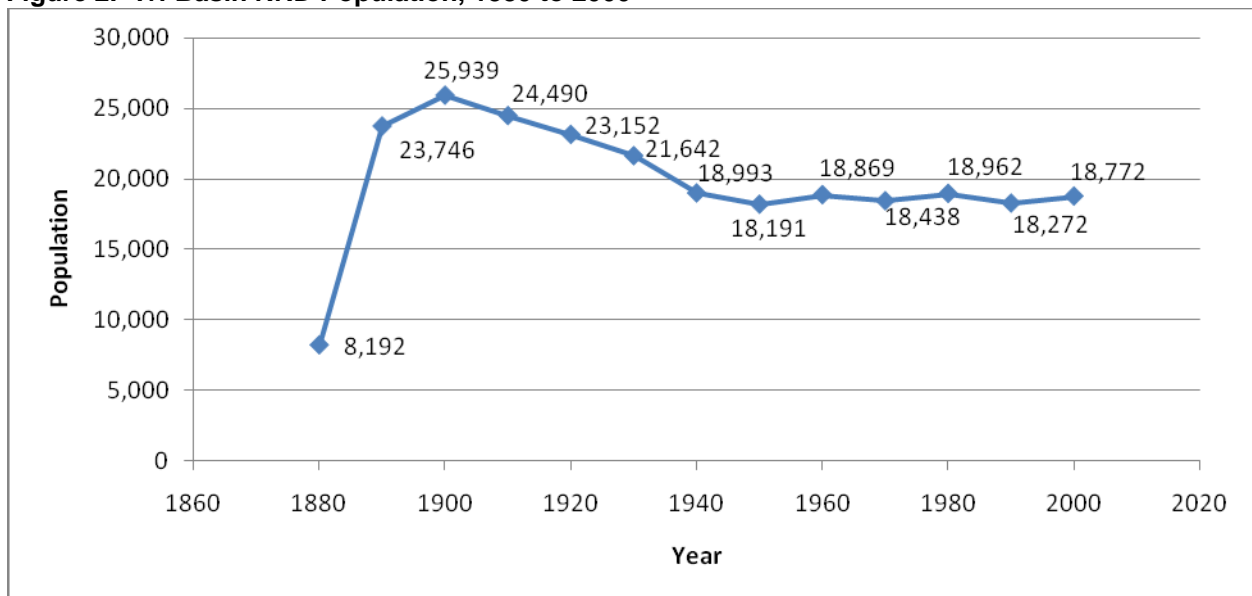
RISK ASSESSMENT

DEMOGRAPHIC SUMMARY

The public input process for this plan was crucial to determine the concerns of the Tri-Basin NRD and potential projects to mitigate the concerns of the citizens of the Tri-Basin NRD. Due to the extensive project area for this planning effort, the Tri-Basin NRD and county emergency management districts (EMDs) were required to produce a high level of enthusiasm for this project by communicating to a diverse group of individuals. The following paragraphs summarize the diversity of the population with the demographic information for the NRD as a whole.

According to the U.S. Census Bureau, the total population of the project area in 2008 was 17,532. The population in the project area has declined slightly during the past few years, decreasing from a population of 18,772 in 2000. Figure 1 below shows the population trend in the Tri-Basin NRD since 1880.

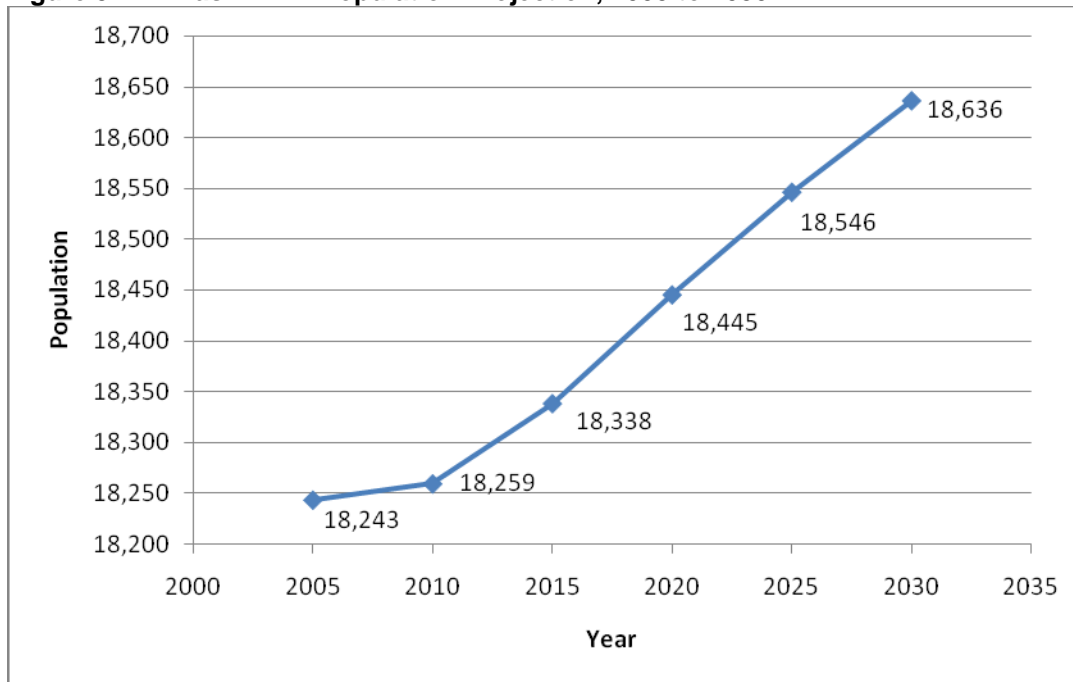
Figure 2. Tri-Basin NRD Population, 1880 to 2000



Sources: Nebraska State Data Center, Center for Public Affairs Research, University of Nebraska – Omaha, U.S. Bureau of Census, '1990 Census of Population and Housing', 'CPH-2-29, Population and Housing Unit Counts, Nebraska', Census Web Site (www.census.gov) and similar publications for preceding years.

The population of the project area is projected to slightly increase over time, as shown in Figure 3. Based on the county populations found on the U.S. Census Bureau Web site, the population in the project area was slightly lower in 2008 than it was in 2000.

Figure 3. Tri-Basin NRD Population Projection, 2005 to 2030



*2005 numbers are Census counts; other numbers are projections
 Source: University of Nebraska, Bureau of Business Research, Nebraska County Population Projections

The gender breakdown for the Tri-Basin area as per the 2000 U.S. Census Bureau information (most recent information) is 49.4 percent male and 50.6 percent female. Table 2 depicts the age characteristics of the Tri-Basin area.

Table 2. Age Characteristics of Tri-Basin Natural Resources District, 2000 Census		
Age	Number of People	Percent of Total
Under 5 years	1,141	6.1%
5 to 9 years	1,358	7.2%
10 to 14 years	1,469	7.8%
15 to 19 years	1,369	7.3%
20 to 24 years	744	4.0%
25 to 34 years	1,994	10.6%
35 to 44 years	2,924	15.6%
45 to 54 years	2,574	13.7%
55 to 59 years	1,002	5.3%
60 to 64 years	840	4.5%
65 to 74 years	1,597	8.5%
75 to 84 years	1,158	6.2%
85 years and older	602	3.2%
<hr/>		
18 years and over	13,836	73.7%
21 years and over	13,305	71.0%
62 years and over	3,873	20.6%
65 years and over	3,357	18.0%

Source: U.S. Census Bureau, DP-1. General Demographic Characteristics: 2000

As shown in Table 2, the population varies among the age brackets. However, there is a higher percentage of the population between the ages of 25 to 54 than in any other age bracket. There also are a significant number of people older than age 65, which is an important fact to consider when determining the best method of protection from hazards for citizens and communities.

Another important demographic detail is housing occupancy and the age of the existing structures. Table 3 below shows housing occupancy and tenure in the project area. Important to note is the large number of people who reside in Gosper County for seasonal, recreational, or occasional use. This group of residents should also be considered when determining protection and mitigation techniques.

Subject	Number of Units	Percent of Total
Total Housing Units	8,318	100.0%
Occupied Housing Units	7,350	88.4%
Vacant Housing Units	968	11.6%
For Seasonal, recreational, or occasional use	406	4.9%
Occupied Housing Units		
Occupied Housing Units	7,350	100.0%
Owner Occupied	5,439	74.0%
Renter Occupied	1,911	26.0%

Source: U.S. Census Bureau, DP-1. Profile of General Demographic Characteristics: 2000

In addition to the occupancy of homes shown in Table 3, the homeowner vacancy rate is 3.2 percent and the rental vacancy rate is 7.2 percent throughout the Tri-Basin NRD area. Table 4 shows the age of homes within Tri-Basin. The age of the home is helpful in determining the level of damage that could be seen in the event of a hazard occurrence.

Year Structure Built	Number	Percent of Total
1999 to March 2000	69	0.8%
1995 to 1998	354	4.3%
1990 to 1994	239	2.9%
1980 to 1989	536	6.4%
1970 to 1979	1,519	18.3%
1960 to 1969	922	11.1%
1940 to 1959	1,567	18.8%
1939 or earlier	3,112	37.4%

Source: U.S. Census Bureau, DP-4. Profile of Selected Housing Characteristics: 2000

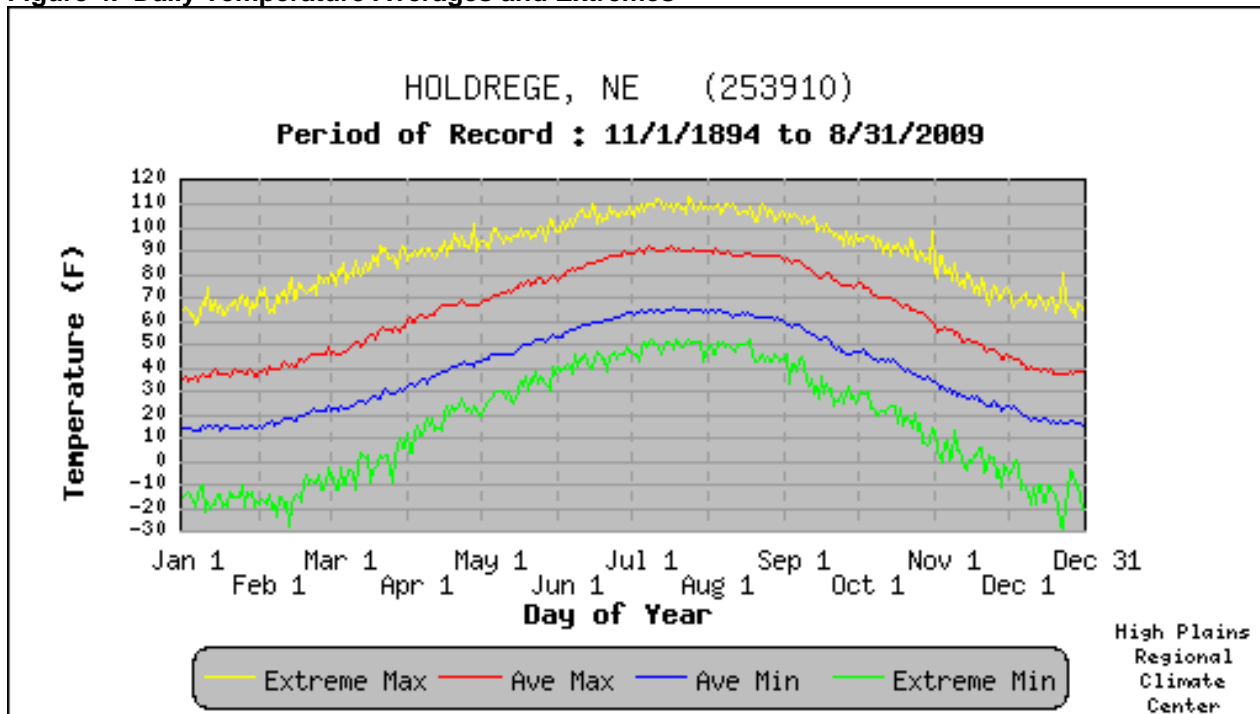
CLIMATE SUMMARY

Since the planning area is a three-county area, the climate varies slightly. To ensure that the climate information provided in this section is as accurate as possible, a central location in the planning area was selected as the source of the climate summary. The City of Holdrege, located in Phelps County, was the most centrally located city of those that had available information. Information in this report is based on climate data from the High Plains Regional Climate Center.

Nebraska has a continental climate, meaning the state experiences highly variable temperatures, from season to season. In general, the planning area sees an average temperature as 28.0 degrees in winter; 50.3 degrees in spring; 74.5 degrees in summer; and 53.1 degrees in fall. The average annual precipitation in the area is 24.75 inches and the average annual snowfall is 28.3 inches.

Figure 4 below depicts the daily temperature averages and extremes. The period of record is 1894 to 2009. According to the High Plains Regional Climate Center, the daily extreme maximum temperature is the maximum of all daily maximum temperatures recorded for that day of the year. The average maximum is the average of all daily maximum temperatures recorded for that day of the year. The average minimum is the average of all daily minimum temperatures recorded for that day of the year. The extreme minimum is the minimum of all daily minimum temperatures recorded for the day of the year.

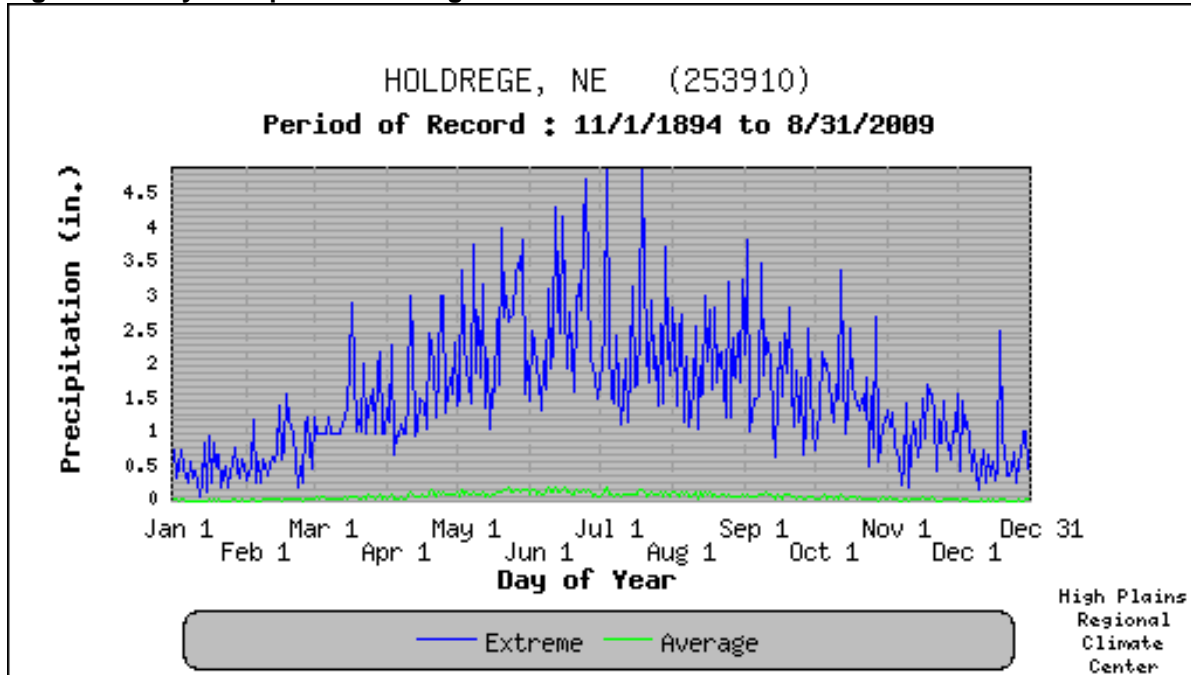
Figure 4. Daily Temperature Averages and Extremes



Source: High Plains Regional Climate Center

Figure 5 shows the precipitation averages and extremes for the planning area.

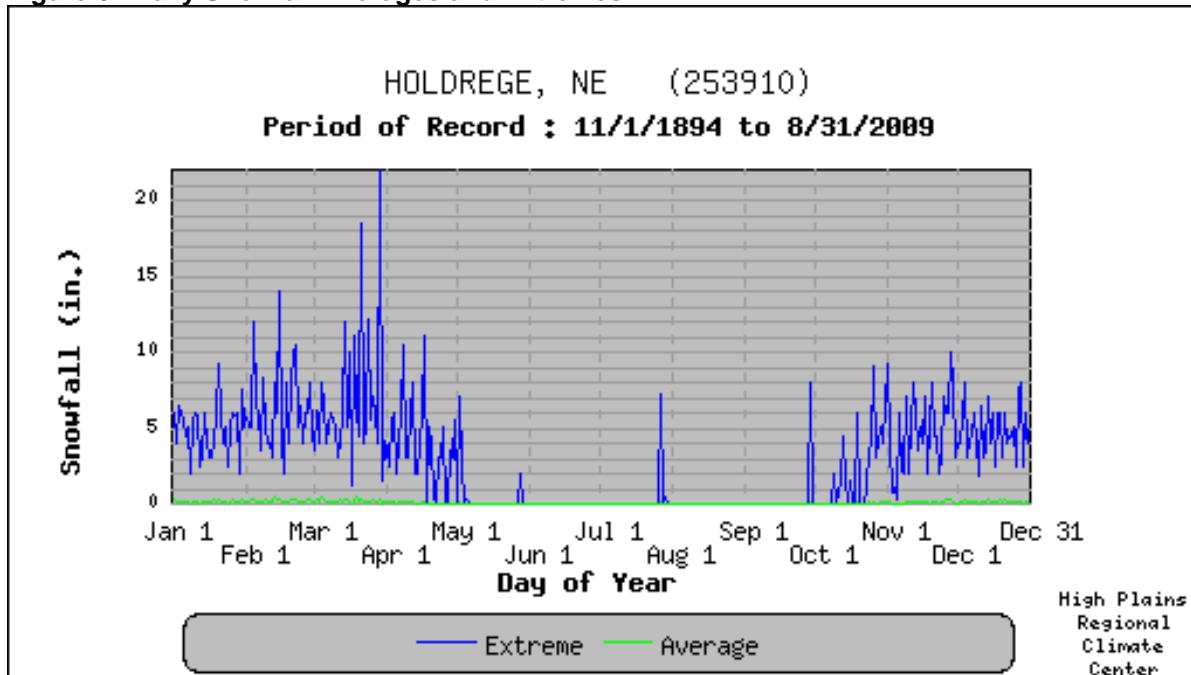
Figure 5. Daily Precipitation Averages and Extremes



Source: High Plains Regional Climate Center

Figure 6 details the snowfall averages and extremes for the project area. The daily extreme is the greatest precipitation or snowfall recorded for that day of the year. The daily average is the average of all daily precipitation of snowfall recorded for that day of the year.

Figure 6. Daily Snowfall Averages and Extremes



Source: High Plains Regional Climate Center

HAZARD IDENTIFICATION

A wide range of hazards affect the planning area. History has proven that many different types of hazards can cause extensive damage. In fact, from 1999 through 2009 there have been six (6) federally declared disasters that have affected at least one-county of the three-county planning area. The following list depicts the number of times each county was involved in the nine federal disasters:

- Gosper County – 3
- Kearney County – 6
- Phelps County – 3

The federally declared disasters did not have a significant time span between each event, reinforcing the fact that another extensive disaster could occur at any time. In fact, there was one disaster declared in each of the following years: 2004, 2005, 2006 and 2008 with two disasters declared in 2007. These events make this planning effort even more beneficial to the area.

To determine the impact of hazards and concerns of the public, it was vital for Tri-Basin and county personnel to develop a high level of interest from the communities. To obtain support from the communities, public meetings discussing the planning process were scheduled in the beginning stages of the planning process. The public meeting results and public input results are detailed in the following section.

The survey forms filled out during the initial public meeting and those received by mail from the representatives and public officials for the project area were used to determine the hazards affecting Tri-Basin. In addition to listing the hazards, representatives were asked to rate the probability of the potential hazard affecting the area and their entity's vulnerability, if such an event were to occur. The following section details the results obtained from the survey forms for the entire project planning area.

The aim of this plan is to provide detailed information regarding the hazards that are most likely to affect the Tri-Basin NRD, the associated risks due to these hazards, and to develop mitigation goals to prevent catastrophic damage from these hazards.

The information obtained through public input was analyzed by Olsson Associates to determine the hazards that are of biggest concern to the entities throughout the planning area. Table 5 below summarizes the results of the survey forms. The hazards are listed in order starting with the hazard of most concern, severe summer storms, and ending with the hazard of least concern, landslides. The probability of occurrence, risk, and vulnerability are based solely on public opinion. The risk category was defined as high, medium, or low. High risk means the risk of damage to the entity was very high; medium indicates a moderate risk of damage in the given hazard event; and, low signifies it is unlikely to experience severe damage in the event of a hazard occurrence. The vulnerability category was defined as either severe, limited, none, or unknown. Severe vulnerability signifies that the community could suffer severe damage if the hazard were to occur; limited vulnerability indicates that the area is limited in the amount of damage that would be expected for a particular hazard; no vulnerability means that the community is not vulnerable to that particular hazard; and, unknown vulnerability signifies that the damage resulting from a particular hazard is unknown. The column listing past occurrences indicates whether the hazard has affected the project area in previous years. This information

was provided by the National Climatic Data Center (NCDC), the NDNR, the NRD, and the county emergency management directors.

Hazard	Probable	Risk	Vulnerability	Past Occurrence
Severe Summer Storms	Yes	High	Severe	Yes
Severe Winter Storms	Yes	High	Severe	Yes
Tornado	Yes	High	Severe	Yes
Drought	Yes	Medium	Limited	Yes
Flood	Yes	Medium	Limited	Yes
Wildfire	Yes	Low	Limited	No
Man-Made Disaster	Yes	Low	Limited	No
Dam Failure	No	Low	Limited	No
Earthquake	No	Low	None	No
Landslide	No	Low	None	No

The information summarized above is an average of the results for all entities in the planning area. To view the results of each county and view the individual entity survey forms, please refer to Appendices A through C.

The subsequent portions of this plan will discuss the hazards that have been identified as potential threats to the planning area, including all items listed in Table 5. In addition to describing the types of hazards affecting the area, a summary of previous occurrences of each hazard will be listed as well. To view hazard events for each county, please refer to Appendices A through C.

SEVERE SUMMER STORMS

Hazard Summary

For the purposes of this plan, it was necessary to define what event would be termed a severe summer storm. According to NOAA's Web site (www.nws.noaa.gov/glossary), a severe thunderstorm is classified as a storm that "produces a tornado, winds of at least 58 mph (50 knots), and/or hail at least three-fourths-inch in diameter." In addition to high winds and hail, this hazard category also contains events dealing with lightning strikes and intense rainfall. It should be noted that since tornadoes were defined as separate events in the survey forms they will be included in a later portion of the plan, and are therefore not included in this section, despite the NOAA definition.

Even though there is not an extensive list of past occurrences of severe summer storms within the entire project area, there is an extensive history of occurrences in isolated areas. This indicates the need to protect the communities and residents of the project area from the impact of these storms, as the area is highly likely to experience the effects of severe summer storms in the future.

Historical Occurrences

Table 6 below provides a list of past occurrences of severe summer storms, causing \$100,000 or more in damage according to the NCDC. The extensive list of past

occurrences of severe summer storms indicates the need to protect the communities and residents of the Tri-Basin NRD from the impact of these storms since the likelihood of the Tri-Basin NRD experiencing the effects of severe summer storms in the future is statistically certain.

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Gosper	06/21/1996	Lightning	N/A	\$500,000	\$0
Phelps	07/07/1996	Hail	2.00 in	\$70,000	\$3,000,000
Kearney	07/22/1996	Thunder/Wind	N/A	\$5,000	\$100,000
Kearney	05/21/1997	Hail	4.50 in.	\$70,000	\$950,000
Kearney	07/07/1997	Hail	2.00 in.	\$25,000	\$250,000
Kearney	07/08/1997	Hail	1.50 in.	\$25,000	\$250,000
Kearney	08/21/1997	Thunder/Wind	N/A	\$150,000	\$750,000
Kearney	09/08/1997	Hail	1.00 in.	\$10,000	\$250,000
Kearney, Phelps, Gosper	10/08/1997	High Wind	63 mph (55 knots)	\$300,000	\$0
Gosper	05/21/1998	Hail	2.75 in.	\$90,000	\$725,000
Phelps	05/21/1998	Hail	2.75 in	\$1,000,000	\$1,200,000
Kearney	05/29/1998	Hail	0.75 in.	\$0	\$100,000
Gosper	06/13/1998	Hail	2.75 in.	\$10,000	\$200,000
Phelps	08/02/1998	Thunder/Wind	N/A	\$5,000	\$200,000
Phelps	09/25/1998	Thunder/Wind	N/A	\$30,000	\$200,000
Phelps	05/14/1999	Hail	1.75 in	\$5,000	\$100,000
Phelps	05/30/1999	Hail	1.75 in	\$40,000	\$400,000
Kearney	06/23/1999	Thunder/Wind	N/A	\$0	\$150,000
Kearney, Phelps	06/27/1999	Thunder/Wind	N/A	\$475,000	\$1,950,000
Phelps	07/25/1999	Thunder/Wind	N/A	\$15,000	\$150,000
Kearney	08/17/1999	Thunder/Wind	N/A	\$25,000	\$100,000
Kearney, Gosper	06/19/2000	Thunder/Wind	N/A	\$100,000	\$1,500,000
Kearney, Phelps	06/19/2000	Hail	1.75 in.	\$30,000	\$1,700,000
Phelps	06/19/2000	Heavy Rain	N/A	\$20,000	\$2,500,000
Gosper	06/29/2000	Hail	1.00 in.	\$100,000	\$2,000,000
Phelps, Gosper	06/29/2000	Thunder/Wind	N/A	\$200,000	\$4,000,000
Phelps	07/03/2000	Hail	0.75 in	\$0	\$100,000
Phelps	07/20/2000	Hail	2.75 in	\$557,000	\$4,750,000
Kearney	07/24/2000	Hail	0.88 in.	\$0	\$100,000
Phelps, Kearney	07/25/2000	Hail	1.75 in	\$20,000	\$350,000
Gosper	08/12/2001	Hail	1.00 in.	\$5,000	\$500,000
Phelps	05/26/2002	Hail	1.25 in	\$45,000	\$200,000
Kearney	06/02/2002	Thunder/Wind	N/A	\$200,000	\$0
Kearney	06/12/2002	Hail	4.50 in.	\$25,000,000	\$5,500,000
Gosper, Phelps	06/15/2002	Hail	1.75 in.	\$20,000	\$900,000
Kearney	07/24/2002	Hail	1.75 in.	\$50,000	\$1,000,000
Phelps	05/04/2003	Hail	1.75 in	\$250,000	\$0
Kearney, Phelps	06/23/2003	High Wind	64 mph (56 knots)	\$1,450,000	\$0
Phelps	07/05/2003	Hail	1.00 in	\$10,000	\$100,000

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Phelps	07/06/2003	High Wind	80 mph (70 knots)	\$1,300,000	\$0
Phelps	09/09/2003	Hail	1.25 in	\$10,000	\$100,000
Phelps, Kearney, Gosper	04/18/2004	High Wind	59 mph (52 knots)	\$750,000	\$0
Phelps, Gosper	07/05/2004	Hail	1.00 in	\$75,000	\$2,250,000
Phelps	07/05/2004	Thunder/Wind	N/A	\$50,000	\$2,500,000
Phelps	05/07/2005	Hail	1.75 in	\$50,000	\$150,000
Kearney	05/10/2005	Hail	2.75 in.	\$100,000	\$0
Phelps	05/17/2005	Hail	1.75 in	\$25,000	\$100,000
Kearney	06/03/2005	Hail	0.88 in.	\$0	\$500,000
Gosper	06/06/2005	Hail	1.00 in.	\$10,000	\$250,000
Gosper	07/04/2005	Hail	1.00 in.	\$0	\$2,000,000
Gosper	08/17/2005	Thunder/Wind	N/A	\$10,000	\$2,000,000
Gosper, Phelps	09/05/2005	Hail	1.25 in.	\$225,000	\$1,250,000
Phelps, Gosper	04/02/2006	High Wind	46 mph (40 knots)	\$200,000	\$0
Kearney	06/16/2006	Hail	1.00 in.	\$30,000	\$800,000
Phelps	06/20/2006	Thunder/Wind	N/A	\$25,000	\$100,000
Phelps, Kearney	07/13/2006	Hail	1.75 in	\$60,000	\$575,000
Phelps	07/21/2006	Thunder/Wind	N/A	\$10,000	\$100,000
Phelps	08/01/2006	Thunder/Wind	N/A	\$65,000	\$250,000
Phelps, Kearney	09/15/2006	Hail	2.00 in	\$65,000	\$175,000
Phelps	04/24/2007	Heavy Rain	N/A	\$0	\$100,000
Gosper	07/12/2007	Hail	2.75 in.	\$75,000	\$400,000
Gosper	08/21/2007	Hail	1.00 in.	\$5,000	\$1,000,000
Gosper, Phelps	09/06/2007	Hail	1.75 in.	\$225,000	\$2,150,000
Phelps, Kearney	05/22/2008	Hail	1.75 in	\$52,000	\$900,000
Gosper	05/29/2008	Hail	2.00 in.	\$20,000	\$1,250,000
Kearney	06/04/2008	Hail	2.75 in.	\$35,000	\$900,000
Phelps, Kearney	06/07/2008	Hail	1.00 in	\$4,000	\$200,000
Kearney	06/19/2009	Hail	1.75 in.	\$10,000	\$150,000
Phelps, Kearney	07/22/2009	Thunder/Wind	N/A	\$30,000	\$2,000,000

Vulnerability Assessment

Severe summer storms pose a serious threat to the project area. The biggest threat is to properties and the potential loss of life. As mentioned above, severe summer storms can produce tornadoes, hail, high wind, lightning strikes, and intense rain. Tornadoes, flooding, hail and high wind events will be detailed in the following sections of this plan. If a severe summer storm were to produce any of the above-mentioned conditions, the affected area could experience flooding; fires resulting from lightning strikes; structural damage from high winds, downed trees or tree limbs; power outages; downed power lines; and, loss of life. If residents were caught outside in such a storm, they would be at risk of lightning strikes, downed trees or tree limbs catching them unaware, or being caught in flash flooding situations. In the event of flash flooding, emergency response vehicles may not have direct access to the residents of the area. If power outages were to occur, critical infrastructure may be affected. Businesses and schools could be closed

due to the impacts of lightning strikes or flooding. The damage resulting from such an event would have impacts on existing and future structures, facilities, and population.

Potential Impact

Severe summer storms tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for the three-county planning area is quite difficult, due to the localized nature of these storms. If a severe summer storm were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table 6. Next, take this total damage amount and divide by the total number of events listed in Table 6. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 69 historical occurrences was approximately \$34.42 million and the total crop damage approximately equaled \$58.38 million. The total for all 69 events equaled approximately \$92.80 million. This number was then divided by the 69 historical occurrences to arrive at a total damage estimate of approximately \$1.34 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe summer storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$22.2 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the NRD. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

SEVERE WINTER STORMS

Hazard Summary

Severe winter storms can be defined in many different ways. In this plan, a severe winter storm includes events producing heavy snow, dangerous wind chills, extreme cold, ice, and blizzard conditions. According to the National Oceanic and Atmospheric Administration (NOAA) Web site (www.nws.noaa.gov/glossary), the events defining a severe winter storm are as follows:

- Heavy snow:
 - Snowfall accumulating to 4 inches or more in depth in 12 hours or less; or
 - Snowfall accumulating to 6 inches or more in depth in 24 hours or less
- Dangerous wind chills:
 - No specific rules exist for determining when wind chill becomes dangerous
 - As a general rule, the threshold for potentially dangerous wind chill conditions is about 20 degrees F
- Ice storm:
 - Significant ice accumulations are usually accumulations of quarter-inch or greater
- Blizzard:
 - Sustained wind or frequent gusts to 35 mph or greater
 - Considerable falling and/or blowing snow, for instance, reducing visibility frequently to less than a quarter-mile

Historical Occurrences

Table 7 provides a list of past occurrences of severe winter storms, causing \$100,000 or more in damage, in the Tri-Basin NRD according to the National Climatic Data Center (NCDC). The list of severe winter storm events in the project area indicates the need for mitigation efforts to prevent the catastrophic effects of these storms. Based on the historic occurrences and on current trends, it is reasonable to assume the risk for the planning area to experience severe winter storms in the future is essentially certain.

Location	Date	Hazard Type	Property Damage	Crop Damage
Gosper, Kearney, Phelps	04/11/1994	Heavy Snow	\$500,000*	\$0
Gosper, Kearney, Phelps	09/21/1995	Freeze	\$0	\$50,000,000*
Gosper, Kearney, Phelps	10/25/1997	Winter Storm	\$15,000,000*	\$1,500,000*
Gosper, Kearney, Phelps	12/07/1997	Ice Storm	\$100,000*	\$0
Gosper, Kearney, Phelps	12/21/1997	Ice Storm	\$100,000*	\$0
Gosper, Kearney, Phelps	03/07/1998	Winter Storm	\$100,000*	\$0
Gosper, Kearney, Phelps	03/01/2002	Winter Storm	\$120,000*	\$0
Kearney, Phelps	02/04/2004	Winter Storm	\$230,000*	\$0
Kearney	2/8/2005	Winter Storm	\$250,000*	\$0
Gosper, Kearney, Phelps	11/27/2005	Blizzard	\$3,000,000*	\$0

Location	Date	Hazard Type	Property Damage	Crop Damage
Gosper, Kearney, Phelps	03/20/2006	Winter Storm	\$1,700,000*	\$0
Gosper, Phelps	12/19/2006	Ice Storm	\$300,000*	\$0
Kearney	12/20/2006	Ice Storm	\$100,000*	\$0
Gosper, Kearney, Phelps	12/29/2006	Ice Storm	\$12,000,000*	\$0
Gosper, Kearney, Phelps	12/10/2007	Winter Storm	\$100,000*	\$0

*Values include areas outside of the planning area.

Vulnerability Assessment

Severe winter storms pose a threat to the entire project area in terms of property damage and the potential loss of life. Severe winter storms, as described above, can produce heavy snowfall, dangerous wind chills, and extreme cold, ice, and blizzard conditions. If a storm were to produce any of these conditions the affected area could experience power outages, downed trees or tree limbs, and downed power lines resulting from the weight of the ice or snow; treacherous driving conditions; and, loss of life, typically resulting from residents not being prepared for severe weather, or due to automobile accidents. If residents were caught outside in such a storm, the risk of death increases due to the threat of hypothermia. In the event of heavy, accumulating snowfall emergency response vehicles may have limited access to reach residents of the planning area. Emergency snow routes would be the primary access throughout communities. In addition to the obvious dangers, such as downed trees and icy roadways, another potential vulnerability is that critical infrastructure, such as water lines, sanitary sewer lines, and other vital underground utilities could freeze if conditions persisted for days, or even weeks, at a time. The functional downtime resulting from infrastructure failure or power outages would be extremely costly in the area. Businesses and schools may need to be closed and residents may need to be relocated to facilities that are able to provide heat and other necessities. While it is possible for a severe winter storm to affect the entire project area in one storm event, the likelihood that the entire project area, and all of the critical facilities in the planning area, would be rendered inoperable is unlikely. The damage resulting from such an event would have impacts both on existing structures, facilities, and population, as well as future structures, facilities and population, depending on the areas affected.

Potential Impact

Severe winter storms tend to be unpredictable and affect a large area with one storm. Determining an estimated loss for the three-county planning area is quite difficult, due to the large scale nature of these storms. If a severe winter storm were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table 7. Next, take this total damage amount and divide by the total number of events listed in Table 7. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 15 historical occurrences was approximately \$33.60 million and the total crop damage approximately equaled \$51.50 million. The total for all 15 events equaled approximately \$85.10 million. This number was then divided by the 15 historical occurrences to arrive at a total damage estimate of approximately \$5.67 million per event. The total damage

estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe winter storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$22.2 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the NRD. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TORNADOES

Hazard Summary

Tornadoes within the project area are common, in fact according to the University of Nebraska-Lincoln High Plain Regional Climate Center (HPRCC) Nebraska averages more than 40 tornadoes a year, with the record number of 110 tornadoes in 2004. The peak month for tornadoes in Nebraska is June, with 78 percent of all tornadoes occurring in the months of May, June, and July. Table 8 shows the categories of the original Fujita Scale. Table 9 shows the categories for the Enhanced Fujita (EF) Scale. The EF Scale was implemented on Feb. 1, 2007 as a way to classify tornado events. It should be noted that tornadoes that occurred prior to the implementation of the Enhanced Fujita Scale were not reclassified; they were left under the original Fujita Scale classification.

Category	Wind Speed (mph)	Potential Damage
F0	< 72	Light Damage
F1	73-112	Moderate Damage
F2	113-157	Considerable Damage
F3	158-206	Severe Damage
F4	207-260	Devastating Damage
F5	261-318	Incredible Damage

Category	Wind Speed (mph)	Potential Damage
EF0	65-85	Light Damage
EF1	86-110	Moderate Damage
EF2	111-135	Considerable Damage
EF3	136-165	Severe Damage
EF4	166-200	Devastating Damage
EF5	Over 200	Incredible Damage

Historical Occurrences

Table 10 provides a list of past occurrences of tornadoes or funnel clouds, causing \$100,000 or more in damage, in the project area according to the NCDC. As is evident from the historic records of tornado incidences, the planning area is highly susceptible to tornadoes and it is statistically certain that the area will experience a tornado at some point in the future. Hopefully, through this planning effort, the damage and risk to the public will be reduced.

Location	Date	Type	Magnitude	Property Damage	Crop Damage
Phelps ¹	07/18/1958	Tornado	F2	\$250,000	\$0
Gosper	04/22/1975	Tornado	F1	\$250,000	\$0
Gosper ²	06/02/1975	Tornado	F2	\$250,000	\$0
Kearney	04/13/1986	Tornado	F2	\$250,000	\$0
Phelps	06/29/1988	Tornado	F1	\$2,500,000	\$0
Kearney	07/14/1989	Tornado	F0	\$250,000	\$0
Kearney	03/13/1990	Tornado	F3	\$2,500,000	\$0
Kearney	03/13/1990	Tornado	F2	\$250,000	\$0
Phelps	10/17/1994	Tornado	F2	\$250,000	\$0
Phelps	10/16/1998	Tornado	F2	\$400,000	\$1,000,000
Phelps	05/02/1999	Tornado	F1	\$100,000	\$0
Phelps	05/07/2005	Tornado	F0	\$250,000	\$0

1 2 injuries from this event

2 4 injuries from this event

In addition to the documented occurrences listed above, another 108 tornado events were recorded between June 22, 1950 and July 8, 2008, but were not listed because the damage amounts were less than \$100,000, or were unknown.

Vulnerability Assessment

Tornadoes pose a serious threat to the entire project area in terms of property damage and the potential loss of life. Tornadoes produce high winds and may accompany storms producing heavy rainfall and hail. If a major tornado event were to occur in the project area, damage could include structural damage to homes, business, and critical facilities, downed trees or limbs, power outages and downed power lines, and loss of life. If residents are outside or not in a shelter during a tornado, the risk of loss of life increases dramatically. If debris from structural damage, downed trees, and other sources affect the project area it could block roads, limiting emergency response vehicles from having access to residents. In addition to structural damage, infrastructure damage could also result, including damage to roads, rail lines, water wells, and water towers. Critical facilities, including hospitals, fire stations, and emergency operations centers may see extensive damage. The downtime resulting from a major tornado strike could be very extensive. Rebuilding a community could take years if the majority of structures and infrastructure were affected. Residents may need to be relocated if they lose their home and businesses and schools could be closed due to damage. The loss of life that could be associated with such an event could be devastating. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Tornadoes tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for the three-county planning area is quite difficult, due to the localized nature of these storms. If a tornado were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning

area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table 10. Next, take this total damage amount and divide by the total number of events listed in Table 10. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 12 historical occurrences was approximately \$7.50 million and the total crop damage approximately equaled \$1.00 million. The total for all 12 events equaled approximately \$8.50 million. This number was then divided by the 12 historical occurrences to arrive at a total damage estimate of approximately \$708 thousand per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For tornadoes, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$22.2 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the NRD. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DROUGHTS

Hazard Summary

Drought is a known hazard throughout the state of Nebraska, in fact, in recent years the state has been plagued by several extended periods of drought and only recently have the conditions in the eastern portion of the state improved. Drought conditions are generally divided into four different categories. These drought categories include meteorological, hydrological, agricultural, and socioeconomic. These categories are defined in the following way according to the National Drought Mitigation Center (NDMC):

- Meteorological drought
 - Usually defined on the basis of the degree of dryness -- in comparison to some normal or average amount -- and duration of the dry period
 - Must be considered as region specific
 - May relate actual precipitation departures to average amounts on monthly, seasonal, or annual time scales
- Agricultural drought
 - Links characteristics of meteorological drought to agricultural impacts, focusing on:
 - Precipitation shortages
 - Differences between actual and potential evapotranspiration
 - Soil water deficits
 - Reduced ground water or reservoir levels
 - Accounts for the variable susceptibility of crops during different stages of crop development, from emergence to maturity
- Hydrological drought
 - Associated with the effects of precipitation, including snowfall, shortfalls on surface or subsurface water supply
 - Frequency and severity of drought is often defined on a watershed or river basin scale
 - Usually out of phase with or lag the occurrence of meteorological and agricultural droughts
 - Takes longer for precipitation deficiencies to show up in the components of a hydrological system
 - Competition for water in hydrological storage systems escalates during drought and conflicts between water users increase significantly
- Socioeconomic drought
 - Associates the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought
 - Occurrence depends on the time and space processes of supply and demand to identify or classify droughts
 - Occurs when the demand for an economic good exceeds supply as a result of weather-related shortfall in water supply

Historical Occurrences

Table 11 below lists the occurrences of drought in the Tri-Basin NRD according to the NCDC and NDMC. While the records of drought in the area are not great in number, the impacts of these periods of drought were intense. With the importance of agricultural production in the project area, the effect of drought conditions has been severe in the past. Although there is not a long record of drought incidences, it is probable that a drought will occur in the future and the effect of these conditions could be catastrophic.

Location	Date	Type	Property Damage	Crop Damage
Gosper, Phelps, Kearney	Fall 1999 to Spring 2001	Drought	\$0	\$240,000,000*
Gosper, Phelps, Kearney	Spring 2002 to Summer 2004	Drought	\$0	\$480,000,000*

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Drought poses a severe threat to the entire project area in terms of property damage, crop damage and the potential loss of animal life. Drought, as described above, can be defined in various ways and can affect various aspects of the planning area. If a drought were to affect the project area for an extended period of time, the area could see an increased risk of fire and the potential for the drinking water supply to be depleted. Typically, during severe droughts, water conservation practices would be implemented to limit the depletion of these drinking water supplies. In addition to these threats, there would be an increased chance for animals to be at risk of losing their lives, which includes both livestock and domestic pets. The lack of water and high temperatures associated with summertime droughts increases the risk of heat-related deaths, as well as dehydration, if animals were to be outside for extended periods of time. The amount of damage to the project area in crop damage alone would be extremely high, which in turn, could cause economic hardship for residents in the project area. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Droughts can be wide spread and span many months or years. Determining an estimated loss for the three-county planning area is quite difficult, due to the broad nature of these and length of time involved with these events. If a drought were to affect the project area, it was estimated that damage of 17 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table 11. Next, take this total damage amount and divide by the total number of events listed in Table 11. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the no property damage is recorded resulting from the 2 historical occurrences. The total crop damage approximately equaled \$720

million. The total for the 2 events equaled approximately \$720 million. This number was then divided by the 2 historical occurrences to arrive at a total damage estimate of approximately \$360 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For droughts, this value was less than 17 percent. For purposes of this planning effort an estimate that 17 percent of the planning area would be affected was used, resulting in approximately \$377.4 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the NRD. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

FLOODING

Hazard Summary

Some communities within the Tri-Basin NRD are located along streams; the risk of flooding in these areas is increased. There are approximately 8,500 existing structures in the Tri-Basin NRD and of those approximately 20 structures are located within the FEMA designated floodplain. Table 12 below details the flood events, causing \$100,000 or more in damage, within the planning area according to NCDC. As is evident in Table 8, flooding is of concern in the area. There have been several major flood incidents in recent years and the probability of another flood event is almost certain.

Historical Occurrences

In the Tri-Basin NRD, it would not be unreasonable to see flooding resulting from ravine flooding, flash flooding, and urban drainage system flooding. There are approximately 8500 existing structures in the Tri-Basin NRD and of those approximately 20 are within the FEMA-designated floodplain. Table 12 below details the flood events, causing \$100,000 or more in damage, within Tri-Basin NRD according to NCDC. There have been several major flood incidents in recent years and the probability of another flood event in planning area is certain.

Location	Date	Type	Property Damage	Crop Damage
Phelps, Kearney, Gosper	06/01/1995	Flood	\$60,000	\$240,000
Kearney	06/19/2000	Flash Flood	\$250,000	\$3,000,000
Phelps	07/03/2000	Flash Flood	\$150,000	\$1,000,000
Phelps, Kearney, Gosper	05/11/2005	Flash Flood	\$5,000,000	\$1,750,000
Phelps	09/05/2005	Flash Flood	\$25,000	\$250,000
Phelps	04/24/2007	Flash Flood	\$75,000	\$250,000
Gosper	05/20/2008	Flash Flood	\$25,000	\$500,000
Gosper	05/23/2008	Flash Flood	\$25,000	\$100,000
Phelps, Kearney	05/29/2008	Flash Flood	\$55,000	\$1,000,000

One of the most important programs developed to aid communities in knowing their flooding risks is the FEMA-managed National Flood Insurance Program (NFIP). According to the official Web site of the NFIP (www.floodsmart.gov), the NFIP was created in 1968 to help property owners, including homeowners, renters, and business owners, to financially protect themselves by offering flood insurance to NFIP participating communities. These communities agree to adopt and enforce floodplain management techniques that meet or exceed FEMA requirements to reduce the risk of flooding. Community participation in the NFIP is purely voluntary, however a large number of communities across the county have become participants due to the benefits of participation for their residents and businesses.

According to FEMA's Web site (www.fema.gov), there are three components of the NFIP. These three components include:

- Flood insurance
- Floodplain management
- Flood hazard mapping

The Web site also clarifies that flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly \$1 billion a year through communities implementing sound floodplain management requirements and property owners purchasing of flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance.

In addition to providing flood insurance and reducing flood damage through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

In the planning area, a number of counties and communities participate in the NFIP. According to the NFIP Community Status Book (www.fema.gov/fema/csb.shtm) the participants and their Community Identification (CID) number are the following:

Gosper County (#310438)

- Village of Elwood (#310365)
- Village of Smithfield (#310131)

Kearney County

- City of Minden (#310389)
- Village of Axtell (#310344)
- Village of Heartwell (#310505)
- Village of Norman (#310506)
- Village of Wilcox (#310334)

Phelps County

- City of Holdrege (#310173)
- City of Loomis (#310524)
- Village of Atlanta (#310521)
- Village of Bertrand (#310522)
- Village of Funk (#310523)

Repetitive Loss structures are defined by FEMA, as any property that has experienced:

- Four or more flood insurance claims of more than \$1,000
- Two flood insurance claims within a 10-year period that, combined, equal or exceed the current value of the property
- Three or more flood insurance claims that, combined, equal or exceed the value of the insured property

According to FEMA's Repetitive Loss list and the Nebraska Department of Natural Resources (NDNR) there are no repetitive loss properties in the Tri-Basin NRD.

Vulnerability Assessment

Flooding poses a threat to the entire planning area, as each county has various streams meandering through them. The Platte River borders Phelps and Kearney Counties and a small portion of Gosper County on the north. There also is a threat of urban flooding in the communities of the planning area if the storm sewer system's capacity was overwhelmed by the runoff resulting from such an event. If a flood event were to affect the planning area the resulting damage could include structural damage, especially if these structures are located in a FEMA-designated floodplain or floodway, downed trees or limbs, downed power lines, dam or levee failure, roadway and bridge failures, crop damage, and potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the planning area, especially in the event of road or bridge failures, downed trees, or other debris, or flood waters blocking access routes.

Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Dam or levee failure could cause large portions of communities to be affected by flood waters and could threaten the lives of residents of each downstream community if proper warning is not given. Critical infrastructure also could be compromised, as flooding can cause sanitary sewer lines to back up, also posing a human safety risk, as well as contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure are once again operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of the planning area. While it is possible for flooding to affect the entire project area in one flood event, the likelihood that the entire project area, and the critical facilities in the planning area, would be affected is highly unlikely. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Flooding tends to be erratic and does not necessarily affect a large area with one event. Determining an estimated loss for the three-county planning area is quite difficult, due to the localized nature of these events. If flooding were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table 12. Next, take this total damage amount and divide by the total number of events listed in Table 12. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 9 historical occurrences was approximately \$5.67 million and the total crop damage approximately equaled \$8.09 million. The total for all 9 events equaled approximately \$13.76 million. This number was then divided by the 9 historical occurrences to arrive at a total damage estimate of approximately \$1.53 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is

affected per storm event. For flooding, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$22.2 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the NRD. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

WILDFIRES

Hazard Summary

While wildfires are not all that common in the project area, they do pose a threat. Wildfires can be started in several different ways including lightning, human carelessness, machinery malfunction, arson, heat waves and droughts with the leading cause of wildfires being human carelessness. Wildfires are necessary to maintain natural habitats that are dependent on periodic burning; however, human factors have been documented as starting more than four out of every five wildfires. As such, it is necessary to be prepared, despite the lack of occurrence. While wildfires are more common in forested areas, it is not uncommon to see wildfires in grasslands, crop stubble fields and other similarly vegetated areas, therefore heightening the risk in the project area.

Historical Occurrences

According to the NCDC there are no records of past occurrences of wildfires in the planning area. There have been numerous wildfires in crop areas and pastures, in very windy and dry conditions. Most of the resulting damage have been fairly minor. The likelihood of a wildfire affecting the area is moderate.

Vulnerability Assessment

Wildfires pose a threat to the entire planning area and could result in property damage, crop damage, and potential loss of life. If a wildfire were to affect the project area the resulting damage could include structural damage, if homes or businesses were in the path of the fire; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk to wildfires, depending on their proximity in relation to the fire, and critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a wildfire and depending on the damage; roads could be closed, thus blocking access routes for emergency response vehicles, limiting their ability to reach residents in the planning area. If power outages result from such an event, the losses could be catastrophic. Not only would businesses, schools, and homes lose power, but without a backup power source critical infrastructure, such as water wells, may fail to work. Residents may be required to relocate until the wildfire is under control. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Wildfire could affect portions of the three county planning area and impacts could last for days or even weeks. If a wild fire were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Tri-Basin NRD. Since there were no historical occurrences available of a wildfire in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should

encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

MAN-MADE AND TECHNOLOGICAL HAZARDS

The Tri-Basin NRD, like most areas, could be subject to technological issues either directly associated with an emergency or disaster or as a single event affecting citizens, facilities, government infrastructure and public safety. For this planning effort, potential technological hazards will be placed into the following categories.

HAZARDOUS MATERIALS

Hazard Summary

Burlington Northern Santa Fe Railway Company (BNSF), Amtrak and Nebraska Kansas Colorado Railway Inc. (NKCR) operate mainline tracks through the Tri-Basin NRD. The largest quantities of hazardous materials are transported by rail; the largest volumes of hazardous materials in the project area are anhydrous ammonia and ethanol. However, the majority of the planning area relies on the trucking industry to transport hazardous materials through the project area.

Ethanol is a potential hazard as it is manufactured and shipped in the Tri-Basin NRD. An ethanol producing plant currently exists between Minden and Axtell along U.S. Highway 6. Ethanol is also transported on the railroad lines and occasionally on the highways in the NRD. If an ethanol spill were to occur, most public safety agencies within the project area are equipped or trained to deal with an accident of this magnitude. In the case of a spill, the facility would have access to a contract response team; however, the response team could be located up to an hour away. There also is a risk of these types of facilities being targets for terrorists.

Many communities maintain anhydrous ammonia storage facilities, and many of these facilities are located near residents of these communities. If an anhydrous ammonia spill were to occur, most public safety agencies within the project area are equipped or trained to deal with an accident of this magnitude. In the instance of a spill, the facility would have access to a contract response team; however, the response team could be located up to an hour away. There also is a risk of these storage locations being a target for terrorists.

Another hazardous material of concern in the planning area includes the storage of propane and/or high pressure natural gas. As with anhydrous ammonia, propane is generally stored in large amounts near residents of the communities of the Tri-Basin NRD. In addition, a significant number of residences are fueled by propane. The primary risk associated with propane is fire and if a propane fire occurred few fire departments in the project area are certified or equipped to deal with this type of fire. While some time may exist for evacuation in the nursing homes, hospitals may not have enough time to evacuate since a propane tank can fail in as little as 15 minutes. There are no current plans for evacuation or containment by qualified responders.

The last major concern regarding hazardous materials is the disposal of residential, business, and industrial hazardous waste. It is very common for homeowners, businesses and industrial facilities to have cleaners and other chemical agents stored on-site. In some cases these products cannot be

disposed of in a landfill leaving the homeowner, business, or industrial facility to use a hazardous waste landfill or dispose of the chemicals by other means, which may be illegal or may pose environmental threats. Whether this material is disposed of by dumping the chemicals in roadside ditches, small streams, small farm landfills, or in some cases dumping it onto the ground, contamination of the groundwater supply can occur. To alleviate this problem, some communities have established programs where people can bring chemical wastes to a specified location for proper disposal at no cost.

Historical Occurrences

Currently there are no historical occurrences of hazardous material spills.

Due to the NKCR and BNSF mainline tracks and transportation routes, including U.S. 6, U.S. 183, U.S. 34, U.S. 283, and Nebraska Highways 23, 10, 44, and 74 running through the planning area and the ethanol facility located in the planning area, the probability is high for a future hazardous material spill.

Vulnerability Assessment

Hazardous materials pose a threat to the entire planning area and could result in property damage, crop damage, and potential loss of life. If a hazardous materials spill were to occur in the project area, the resulting damage could include structural damage, if homes or businesses were in the path of the spill; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk of hazardous materials spills, as hospitals and retirement homes store chemicals required for the equipment within the facilities, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a hazardous materials spill and, depending on the location of the spill, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the planning area. Residents may be required to evacuate until the spill is under control, as they are at risk from fumes and the chemicals until the spill is cleaned-up. Water sources could be contaminated with the chemicals, thus infiltrating groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Hazardous material spills could affect portions of the three county planning area and impacts from the hazardous material spill could last for days or even weeks. If a hazardous material spill were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of a hazardous material spill in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately

\$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

URBAN FLOODING

Hazard Summary

Within the Tri-Basin NRD, many of the identified flood zones are not heavily populated. While some communities have joined the National Flood Insurance Program (NFIP) and have FEMA approved Flood Insurance Rate Maps (FIRM) not all communities do. The main concern within these communities is urban flooding. In the Tri-Basin NRD, when heavy rains occur it is common for city streets to flood. In cases where the rain water does not permeate into the ground quickly enough, the risk for basement flooding increases as well. Some homeowners have installed sump pumps and generators, but since these homes are not in a floodplain, flood insurance may not be available or may be too expensive to be purchased. In order to alleviate urban flooding, drainage ditches should be cleared of debris, storm drainage systems added and building homes with basements on higher ground should all be considered. Another concern contributing to urban flooding is the impacts of irrigation. During the irrigating season, it is not uncommon for crops to receive up to one-quarter of an inch of water per day. If a heavy rain occurs when soils are saturated, the amount of storm water runoff increases, carrying with them considerable debris which are subject to block culverts and small bridges. The result of this increased runoff can be roadway flooding and erosion.

Historical Occurrences

There are no detailed records of major urban flooding in the Tri-Basin NRD, however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a high chance for urban flooding to occur.

Vulnerability Assessment

There is a threat of urban flooding in the communities of the Tri-Basin NRD if the storm sewer system's capacity was overwhelmed by the runoff resulting from a heavy rain. If a flood event were to affect the county the resulting damage could include structural damage; roadway failures; and, potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the community, especially in the event of road failures and debris or flood waters blocking access routes. Residents could be in

added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Critical infrastructure could also be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure are once again operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of these communities. While it is possible for flooding to affect the entire county in one flood event, the likelihood that the entire county, and the critical facilities in the county, would be affected is unlikely. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Urban flooding could affect portions of the three county planning area and impacts from the resulting flooding could last for days or even weeks. If an urban flooding event were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of planning area. Since there were no historical occurrences available of urban flooding in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TRAIN DERAILMENT

Hazard Summary

With thousands of miles of rail lines running through Nebraska and the mainline tracks running through the project area, train derailment is a concern in the Tri-Basin NRD. Burlington Northern Santa Fe operates a mainline track through central Nebraska. NKCR Railway, smaller in size only to BNSF, also operates a mainline track through the project area. While these railroads carry a variety of cargo, the transport of coal and the use of the lines for transcontinental business are the leading uses nationwide. The leading usage in Nebraska is to transport grain to other areas of the country. The rail lines running through the Tri-Basin NRD are primarily used for transporting grain, coal, ethanol and other

manufactured products. However, rail lines may also be used for transporting hazardous materials, and as such, each county in the project area should be prepared in the event of a train derailment. In the project area, BNSF operates mainline tracks through Kearney and Phelps counties. NKCR operates mainline tracks, which BNSF also has access to, running through Gosper and Phelps counties. Amtrak also utilizes lines through Kearney and Phelps counties, which poses a derailment risk as well.

Historical Occurrences

There have been train derailments in the Tri-Basin NRD, but due to the nature of derailments, the railroad companies are unable to release the information. Despite the lack of records of train derailment, the risk for a train derailment occurring is moderate, with BNSF, NKCR, and Amtrak operating tracks through the project area.

Vulnerability Assessment

Train derailments pose a threat to the entire planning area and could result in property damage, crop damage, and potential loss of life. If a train derailment were to occur in the project area, the resulting damage could include structural damage, if homes or businesses were in the vicinity of the derailment; crop damage; and, loss of life, both human and livestock. Critical facilities could be at risk to train derailments, depending on their location, and critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a train derailment and, depending on the location of the incident, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the planning area. Residents may be required to evacuate until the debris is cleaned up because of the dangers posed by fumes and the chemicals that could be contained within the train cars. Water sources could be contaminated with chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Train derailments could affect portions of the three county planning area and impacts from the event could last for days or even weeks. If a train derailment were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of planning area. Since there were no historical occurrences available of train derailments in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and

future structures and facilities NRD-wide, but it is possible that localized events would account for damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DISEASE

Hazard Summary

The possibility of wide outbreaks of disease pose a risk to every area, and in the event of a disaster the likelihood of this type of outbreak intensifies due to the conditions of the disaster area. According to the Center for Disease Control and Prevention (CDC), people can be infected by diseases in multiple ways. Disease can be spread from animal to human, from food to human, or from human to human. Contagious diseases threatening populations have always existed and even though vaccinations have controlled the outbreaks of many diseases, there are many concerns now about certain types of diseases, such as avian influenza, and also about terroristic acts involving disease.

Historical Occurrences

While there are no records of a major disease outbreak in the project area, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an outbreak, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Disease outbreak poses a threat to the entire planning area and could result in potential loss of life. If a disease outbreak were to occur in the project area, the resulting damage could include economic hardships if businesses and schools were forced to close and communities were required to quarantine residents. Lives could be lost if hospitals and other care facilities became overburdened with patients. Residents may be required to evacuate or quarantine themselves until the outbreak is under control, as they are at risk of spreading the disease. The damage resulting from such an event would have impacts both on existing and future facilities and population.

Potential Impact

Disease outbreak could affect portions of three county planning area and impacts from the outbreak could last for days or even weeks. If a disease outbreak were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of a disease outbreak

in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TERRORISM

Hazard Summary

Terrorism is not often considered when talking about threats in Central Nebraska. However with many public and private critical facilities that exist, and with a population which generally has free access to many tools, products and/or resources which could be used for terrorism purposes, the threat always exists. These threats to various entities and facilities are possible if people who are angry, unstable, deranged, harbor animosity, or those who incite general civil unrest take matters into their own hands to initiate terroristic actions. All forms of properties are at risk including such things as water, gas and electricity utilities, dams, roads, bridges, large livestock facilities, crops, shopping malls, hospitals, schools, government offices, and other public or private facilities.

Historical Occurrences

There are no records of terrorism occurrences in the project area, but the risk for such activities will always exist, making it vital to include the possibility in this all-hazards mitigation plan. Despite the lack of occurrences, there is a moderate chance of terrorism activities in the planning area in the future.

Vulnerability Assessment

Terrorism poses a threat to the entire planning area and could result in property damage, crop damage, and potential loss of life. If a terroristic activity were to occur in the project area the resulting damage could include structural damage, if homes or businesses were in the path attack; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk to terroristic attacks, as they may be targets for such activity, and critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a terrorist attack and, depending on the location of the incident, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the planning area. Residents may be required to evacuate until the clean-up is completed, as they could be at risk from fumes, chemicals, and other toxins until the hazards are removed. Water sources could be contaminated, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would affect existing and future structures, facilities, and population.

Potential Impact

Terrorism could affect portions of the three county planning area and impacts from the event could last for days or even weeks. If terrorism were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of terrorism in the planning area, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

GROUNDWATER CONTAMINATION

Hazard Summary

Groundwater is one of the most valuable resources and assets of the Tri-Basin NRD. As with much of the state, farming has significant importance in the planning area. Irrigation, industrial and residential uses depend on an ample and clean water supply. If the clean water sources were to become contaminated, the impacts would be significant. Contamination of the area's groundwater could occur from a number of sources, including: underground storage tanks, transcontinental pipelines, abandoned landfills, old grain storage facilities, illegal chemical disposal, chemical accidents, or improperly closed abandoned wells. While the downward migration of contaminants from these sources toward the aquifer is relatively slow, the risk still exists. A minimal amount of these chemical contaminants can negatively impact fairly large areas of the aquifer. The implementation of wellhead protection areas and associated practices, along with additional education efforts should help to provide some level of protection for public water supplies. Efforts in planning, the ability to identify and respond to potential problems, along with recovery efforts where needed, must remain priorities for the Tri-Basin NRD.

Historical Occurrences

According to the Nebraska Department of Environmental Quality (NDEQ), there are six sites of leaking underground storage tanks within the Tri-Basin NRD and approximately 130 registered underground storage tanks. Due to aging infrastructure of gas stations and farm equipment the risk of underground storage

tanks leaking is moderate in the Tri-Basin NRD, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Groundwater contamination poses a threat to the entire planning area and could result in potential loss of life. If a groundwater contamination were to occur in the project area, the resulting damage could include economic hardships, if businesses and schools were forced to find other sources for water and if communities were required to finance efforts to eliminate the contaminants. Lives could be lost if hospitals and other care facilities became overburdened with patients suffering the effects of contaminated water. The damage resulting from such an event would have impacts both on existing and future facilities and population.

Potential Impact

Ground water contamination could affect portions of three county planning area and impacts from the ground water contamination could last for days, weeks, months or even years. If ground water contamination were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of groundwater contamination in the planning area, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

ELECTRICAL, PROPANE OR NATURAL GAS INTERRUPTION

Hazard Summary

Like most areas of the state, the Tri-Basin NRD is dependent on reliable energy resources. The loss of energy resources needed to heat homes and run businesses and industry, can be life-threatening, as well as economically damaging, if such resources remain out of service for any length of time. Service interruption can occur due to severe weather, equipment failure, fuel or electrical shortages, or due to acts of terrorism. The impact of an outage or interruption is dependent on the length of outage, time of year, weather conditions, and the secondary impact upon equipment and/or commerce. The planning area has historically suffered several prolonged outages during adverse conditions. These

outages posed widespread interruption of business and industry operations and netted significant economic losses and public inconvenience. While some systems, like many public water wells, communication systems, sewage facilities, and a few other key facilities, have emergency generators, these generators typically require gasoline, natural gas, or diesel fuel to operate. Thus, ready fuel supplies and backup power generation are a critical component of the area's economy.

Historical Occurrences

In December of 2006 a major ice storm interrupted electrical services for several weeks in certain areas of the Tri-Basin NRD. There are no records of long-term propane or natural gas interruptions in the Tri-Basin NRD. The possibility of additional power losses in the past is highly likely due to the nature of weather. The December 2006 ice storm is listed because it was in recent history. Unfortunately, the value of the impact of this event on electrical service interruption was not calculated separate from the ice storm as reported under severe winter storms, so no value can be placed on the impacts of the storm on electrical service interruption.

Vulnerability Assessment

Electrical, propane, or natural gas interruptions pose a threat to the entire planning area and could result in property damage and potential loss of life. If a service interruption were to occur in the project area the resulting damage could include property damage, if homes or businesses experienced freezing pipes, and loss of life, both human and livestock. Critical facilities are also at risk to these service interruptions, depending on the location of the incident. Critical infrastructure potentially could be affected as well if it is dependent on these services to operate. Residents may be required to evacuate until the situation is under control, as they are at risk from extreme temperatures and the inability to operate devices dependent on these services for food and water. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Electrical, propane or natural gas interruptions could affect portions of the three county planning area and impacts from the event could last for days or even weeks. If electrical, propane or natural gas interruptions were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of electrical, propane or natural gas interruptions, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures

and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

PIPELINE EXPLOSION

Hazard Summary

Nebraska has many pipelines crossing it, connecting Canada to the Gulf of Mexico, the Rocky Mountains and southwest to population centers in the Midwest. According to the National Pipeline Mapping Network, the planning area has seven major pipeline companies operating pipelines: Jayhawk Pipeline, LLC; Source Gas, LLC; Trailblazer Pipeline Co.; Nustar Pipeline Operating Partnership LLC; Rockies Express Pipeline LLC; Kinder Morgan Pipelines Inc.; and KM Interstate Gas Transmission Co. With the amount of natural gas pipelines in the project area, pipeline explosions do pose a relatively serious risk to the area. However, the likelihood of any single pipeline exploding is low, due to the number of pipelines in the area; the likelihood of a pipeline explosion occurring in the planning area is moderate.

Historical Occurrences

The likelihood of any single pipeline exploding is low, due to the number of pipelines in the Tri-Basin NRD, the likelihood of a pipeline explosion occurring in the planning area is moderate. There are no records of pipeline explosions in the area.

Vulnerability Assessment

Pipeline explosion poses a threat to the entire planning area and could result in property damage, crop damage, and potential loss of life. If a pipeline explosion were to occur in the project area, the resulting damage could include structural damage, if homes or businesses were in the vicinity of the explosion; crop damage; and, loss of life, both human and livestock. Critical facilities also are at risk to pipeline explosions, depending on the location of the incident. Critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a pipeline explosion and depending, on the location of the incident, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the planning area. Residents may be required to evacuate until the site is properly cleared, as fumes and chemicals pose a hazard until the debris is cleaned up and the pipeline is patched. Water sources could be contaminated, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Pipeline explosion could affect portions of the three county planning area and impacts from the explosion could last for days or even weeks. If a pipeline explosion were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of a pipeline explosion in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DAM FAILURE

Hazard Summary

A dam differs from a levee in that a levee is designed to protect areas from floodwaters and a dam is designed to store water and to reduce flooding downstream. Dams can be used to create hydroelectric power or for agricultural purposes. Dam failures can occur due to a variety of reasons and with little warning to those in the inundation area. There are currently dams in the project area. Of those 71 dams, 69 are low hazard dams, 1 is a significant hazard dam, and 1 is a high hazard dam. Where a low hazard dam would only damage minor resources in the event of failure, a significant hazard dam would damage important resources in the event of failure and a high hazard dam would result in loss-of-life in the event of failure.

Historical Occurrences

There have been no dam failures in the Tri-Basin NRD. Even though there is little risk for dam failure within the planning area, there are dams in that could impact residents of the project area. In fact, according to the county local emergency operations plans (LEOP), the dams shown in Table 13 below could negatively affect the project area in the event of a failure.

Location	Structure Name	Owner	Inundation Area
Gosper County	Johnson Lake Dam	Central Nebraska Public Power and Irrigation District	Would affect the entire Plum Creek watershed as far as the Platte River in Phelps County.
Gosper County	Elwood Dam	Central Nebraska Public Power and Irrigation District	Currently Elwood Dam does not fall under the Federal Regulatory Commission guidelines. As such, no emergency plans have been prepared.
Keith County	Kingsley Dam	Central Nebraska Public Power and Irrigation District	This would affect the Platte River as far east as Louisville, Nebraska.

Source: Local Emergency Operations Plans (LEOP) for all Counties

See Appendix A through C under 'Dam Failure' for a detailed breakdown of the high hazard, significant hazard and low hazard dams that are located within the planning area.

Vulnerability Assessment

Dam failure poses a threat to the property located downstream. In the event of a dam failure, the inundation areas contained within the emergency action plans, on file with the NDNR and not available to the public because of security concerns, show the areas that would be impacted in such an event. If a dam were to fail in the project area, potential damage resulting from the dam failure could include structural damage to homes, businesses, and possibly to critical facilities, as well as power outages, and potential loss of life. Roads or bridges may fail depending on the location of the dams, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for lengthy periods, which would have a severe impact on the local economy. If the dam were located just upstream of a community, loss of life in the inundation area could occur, especially if no warning is given and residents are caught unaware. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population, especially if future development occurs downstream of a dam site.

Potential Impact

Dam failure could affect portions of the three county planning area and impacts from the resulting flooding could last for days or even weeks. If a dam failure were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of a dam failure in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

EARTHQUAKES

Hazard Summary

According to the U.S. Geological Survey (USGS) Web site (earthquake.usgs.gov), an earthquake occurs when there is a sudden slip on a fault that causes the ground to shake and radiate seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. Earthquakes are not typically mentioned as a high risk when referencing natural hazards in Nebraska; however, earthquakes can, and have occurred, within the state. In fact, according to the USGS Web site, there are several significant earthquakes that have affected Nebraska and, while the fault lines in the project area are not extremely active, it is possible for the area to experience an earthquake.

Historical Occurrences

According to the NCDRC and the USGS, there are no records of damaging earthquakes impacting the Tri-Basin NRD. It is important to note that the risk of an earthquake affecting the area is equal for all portions of the planning area; however, the risk of a damaging earthquake affecting the area is low, as there is no major fault line in the area.

Vulnerability Assessment

While earthquakes are not common in the project area, all three counties are equally susceptible to experiencing the effects of an earthquake. Earthquakes, as described above occur when there is a slip on a fault, causing the ground to shake. The damage resulting from an earthquake would depend on the magnitude of the event. If an earthquake were to occur, the area could experience power outages, structural damage, landslides, dam failure, and potential loss of life. In the event of an extreme earthquake, structures, including homes, businesses, schools, and critical facilities, all could suffer structural damage. Critical infrastructure, including water lines, sanitary sewer lines, other pipelines, water wells, roads, and bridges all could suffer from damage that destroy the affected area. Emergency response vehicles would have limited access to residents, increasing the risk of loss of life. Residents caught unaware could be injured from falling debris, or even trapped in buildings or on roadways suffering structural damage. The functional downtime resulting from aftermath of such an event is difficult to imagine. Businesses, schools, and critical facilities could be closed for weeks, which would be detrimental for the economy of the area. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Earthquakes could affect portions of the three county planning area and impacts from the event could last for days or even weeks. If an earthquake were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of an earthquake in the planning area, it is estimated that 1

percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

LANDSLIDE

Hazard Summary

Typically landslides in Nebraska pose the greatest threat to roads and homes. According to FEMA, a landslide occurs when “masses of rock, earth or debris move down a slope.” Landslides may be small or large; slow, or rapid. They can be activated by:

- Storms
- Earthquakes
- Volcanic eruptions
- Fires
- Alternate freezing or thawing
- Steepening of slopes by erosion or human modification

Historical Occurrences

The University of Nebraska – Lincoln School of Natural Resources (UNL-SNR) documents landslides in the state of Nebraska and maintains a database of these landslides. Currently the Tri-Basin NRD has not experienced any landslides according to the UNL-SNR database. The probability of the project area experiencing a damaging landslide is low; however, it is not impossible that a landslide could be seen in this area.

Vulnerability Assessment

Landslides pose a threat to the entire project area in terms of property damage, downed trees, power outages, and potential loss of life. In the event of a landslide in the project area, potential damage resulting from the landslide could include property damage to homes, businesses, and critical facilities; power outages resulting from downed power lines; and, potential loss of life if residents are caught unaware. Roads or bridges may fail depending on the location of the landslide, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Landslides could affect portions of the three county planning area and impacts from the landslide could last for days or even weeks. If a landslide were to occur in the Tri-Basin NRD it was assumed that approximately 1 percent of the area's valuation would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of the planning area. Since there were no historical occurrences available of a landslide in the planning area, it is estimated that 1 percent of the NRD valuation would be impacted for the purposes of this planning effort. The total valuation of the NRD is approximately \$2.22 billion, resulting in approximately \$22.2 million in damage. This estimate should encompass both existing and future structures and facilities NRD-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

MITIGATION STRATEGY

In addition to obtaining hazard information from the public meeting survey forms, the representatives also were asked to list projects that could protect the entities they were representing from hazards. These project lists indicated the problem areas in specific locations as well as identifying the items of most concern for the entities in the Tri-Basin NRD. Using this information, as well as information obtained from FEMA's how-to guide titled "Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies", specific goals for the planning area were developed. According to the how-to guide there are six categories of mitigation actions. Those six categories include the following:

- **Prevention:**
Mitigation actions that reduce hazard losses, including items such as planning and zoning regulations, building codes, capital improvement programs, open space preservation, and storm water management practices
- **Property Protection:**
Mitigation projects that modify structures or remove them to reduce damage from hazards, including acquisition projects, elevation projects, relocation projects, structural retrofits, storm shutters, and shatter-resistant glass
- **Public Education and Awareness:**
Programs that inform and educate the public of the hazards effecting their area and ways to mitigate against them, including outreach programs, real estate disclosure, hazard information centers, and school-age and adult education programs
- **Natural Resource Protection:**
Mitigation projects that preserve or restore natural systems, while also reducing the hazard risks, including sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation
- **Emergency Services:**
Mitigation actions that protect residents and property during and immediately following a hazard, including warning systems, emergency response services, and protection of critical facilities
- **Structural Projects:**
Mitigation actions involving construction of structures to reduce impacts of hazards, including dams, levees, floodwalls, seawalls, retaining walls, and safe rooms

GOALS

Using the public meeting survey results and referencing the six categories of HMGP project, the following are the mitigation goals for the Tri-Basin NRD:

Goal 1: Protect the Health and Safety of the Public

Objectives:

- 1.1 Comply with NFIP
- 1.2 Construct safe rooms in schools, public buildings, and in select locations at popular outdoor venues
- 1.3 Update or obtain additional outdoor warning sirens as needed in the project area
- 1.4 Develop additional emergency notification methods to alert the public of potential hazards
- 1.5 Provide educational opportunities for the public to promote preparedness in the project area

Goal 2: Protect Critical Facilities, Critical Infrastructure, and Maintain their Operation after a Hazard

Objectives:

- 2.1 Obtain generators and other backup power systems required to keep critical facilities, critical infrastructure, and emergency operations running after a hazard event
- 2.2 Develop studies to determine infrastructure systems that require updating
- 2.3 Protect power lines throughout the NRD by burying them or reinforcing them

Goal 3: Protect Existing Properties and Natural Resources

Objectives:

- 3.1 Enforce a maintenance plan for tree trimming and tree removal
- 3.2 Improve storm water management and localized flooding

Goal 4: Promote efficient use of public funds

Objectives:

- 4.1 Maximize funding opportunities through grant money and other outside sources

MITIGATION ACTIONS

With these goals in mind, Table 14 provides specific projects that the Tri-Basin NRD chose to consider pursuing to mitigate damage within the NRD and to protect the public in the event of a

hazard. Please note, this is not a complete list of the projects that could be considered in the project area and additional projects may be included in subsequent revisions of the plan. Also, this project list does not guarantee that any of the represented entities have committed to undertaking these projects or provided financial assistance to do so. The list represents projects that representatives of the entities believe would protect the residents and structures within the project area.

The mitigation actions depicted in Table 14 were analyzed using the STAPLEE method. This methodology is used for project prioritization and also used for a preliminary benefit-cost review for each project. The STAPLEE forms for the communities were handed out at the second public meeting and once turned in; Olsson Associates developed an approach, based on guidance from the FEMA reference titled “Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5)”, for the project prioritization and benefit-cost review to be completed. The STAPLEE method is an all-encompassing spreadsheet containing categories including the following:

- Social – Projects are accepted by the community and do not adversely affect particular portions of the population.
- Technical – Projects are feasible and provide lasting protection with minimal impacts.
- Administrative – The entity has the necessary resources to implement the project.
- Political – Projects have the support of community officials and the public as a whole.
- Legal – Projects follow state and local laws and the entity has the authority to implement the project.
- Economic – Projects are cost-effective, beneficial, and affordable for the entity.
- Environmental – Projects do not adversely affect the environment; comply with local, state, and federal environmental regulations; and remain consistent with local environmental goals.

The key ideas under each category are provided for each representative to contemplate and to rank. The STAPLEE forms for this plan were developed using a scale of high, medium, low, or not applicable. High means the project is very beneficial to an entity with regards to the specific category. Medium indicates that the mitigation action is favorable for the entity. Low signifies that the item is not favorable for the entity. Not applicable indicates that the category does not apply in that particular instance. Once the forms were completed, a value of two was assigned for high rankings; one, for medium rankings; minus one, for low rankings; and, zero for not applicable items. The values were multiplied by the number of times each ranking was assigned for a project and a sum of the values was obtained. The project with the highest value was determined to be the highest priority for the entity. This system also allowed the project team to determine whether the projects were cost-effective based on the rankings provided in the STAPLEE forms. For instance, a project with mostly low rankings may not be cost effective due to the fact that the benefit to the entity would be outweighed by the costs, both direct and indirect, to complete the project. The list provided in Table 14 includes only projects that were deemed cost-effective based on the STAPLEE method. If an entity were to pursue one of the mitigation actions, a more formal benefit-cost analysis would need to be completed.

Table 14. Tri-Basin Mitigation Projects					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
Tri-Basin NRD					
	Need list of projects from the NRD on what projects they would like to see on here besides the ones listed by county or city				
	Comprehensive Effort of Resident Awareness and Education	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
Gosper County					
	Need list of projects from the county on what projects they would like to see on here besides the ones listed city				
	Emergency Generator for Sheriff's Office	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Gosper County Gosper County Emergency Management Agency Gosper County Sheriff's Department Nebraska Emergency Management Agency (NEMA)
	Comprehensive Effort of Resident Awareness and Education	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
Village of Elwood					
	New Tornado Sirens	Tornado	Unknown	Hazard Mitigation Grant Program (HMGP)	Village of Elwood Gosper County Gosper County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
	Emergency Generator for Elwood Housing & Senior Center	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Elwood Gosper County Gosper County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Maintain High Quality Outdoor Warning Sirens and Systems	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Elwood Gosper County Gosper County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator for Sheriff's Office	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Elwood Gosper County Gosper County Emergency Management Agency Gosper County Sheriff's Department Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
	Emergency Shelter for the Village of Elwood	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM) DED CDBG Community Development Program USDA Community Facilities Loans and Grants	Village of Elwood Nebraska Emergency Management Agency (NEMA) U.S. Department of Agriculture (USDA) Nebraska Department of Economic Development (DED)
	Storm Drainage Project in Village of Elwood	Flood	Unknown	Hazard Mitigation Grant Program (HMGP)	Village of Elwood Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
Kearney County					
	Need list of projects from the county on what projects they would like to see on here besides the ones listed city				
	Reverse 911 System for Kearney County 911 Center	All	Unknown	Hazard Mitigation Grant Program (HMGP)	City of Holdrege Phelps County Kearney County Emergency Management Agency Communities of Kearney County Community Police Departments Nebraska Emergency Management Agency (NEMA)
	Bury Power Lines	All	Unknown	Hazard Mitigation Grant Program (HMGP)	Nebraska Public Power District Kearney County Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Comprehensive Effort of Resident Awareness and Education	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
City of Minden					
	Tree Maintenance Program	Tornado, High Wind, and Severe Winter Storms	Unknown	Hazard Mitigation Grant Program (HMGP)	City of Minden Kearney County Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator at Storm Shelter	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Minden Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator at Fire Hall	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Minden Kearney County Emergency Management Agency Minden Fire Department Nebraska Emergency Management Agency (NEMA)
	Emergency Generator at City Hall	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Minden Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
	Drainage Improvements	Flood	Unknown	Hazard Mitigation Grant Program (HMGP)	City of Minden Nebraska Emergency Management Agency (NEMA)
	Tornado Shelter	Tornado	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM) DED CDBG Community Development Program USDA Community Facilities Loans and Grants	City of Minden Nebraska Emergency Management Agency (NEMA) Nebraska Department of Economic Development (DED)
Village of Wilcox					
	Emergency Generator for Town Hall	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Wilcox Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Tornado Shelter	Tornado	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM) DED CDBG Community Development Program USDA Community Facilities Loans and Grants	Village of Wilcox Nebraska Emergency Management Agency (NEMA) Nebraska Department of Economic Development (DED)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
Village of Axtell					
	Maintain High Quality Outdoor Warning Sirens and Systems	All	Unknown	Hazard Mitigation Grant Program (HMGP)	Village of Axtell Kearney County Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator for Emergency Shelter	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Axtell Kearney County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
Phelps County					
	Need list of projects from the county on what projects they would like to see on here besides the ones listed city				
	Comprehensive Effort of Resident Awareness and Education	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
City of Holdrege					
	Outdoor All-Hazard Warning Siren	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Holdrege Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator for Communications Center	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Holdrege Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Emergency Generator for Critical Infrastructure	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	City of Holdrege Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
	Tornado Shelter	Tornado	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM) DED CDBG Community Development Program USDA Community Facilities Loans and Grants	City of Holdrege Nebraska Emergency Management Agency (NEMA) U.S. Department of Agriculture (USDA) Nebraska Department of Economic Development (DED)

Table 14. Tri-Basin NRD Mitigation Projects (Continued)					
Priority	Mitigation Action/ Program/Project	Hazard Addressed	Estimated Cost (\$)	Funding Sources	Funding Partners
	Emergency Shelter	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM) DED CDBG Community Development Program USDA Community Facilities Loans and Grants	City of Holdrege Nebraska Emergency Management Agency (NEMA) Nebraska Department of Economic Development (DED)
Village of Funk					
	Outdoor All-Hazard Warning Siren (Remote Activated)	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Funk Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)
Village of Loomis					
	Outdoor All-Hazard Warning Siren	All	Unknown	Hazard Mitigation Grant Program (HMGP) Pre-Disaster Mitigation Program (PDM)	Village of Loomis Phelps County Phelps County Emergency Management Agency Nebraska Emergency Management Agency (NEMA)

IMPLEMENTATION AND PLAN MAINTENANCE

A critical part of the planning process is implementing the plan and making certain the document is maintained and updated as required by FEMA. Not only is this a FEMA requirement, but it is also necessary to keep the document up-to-date and useful to all entities involved in the planning process. The concept of implementing the plan is somewhat complex and requires the coordination of the planning team to determine the best approach.

It was crucial for the planning team to develop sound mitigation alternatives that would benefit the entities they are representing, while being cost-effective based on the FEMA benefit-cost analysis, meaning that the benefits must equal or outweigh the total project costs. The planning team was responsible for determining which projects were considered high-priority in the project area, and it also was responsible for deciding whether the high-priority projects should be pursued immediately or identifying a projected time frame. Of the items listed in Section 2: Mitigation Strategy, Tri-Basin NRD representatives have determined the following projects as their high-priority projects based on need and feasibility:

Tri-Basin NRD

(this section to be completed after 2nd round of public meetings)

The Tri-Basin NRD Board will be responsible for determining which projects are pursued at the NRD level and the time frame for these projects. At the local level, the counties or communities within the project area ultimately will be responsible for determining which projects are pursued and the time frame for construction. However, the NRD also may be a project sponsor on those projects, which may require NRD Board approval. This plan was not designed to contain an all-inclusive project list; therefore, projects not identified in this edition should be incorporated into subsequent updates of the plan, as required by FEMA.

Monitoring the plan is an important step to making sure the information within the plan adequately reflects the hazards that could affect the project area and the projects that can mitigate for these hazards. Since the lead agency is the Tri-Basin NRD, it will be its responsibility to monitor the plan. Due to the large project area, the creation of a committee responsible for monitoring the plan would allow the entire project area to be represented and would spread the work throughout the counties to lessen the impact that an individual monitoring process would have on the NRD. The representatives could come from various locations throughout the project area. This would limit the amount of time each representative would be required to put into the revision. This committee would be responsible for documenting the projects that were chosen for completion and make note of the timeline for construction as the project progresses, to include that information in an update of this plan. Every year, the committee should evaluate the plan and incorporate any changes into the document that are deemed necessary. The goal of this evaluation is to verify that the information still adequately describes the hazards affecting the project area and still lists relevant projects.

FEMA requires that the plan be updated every five years. This update also can take place after a major hazard affects the project area. Using the information that is obtained through monitoring and evaluating the plan, the five-year update will be much simpler. This update should take the form of the initial planning process, and include public participation and input. At this point, items that were discovered after the approval of the initial plan can be included in the updated plan. This document should be updated to verify the recommendations coincide with the goals and objectives of the Tri-Basin NRD, and all entities included in the planning process, throughout the life of this plan. If an entity opted not to participate during the initial plan, these

entities can be added at this time as well. If additional hazards and mitigation alternatives have been identified, it is crucial to include them in the plan during the revision period for implementation after FEMA approval.

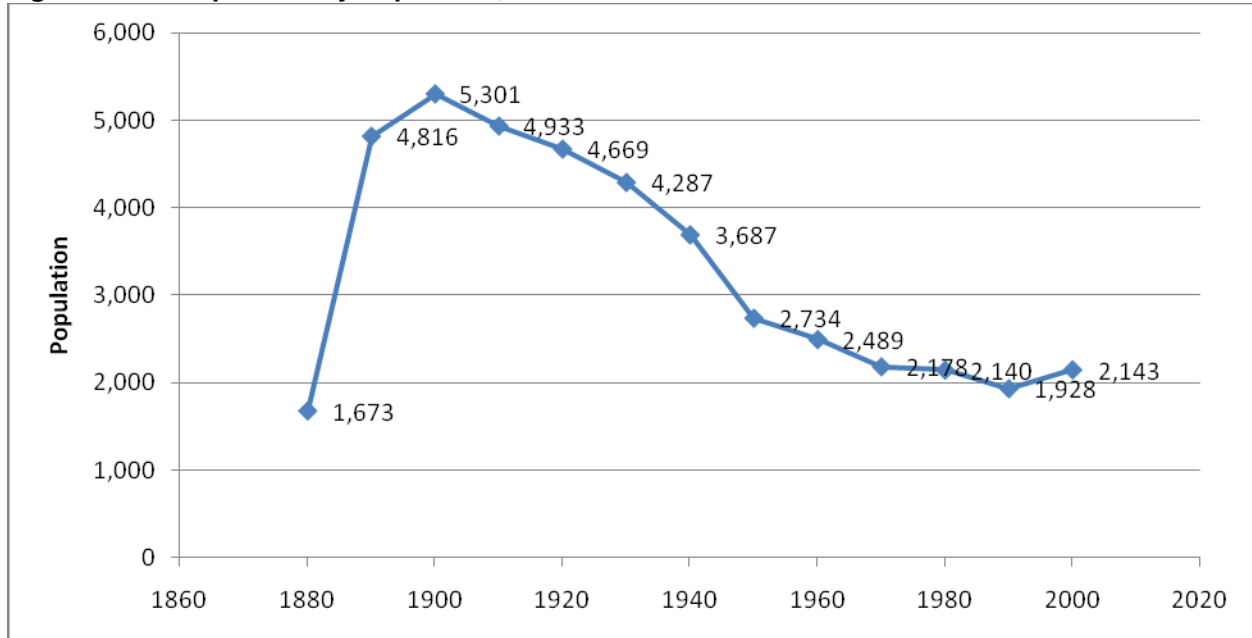
Implementation not only involves enforcing the mitigation alternatives listed in mitigation strategy section of this report, but also involves incorporating this plan into existing planning mechanisms. At this time, there are no existing plans at the NRD level requiring incorporation of this plan. However, there are existing plans at the local level that would benefit from the inclusion of this plan. In the project area, this plan could be incorporated into the county LEOPs and any community comprehensive plans, at the discretion of the participating communities and the emergency management director for each county. It also is critical that the communities adopt and enforce the building codes effective for the state of Nebraska and include this All-Hazards Mitigation Plan in any capital improvement plans in the project area, again at the discretion of the participating communities and the county emergency management directors.

APPENDIX A: GOSPER COUNTY

DEMOGRAPHIC SUMMARY

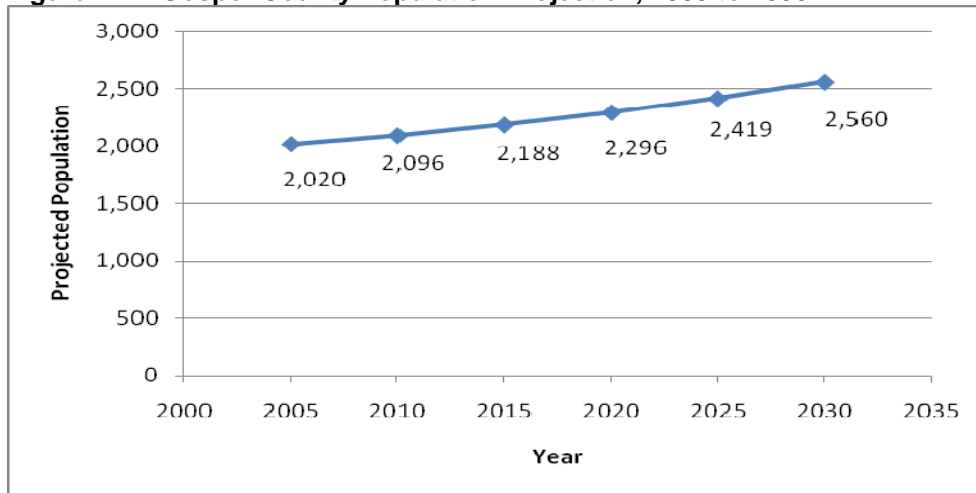
According to the U.S Census Bureau, the total population of Gosper County in 2008 was 1,926. The population in the county has basically maintained during the past few years, as the population in 2000 was 2,143. Based on the information found on the U.S. Census Bureau Web site, the population in the county has decreased slightly from 2000 to 2008. Figure A-1 below shows the population trend in the Gosper County since 1870.

Figure A-1. Gosper County Population, 1870 to 2000



Sources: Nebraska State Data Center, Center for Public Affairs Research, University of Nebraska – Omaha, U.S. Bureau of Census, '1990 Census of Population and Housing', 'CPH-2-29, Population and Housing Unit Counts, Nebraska', Census Web Site (www.census.gov) and similar publications for preceding years.

The population of the Gosper County is projected to increase very slightly over time, as shown in Figure A-2 below.

Figure A-2. Gosper County Population Projection, 2005 to 2030

*2005 numbers are Census counts; other numbers are projections

Source: University of Nebraska, Bureau of Business Research, Nebraska County Population Projections

The gender breakdown for Gosper County as per the 2000 U.S. Census Bureau Information (most recent information) is 50.5 percent male and 49.5 percent female. Table A-1 below depicts the age characteristics of Gosper County.

Table A-1. Age Characteristics of Gosper County, 2000		
Age	Number of People	Percent of Total
Under 5 years	111	5.2%
5 to 9 years	132	6.2%
10 to 14 years	160	7.5%
15 to 19 years	145	6.8%
20 to 24 years	77	3.6%
25 to 34 years	179	8.4%
35 to 44 years	335	15.6%
45 to 54 years	295	13.8%
55 to 59 years	129	6.0%
60 to 64 years	134	6.3%
65 to 74 years	217	10.1%
75 to 84 years	153	7.1%
85 years and older	76	3.5%
Age	Number of People	Percent of Total
18 years and over	1,633	76.2%
21 years and over	1,580	73.7%
62 years and over	530	24.7%
65 years and over	446	20.8%

Source: U.S. Census Bureau, DP-1. General Demographic Characteristics: 2000

As shown in Table A-1, the population varies among the age brackets; however there is a higher percentage of the population between the ages of 35 to 54 than any other age bracket. There is also a larger percentage in the 65 to 74 years age bracket and a significant amount of the population older than age 65, which is important to consider when determining the best method of protection from hazards for citizens and communities.

Another important demographic detail that should not be overlooked is the housing occupancy and the age of the existing structures. Table A-2 below shows the housing occupancy and tenure in the project area.

Subject	Number of People	Percent of Total
Total Housing Units	1,281	100.0%
Occupied Housing Units	863	67.4%
Vacant Housing Units	418	32.6%
For Seasonal, recreational, or occasional use	332	25.9%
Occupied Housing Units		
Owner Occupied	655	75.9%
Renter Occupied	208	24.1%

Source: U.S. Census Bureau, DP-1. Profile of General Demographic Characteristics: 2000

In addition to the occupancy of homes shown in Table A-2, the homeowner vacancy rate is 4.5 percent and the rental vacancy rate is 5.5 percent throughout Gosper County. Table A-3 shows the age of homes within Gosper County. The age of the home is helpful in determining the level of damage that could be seen in the event of a hazard occurrence. In addition, the median value of a home in Gosper County is \$67,900, which should also be considered in damaging events.

Year Structure Built	Number	Percent of Total
1999 to March 2000	7	0.5%
1995 to 1998	74	5.8%
1990 to 1994	69	5.4%
1980 to 1989	81	6.3%
1970 to 1979	225	17.6%
1960 to 1969	173	13.5%
1940 to 1959	173	13.5%
1939 or earlier	479	37.4%

Source: U.S. Census Bureau, DP-4. Profile of Selected Housing Characteristics: 2000

CLIMATE SUMMARY

This plan will focus on Elwood for information about the climate for Gosper County as a whole as it has the most sufficient information available. Nebraska has a continental climate, meaning the state experiences highly variable temperatures from season to season. For Gosper County, the High Plains Regional Climate Center reports that there has been insufficient data related to temperatures. Based on this there is no data available specific to Gosper County.

The average annual precipitation is 18 inches, with the maximum daily rainfall amount of 6.63 inches occurring on April 20, 1933, and the average annual snowfall is just more than 17 inches, with the maximum daily snowfall amount of 12 inches occurring on February 19, 1984.

Figure A-3 shows the precipitation averages and extremes for Gosper County.

Figure A-3. Daily Precipitation Averages and Extremes

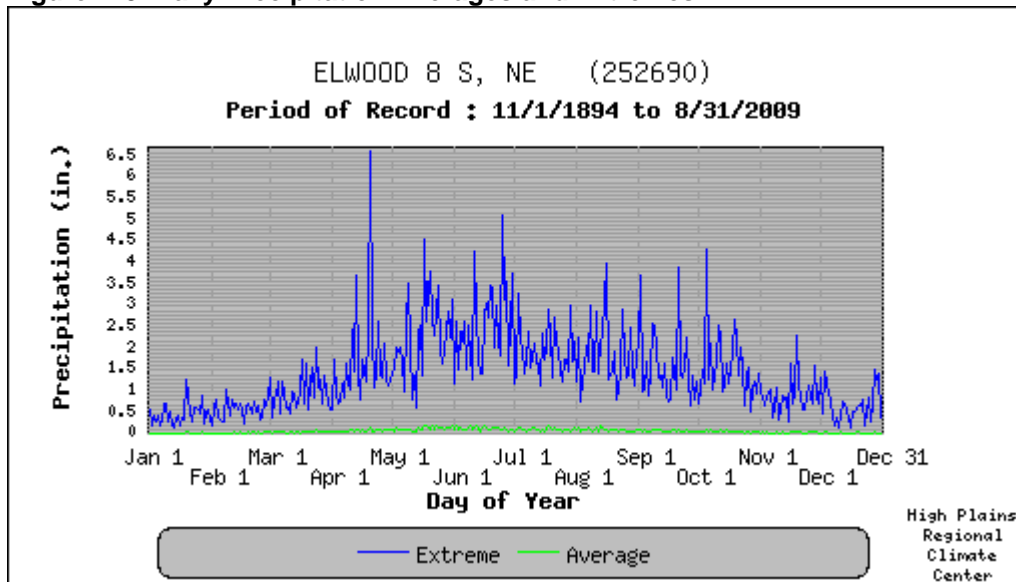
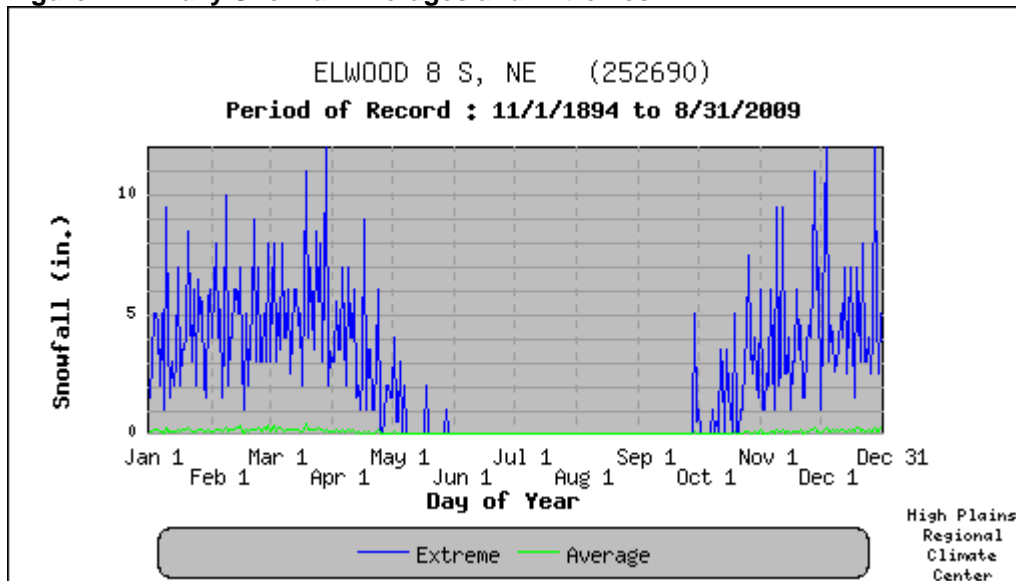


Figure A-4 details the snowfall averages and extremes for Elwood. The daily extreme is the greatest precipitation or snowfall recorded for that day of the year and the daily average is the average of all daily precipitation of snowfall recorded for that day of the year.

Figure A-4. Daily Snowfall Averages and Extremes



Source: High Plains Regional Climate Center

HAZARD IDENTIFICATION

There are a wide range of hazards that affect Gosper County and history has proven that many different types of hazards can cause extensive damage. In fact, from 2006 through 2008 there have been three federally declared disasters that affected Gosper County.

The federally declared disasters did not have a significant time span between each, reinforcing the fact that another extensive disaster could occur at any time. In fact, there was a disaster declared in 2006, 2007 and 2008, which makes this planning effort even more beneficial in Gosper County.

To obtain support from the communities, public meetings discussing the planning process were scheduled in the beginning stages of the planning process. The public meeting results for Gosper County is detailed in the following section.

The information obtained through public input was analyzed by Olsson Associates to determine the hazards that are of biggest concern to the entities throughout the county. Table A-4 below summarizes the results of the Gosper County survey forms. The hazards are listed in the order starting with the hazard of most concern, which was identified as tornadoes, and proceeding to the hazard of least concern, which was identified as dam failure. The probabilities of occurrence, risk, and vulnerability are based solely on public opinion. The column listing past occurrences indicates whether the hazard has affected Gosper County in previous years. This information was provided by the National Climatic Data Center (NCDC) and the county emergency management directors.

Hazard	Probable	Risk	Vulnerability	Past Occurrence
Tornado	Yes	High	Severe	Yes
Severe Summer Storms	Yes	High	Severe	Yes
Severe Winter Storms	Yes	High	Limited	Yes
Wildfire	Yes	High	Limited	Yes
Drought	Yes	Medium	Limited	Yes
Flood	Yes	Medium	Limited	Yes
Man-Made and Technological Hazards	No	Low	Severe	No
Earthquake	No	Low	Limited	No
Landslide	No	Low	None	No
Dam Failure	No	Low	None	No

The information summarized above is an average of the results for all entities in Gosper County, to view the individual entity survey forms, please refer to the end of this appendix.

The subsequent portions of this plan will discuss the hazards that have been identified as potential threats to Gosper County, including all items listed in Table A-4 above. A summary of previous occurrences of each hazard will be listed as well.

TORNADOES

Hazard Summary

A summary of information regarding tornadoes may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Tornadoes” to view this summary.

Historical Occurrences

Table A-5 below provides a list of past occurrences of tornadoes or funnel clouds, causing \$100,000 or more in damage, in Gosper County according to the NCDC. The historic records show that Gosper County does not have a high occurrence of tornadoes, but statistically speaking Gosper County will experience a tornado at some point in the future.

Location	Date	Type	Magnitude	Property Damage	Crop Damage
Gosper County	04/22/1975	Tornado	F1	\$250,000	\$0
Elwood ¹	06/02/1975	Tornado	F2	\$250,000	\$0

¹ 4 injuries resulted from this event

Vulnerability Assessment

Tornadoes pose a serious threat to all of Gosper County in terms of property damage and the potential loss of life. Tornadoes produce high winds and may accompany storms producing heavy rainfall and hail. If a major tornado event were to occur in Gosper County, damage could include structural damage to homes, business, and critical facilities; downed trees or limbs; power outages and downed power lines; which could potentially block roads limiting access to residents for emergency response vehicles, infrastructure damage also could result, including damage to roads, rail lines, water wells, and water towers. Critical facilities, including hospitals, fire stations, and emergency operations centers may see extensive damage. If residents were outside or not in a shelter during a tornado, the risk of loss of life increases dramatically. Rebuilding a community could take years, if the majority of structures and infrastructure were affected. Residents may need to be relocated if they lose their home. Businesses and schools could be closed due to damage. The loss of life that could be associated with such an event could be devastating. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Tornadoes are erratic and do not necessarily affect a large area with one event. Determining an estimated loss for the county is quite difficult, due to the localized nature of these storms. If a Tornado were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage

totals for all historical occurrences listed in Table A-5. Next, take this total damage amount and divide by the total number of events listed in Table A-5. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Using this formula, the total property damage resulting from the 2 historical occurrences was approximately \$500 thousand and the no reported crop damage. The total for the 2 events equaled approximately \$500 thousand. This number was then divided by the 2 historical occurrences to arrive at a total damage estimate of approximately \$250 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$354 million. This result was multiplied by 100 to get the percentage of the counties valuation that is affected per event. For severe summer storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$3.54 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

SEVERE SUMMER STORMSHazard Summary

A summary of information regarding severe summer storms may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Summer Storms” to view this summary.

Historical Occurrences

Table A-6 below provides a list of past occurrences of severe summer storms, causing \$100,000 or more in damage, in Gosper County according to the NCDC. The extensive list of past occurrences of severe summer storms indicates the need to protect the communities and residents of the area from the impact of these storms, as the likelihood of Gosper County experiencing the effects of severe summer storms in the future is statistically certain. It should be noted that tornadoes were defined as separate events in the survey forms they were included in an earlier portion of the plan, and are therefore not included in this section.

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Smithfield	06/21/1996	Lightning	N/A	\$500,000	\$0
Gosper County	10/08/1997	High Wind	63 mph(55 knots)	\$100,000	\$0
Smithfield, Elwood, Johnson Reservoir	05/21/1998	Hail	2.75 in.	\$90,000	\$725,000
Elwood	06/13/1998	Hail	2.75 in.	\$10,000	\$200,000
Johnson Reservoir, Elwood	06/19/2000	Thunder/Wind	N/A	\$100,000	\$1,000,000
Elwood	06/29/2000	Thunder/Wind	N/A	\$100,000	\$2,000,000
Elwood	06/29/2000	Hail	1.00 in.	\$100,000	\$2,000,000
Elwood	08/12/2001	Hail	1.00 in.	\$5,000	\$500,000
Smithfield	06/15/2002	Hail	1.75 in.	\$15,000	\$300,000
Gosper County	04/18/2004	High Wind	60 mph (52 knots)	\$250,000	\$0
Elwood	07/5/2004	Hail	1.00 in.	\$25,000	\$2,000,000
Elwood	06/6/2005	Hail	1.00 in.	\$10,000	\$250,000
Elwood	07/4/2005	Hail	1.00 in.	\$0	\$2,000,000
Johnson Reservoir	08/17/2005	Thunder/Wind	N/A	\$10,000	\$2,000,000
Smithfield, Elwood	09/5/2005	Hail	1.25 in.	\$125,000	\$550,000
Gosper County	04/2/2006	High Wind	46 mph(40 knots)	\$100,000	\$0
Elwood	07/12/2007	Hail	2.75 in.	\$75,000	\$400,000
Johnson Reservoir	08/21/2007	Hail	1.00 in.	\$5,000	\$1,000,000
Elwood	09/6/2007	Hail	1.75 in.	\$200,000	\$2,000,000
Johnson Reservoir, Elwood	05/29/2008	Hail	2.00 in.	\$20,000	\$1,250,000

Vulnerability Assessment

Severe summer storms pose a serious threat to Gosper County. The biggest threat is to properties and the potential loss of life. As mentioned above, severe summer storms can produce tornadoes, hail, high wind, lightning strikes, and intense rain. Tornadoes and flooding events will be detailed in separate sections of this plan. If a severe summer storm were to produce any of the above-mentioned conditions the affected area could experience flooding, fires resulting from lightning strikes, structural damage from high winds, hail, downed trees or tree limbs, power outages, downed power lines, and loss of life. If residents were caught outside in such a storm, they would be at risk to lightning strikes, hail, downed trees or tree limbs catching them unaware, or being caught in flash flooding situations. In the event of flash flooding, emergency response vehicles may not have direct access to the residents of the area. If power outages were to occur, critical infrastructure may be affected. Businesses and schools could be closed due to the impacts of lightning strikes, flooding, or hail. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Severe summer storms are erratic and do not necessarily affect a large area with one event. Determining an estimated loss for the county is quite difficult, due to the localized nature of these storms. If a severe summer storm were to affect the county, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table A-6. Next, take this total damage amount and divide by the total number of events listed in Table A-6. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Using this formula, the total property damage resulting from the 20 historical occurrences was approximately \$1.84 million and crop damage was approximately \$18.18 million. The total for the 20 events equaled approximately \$20.02 million. This number was then divided by the 20 historical occurrences to arrive at a total damage estimate of approximately \$1.00 million per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$354 million. This result was multiplied by 100 to get the percentage of the county's valuation that is affected per storm event. For severe summer storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$3.54 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

SEVERE WINTER STORMS

Hazard Summary

A summary of information regarding severe winter storms may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Winter Storms” to view this summary.

Historical Occurrences

Table A-7 below provides a list of past occurrences of severe winter storms, which caused \$100,000 or more in damage, in Gosper County according to the NCDC. The list of severe winter storm events in the project area indicates the need for mitigation efforts to prevent the catastrophic effects of these storms. Based on the historic occurrences and on current trends, it is reasonable to assume the risk for Gosper County to experience severe winter storms in the future is virtually definite.

Location	Date	Hazard Type	Property Damage	Crop Damage
Gosper County	04/11/1994	Heavy Snow	\$500,000*	\$0
Gosper County	09/21/1995	Freeze	\$0	\$50,000,000*
Gosper County	10/25/1997	Winter Storm	\$15,000,000*	\$1,500,000*
Gosper County	12/07/1997	Ice Storm	\$100,000*	\$0
Gosper County	12/21/1997	Ice Storm	\$100,000*	\$0
Gosper County	03/07/1998	Winter Storm	\$100,000*	\$0
Gosper County	03/01/2002	Winter Storm	\$120,000*	\$0
Gosper County	11/27/2005	Blizzard	\$3,000,000*	\$0
Gosper County	03/20/2006	Winter Storm	\$1,700,000*	\$0
Gosper County	12/19/2006	Ice Storm	\$1,000,000*	\$0
Gosper County	12/29/2006	Ice Storm	\$2,000,000*	\$0
Gosper County	12/10/2007	Winter Storm	\$100,000*	\$0

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Severe winter storms pose a threat to the Gosper County in terms of property damage and the potential loss of life. Severe winter storms, as described above, can produce heavy snowfall, dangerous wind chills, and extreme cold, ice, and blizzard conditions. If a storm were to produce any of these conditions the county could experience power outages, downed trees or tree limbs, and downed power lines resulting from the weight of the ice or snow; treacherous driving conditions; and, loss of life, typically resulting from residents not being prepared for severe weather, or due to automobile accidents. If residents were caught outside in such a storm, the risk of death increases due to the threat of hypothermia. In the event of heavy, accumulating snowfall, emergency response vehicles may have limited access to reach residents of Gosper County. Emergency snow routes would be the primary access throughout communities. In

addition to the obvious vulnerabilities, such as downed trees and icy roadways, another potential vulnerability in the county is to critical infrastructure, such as water lines, sanitary sewer lines, and other vital underground utilities that could freeze if conditions persisted for days or even weeks at a time. The functional downtime resulting from infrastructure failure or power outages would be extremely costly in the area. Businesses and schools may need to be closed and residents may need to be relocated to facilities that are able to provide heat and other necessities. While it is possible for a severe winter storm to affect the entire county in one storm event, the likelihood that the entire county, and all of the critical facilities in Gosper County, would be rendered inoperable is unlikely. The damage resulting from such an event would have impacts both on existing structures, facilities, and population, as well as future structures, facilities and population, depending on the areas impacted.

Potential Impact

Severe winter storms tend to be unpredictable and affect a large area with one storm. Determining an estimated loss for the three-county planning area is quite difficult, due to the large scale nature of these storms. If a severe winter storm were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula (the entire NRD valuation is used because the storm damage values encompass more than Gosper County). First, add up the damage totals for all historical occurrences listed in Table A-7. Next, take this total damage amount and divide by the total number of events listed in Table A-7. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 15 historical occurrences was approximately \$23.72 million and the total crop damage approximately equaled \$51.50 million. The total for all 12 events equaled approximately \$75.22 million. This number was then divided by the 12 historical occurrences to arrive at a total damage estimate of approximately \$6.27 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe winter storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used. For Gosper County, the result would be 1 percent of the \$354 million valuation, or \$3.54 million in damage per event. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

WILDFIRES

Hazard Summary

A summary of information regarding wildfires may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Wildfires” to view this summary.

Historical Occurrences

According to the NCDC there are no records of past occurrences of wildfires in Gosper County. There have been numerous wildfires in crop areas and pastures (not recorded with the NCDC), in very windy and dry conditions. The likelihood of a wildfire affecting Gosper County is moderate.

Vulnerability Assessment

Wildfires pose a threat to Gosper County and could result in property damage, crop damage, and potential loss of life. If a wildfire were to affect the county the resulting damage could include structural damage, if homes or businesses were in the path of the fire; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk to wildfires, depending on their proximity to the fire, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a wildfire and, depending on the damage, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in Gosper County. If power outages result from such an event, the losses could be catastrophic. Businesses, schools, and homes lose power, and without a backup power source critical infrastructure, such as water wells, may stop working. Residents may be required to relocate until the wildfire is under control. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Wildfires could affect portions of Gosper County and impacts from the wildfire could last for days or even weeks. If a wildfire were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a wildfire in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 billion, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock,

past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DROUGHTS

Hazard Summary

A summary of information regarding droughts may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Droughts" to view this summary.

Historical Occurrences

Table A-8 below lists the occurrences of drought in Gosper County according to the NCDC and NDMC. While the records of drought in Gosper County are not great in number, the impacts of these periods of drought were intense. With the importance of agricultural production in the project area, the effect of drought conditions has been severe in the past. Although there is not a long record of drought incidences in Gosper County, it is probable that a drought will occur in the future and the effect of these conditions could be catastrophic.

Location	Date	Type	Property Damage	Crop Damage
Gosper County	Fall 1999 to Spring 2001	Drought	\$0	\$240,000,000*
Gosper County	Spring 2002 to Summer 2004	Drought	\$0	\$480,000,000*

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Drought poses a severe threat to all of Gosper County in terms of crop damage and the potential loss of animal life. Drought, as described above, can be defined in various ways and can affect various aspects of the county. If a drought were to affect Gosper County for an extended period of time, the county could see an increased risk of fire and the potential for the drinking water supply to be depleted. Typically, during severe droughts, water conservation practices would be implemented to limit the depletion of these drinking water supplies. In addition to these threats, there would be an increased chance for animals to be at risk of losing their lives, which includes both livestock and domestic pets. The lack of water and high temperatures associated with summertime droughts increase the risk of heat-related deaths, as well as dehydration, if animals were to be outside for extended periods of time. The amount of damage to Gosper County in crop damage would be extremely high, which, in turn, could cause economic hardship for residents in Gosper County.

Potential Impact

Droughts can be wide spread and span many months or years. Determining an estimated loss for the three-county planning area is quite difficult, due to the broad nature of these and length of time involved with these events. If a drought were to affect the project area, it was estimated that damage of 17 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table A-8. Next, take this total damage amount and divide by the total number of events listed in Table A-8. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the no property damage is recorded resulting from the 2 historical occurrences. The total crop damage approximately equaled \$720 million. The total for the 2 events equaled approximately \$720 million. This number was then divided by the 2 historical occurrences to arrive at a total damage estimate of approximately \$360 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For drought, this value was less than 17 percent. For purposes of this planning effort an estimate that 17 percent of the planning area would be affected was used. For Gosper County, the result would be 17 percent of the \$354 million valuation, or \$60.18 million in damage per event.. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

FLOODING

Hazard Summary

A summary of information regarding flooding may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Flooding” to view this summary.

Historical Occurrences

In Gosper County it would not be unreasonable to see flooding resulting from ravine flooding, flash flooding, ice jams, and urban drainage system flooding. The Johnson Lake area and area along the Platte River in the Northeast corner of the county are the most susceptible to flooding. The Village of Elwood and the Village of Smithfield would experience floodwater from overland flow and ponding due to the areas flat terrain. There are approximately 1,500 structures in Gosper County and no structures within the FEMA-designated floodplain. Table A-9 below details the flood events, causing \$100,000 or more, within Gosper County according to NCDC.

Location	Date	Type	Property Damage	Crop Damage
Gosper County	06/01/1995	Flood	\$20,000	\$80,000
Gosper County	05/11/2005	Flash Flood	\$1,000,000	\$250,000
Johnson Reservoir	05/20/2008	Flash Flood	\$25,000	\$500,000
Johnson Reservoir	05/23/2008	Flash Flood	\$25,000	\$100,000

According to FEMA’s Repetitive Loss list there are no repetitive loss properties in Gosper County. This does not necessarily mean there are no repetitive loss structures; it simply means that there is no record of flood insurance claims. This could be the result of a lack of flooding, or a lack of flooding victims having flood insurance.

Vulnerability Assessment

Flooding poses a threat to the Gosper County, as the county has various streams meandering through it. If a flood event were to affect the county, the resulting damage could include structural damage, especially if these structures are located in a FEMA-designated floodplain or floodway; downed trees or limbs; downed power lines; dam or levee failure; roadway and bridge failures; crop damage; and potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the county, especially in the event of road or bridge failures, downed trees, or other debris or flood waters blocking access routes. Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Dam or levee failure could cause large portions of communities to be affected by flood waters and could threaten the lives of residents of each downstream community if proper warning is not given. Critical infrastructure also could be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as potentially contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and

critical infrastructure is operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of Gosper County. While it is possible for flooding to affect the entire county in one flood event, it is highly unlikely that the entire county, and the critical facilities in the county, would be affected. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Flooding tends to be erratic and does not necessarily affect a large area with one event. Determining an estimated loss for the county is quite difficult, due to the localized nature of these events. If a flood were to affect the county, it was estimated that damage less than 1 percent of the property valuation within the county would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table A-9. Next, take this total damage amount and divide by the total number of events listed in Table A-9. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Using this formula, the total property damage resulting from the 4 historical occurrences was approximately \$1.07 million and the total crop damage approximately equaled \$930 thousand. The total for all 4 events equaled approximately \$2.00 million. This number was then divided by the 4 historical occurrences to arrive at a total damage estimate of approximately \$500 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$354 million. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For flooding, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$3.54 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

MAN-MADE AND TECHNOLOGICAL HAZARDS

Gosper County, like most areas, could be subject to technological issues either directly associated with an emergency or disaster or as a single event affecting citizens, facilities, government infrastructure and public safety. For Gosper County, potential technological hazards will be placed into the following eight categories.

HAZARDOUS MATERIALS

Hazard Summary

A summary of information regarding hazardous materials may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

Due to the NKCR mainline tracks and transportation routes, including U.S. Highway 283 (U.S.283), Nebraska Highways 18 and 23 running through the planning area the probability is high of a future hazardous material spill.

Vulnerability Assessment

Hazardous materials pose a threat to Gosper County and could result in property damage, crop damage, and potential loss of life. If a hazardous materials spill were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Roads and bridges could be affected in the event of a hazardous materials spill and, depending on the location of the spill, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the spill is under control, to avoid risks from fumes and the chemicals until the spill is cleaned up. Water sources could be contaminated with the chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Hazardous material spill could affect portions of Gosper County and impacts from the event could last for days or even weeks. If a hazardous material spill were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a hazardous material spill in the Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures

and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TRAIN DERAILMENT

Hazard Summary

A summary of information regarding train derailment may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards’ to view this summary.

Historical Occurrences

In Gosper County, NKCR operate rail lines running in an east/west direction through the communities of Smithfield and Elwood. There may have been train derailments in Gosper County, but due to the nature of derailments, the railroad companies are unable to release the information. Despite the lack of records of train derailment, the risk for a train derailment occurring is moderate.

Vulnerability Assessment

Train derailments pose a threat to Gosper County and could result in property damage, crop damage, and potential loss of life. If a train derailment were to occur in the area the resulting damage could include structural damage, if homes or businesses were in the vicinity of the derailment; crop damage; and, loss of life, both human and livestock. Critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a train derailment and, depending on the location of the incident; roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the debris is cleaned up, as fumes and the chemicals that may be present within the train cars may pose a risk. Water sources could be contaminated with chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Train Derailments could affect portions of Gosper County and impacts from the event could last for days or even weeks. If a train derailment were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a train derailment in the Gosper County, it is

estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DISEASE

Hazard Summary

A summary of information regarding disease may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

There are no records of a major disease outbreak in Gosper County; however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an outbreak, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Disease outbreak poses a threat to all of Gosper County and could result in potential loss of life. If a disease outbreak were to occur in the county the resulting damage could include economic hardships, if businesses and schools were forced to close and communities were required to quarantine residents, and lives could be lost if hospitals and other care facilities became overburdened with patients. Residents may be required to evacuate or quarantine themselves until the outbreak is under control, as they are at risk of spreading the disease. The damage resulting from such an event would have impacts both on existing and future facilities, and population.

Potential Impact

Disease outbreak could affect portions of Gosper County and impacts from the event could last for days or even weeks. If a disease outbreak were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of disease outbreaks in the Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the

purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TERRORISM

Hazard Summary

A summary of information regarding terrorism may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

While there are no records of terrorism occurrences in the project area, the risk for such activities will always exist, which is why it is so vital to include the possibility in this all-hazards mitigation plan. Despite the lack of occurrences, there is still a low chance of terrorism activities in Gosper County in the future.

Vulnerability Assessment

Terrorism poses a threat to all of Gosper County and could result in property damage, crop damage, and potential loss of life. If a terroristic activity were to occur in the area the resulting damage could include structural damage, if homes or businesses were in the path of attack, crop damage and loss of life, both human and livestock. Critical facilities are also at risk to terroristic attacks, as they may be targets for such activity, and critical infrastructure could potentially be affected as well. Roads and bridges could be impacted in the event of a terrorist attack and depending on the location of the incident; roads could be closed, thus blocking access routes for emergency response vehicles, limiting their ability to reach residents in the county. Residents may be required to evacuate until the clean-up is completed, as they could be at risk from fumes, chemicals, and other toxins until the attack site is properly cleaned up. Water sources could be contaminated, thus infiltrating into the groundwater and impacting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Terrorism could affect portions of Gosper County and impacts from the event could last for days or even weeks. If terrorism were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals

for all historical occurrences. Next, take this total damage amount and divide it by the total number of events listed in the table. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of terrorism in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$354 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

PIPELINE EXPLOSION OR LEAK

Hazard Summary

A summary of information regarding pipeline explosion may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

The likelihood of any single pipeline exploding is low, due to the number of pipelines in Gosper County, the likelihood of a pipeline explosion occurring in the Gosper County is moderate. There are no records of pipeline explosions in Gosper County.

Vulnerability Assessment

Pipeline explosions or leaks pose a threat to Gosper County and could result in property damage, crop damage, and potential loss of life. If an explosion were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Roads and bridges could be affected in the event of an explosion and, depending on the location of the explosion, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the leak is under control, to avoid risks from fumes and the chemicals until the leak is contained. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Pipeline explosions could affect portions of Gosper County and impacts from the event could last for days or even weeks. If a pipeline explosion were to occur in the county it was assumed that approximately 1 percent of the county would be

affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a pipeline explosion in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

URBAN FLOODING

Hazard Summary

Within Gosper County, many of the identified flood zones are not heavily populated. While some communities have joined the National Flood Insurance Program (NFIP) and have FEMA approved Flood Insurance Rate Maps (FIRM) not all communities do. The main concern within these communities is urban flooding. In Gosper County, when heavy rains occur it is common for city streets to flood. In cases where the rain water does not permeate into the ground quickly enough, the risk for basement flooding increases as well. Some homeowners have installed sump pumps and generators, but since these homes are not in a floodplain flood insurance may not be available or may be too expensive to be purchased. In order to alleviate urban flooding, drainage ditches should be cleared of debris, storm drainage systems added and building homes with basements on higher ground should all be considered. Another concern contributing to urban flooding is the impacts of irrigation. During the irrigating season, it is not uncommon for crops to receive up to one-quarter of an inch of water per day. If a heavy rain occurs when soils are saturated, the amount of storm water runoff increases, carrying with them considerable debris which are subject to block culverts and small bridges. The result of this increased runoff can be roadway flooding and erosion.

Historical Occurrences

There are no detailed records of urban flooding in Gosper County, however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a high chance for urban flooding to occur.

Vulnerability Assessment

There is a threat of urban flooding in the communities of the Gosper County if the storm sewer system's capacity was overwhelmed by the runoff resulting from a

heavy rain. If a flood event were to affect the county the resulting damage could include structural damage; downed trees or limbs; roadway failures; and, potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the community, especially in the event of road failures, downed trees, or other debris or flood waters blocking access routes. Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Critical infrastructure could also be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure are once again operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of these communities. While it is possible for flooding to affect the entire county in one flood event, the likelihood that the entire county, and the critical facilities in the county, would be affected is unlikely. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Urban Flooding could affect portions of Gosper County and impacts from the flooding could last for days or even weeks. If urban flooding were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of urban flooding in the Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

GROUNDWATER CONTAMINATION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

While there are no records of groundwater contamination damage in the Gosper County, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an occurrence, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Groundwater contamination poses a threat to the entire county and could result in potential loss of life. If a groundwater contamination were to occur in Gosper County, the resulting damage could include economic hardships, if businesses and schools were forced to find other sources for water and if communities were required to finance efforts to eliminate the contaminants. Lives could be lost if hospitals and other care facilities became overburdened with patients suffering the effects of contaminated water. The damage resulting from such an event would have impacts both on existing and future facilities and population.

Potential Impact

Groundwater contamination could affect portions of Gosper County and impacts from the contamination could last for days, weeks, months or even years. If groundwater contamination were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a Groundwater contamination in the Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

ELECTRICAL, PROPANE OR NATURAL GAS INTERRUPTION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

In December 2006 a major ice storm interrupted electrical services for several weeks in certain areas of the county. There are no records of long-term propane or natural gas interruptions in Gosper County.

Vulnerability Assessment

Electrical, propane, or natural gas interruptions pose a threat to the entire county and could result in property damage and potential loss of life. If a service interruption were to occur in Gosper County the resulting damage could include property damage, if homes or businesses experienced freezing pipes, and loss of life, both human and livestock. Critical facilities are also at risk to these service interruptions, depending on the location of the incident. Critical infrastructure potentially could be affected as well if it is dependent on these services to operate. Residents may be required to evacuate until services are restored, as they are at risk from extreme temperatures and the inability to operate devices dependent on these services for food and water. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Electrical, propane or natural gas interruptions could affect portions of Gosper County and impacts from the interruptions could last for days or even weeks. If an electrical, propane or natural gas interruptions were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of an electrical, propane or natural gas interruption in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

LANDSLIDE

Hazard Summary

A summary of information regarding landslide may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Landslide” to view this summary.

Historical Occurrences

The University of Nebraska – Lincoln School of Natural Resources (UNL – SNR) documents landslides in the state of Nebraska and maintains a database of these landslides. According to this database there is no record of landslides in Gosper County. The probability of Gosper County experiencing a damaging landslide is low; however, it is not impossible that a landslide could occur in this area.

Vulnerability Assessment

Landslides pose a threat to Gosper County in terms of property damage, downed trees, power outages, and potential loss of life. In the event of a landslide in the area, potential damage resulting from the landslide could include property damage to homes, businesses, and critical facilities; power outages resulting from downed power lines; and, potential loss of life if residents are caught unaware. Roads or bridges may fail depending on the location of the landslide, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Landslides could affect portions of Gosper County and impacts from the event could last for days or even weeks. If a landslide were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Gosper County. Since there were no historical occurrences available of a landslide in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DAM FAILURE

Hazard Summary

A summary of information regarding dam failure may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Dam Failure” to view this summary.

Historical Occurrences

There are currently 53 dams in Gosper County. Of those, 51 are low hazard dams, one is a significant hazard dam, and one is a high hazard dam. A low hazard dam would only damage minor resources in the event of failure. A significant hazard dam would damage important resources in the event of failure. A high hazard dam would result in lives lost in the event of failure. There has been no dam failures in Gosper County according to the Association of State Dam Safety Officials.

The Elwood Dam in Gosper County (a significant hazard dam) could affect the area. The dam is owned by the Central Nebraska Power & Irrigation District. The Johnson Lake Dam (a high hazard dam) in Gosper County also could pose a risk to the residents of Gosper County. The dam is owned by the Central Nebraska Power & Irrigation District, and, in the event of a dam failure, the inundation area would include commercial areas in Lexington located downstream. Due to the location of the high hazard dam, it is imperative to include dam failure in this plan.

Vulnerability Assessment

Dam failure poses a threat to the property located downstream. In the event of a dam failure, the inundation areas contained within the emergency action plans, which are on file with the NDNR, show the areas that would be affected in such an event. The action plans are not available for release because of security concerns.

If a dam were to fail in Gosper County, potential damage could include structural damage to homes, businesses, and critical facilities; power outages; and, potential loss of life. Roads or bridges may fail depending on the location of the dams, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. If the dam were located just upstream of a community, loss of life in the inundation area could occur, especially if no warning is given and residents are caught unaware. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population, especially if future development occurs downstream of a dam site.

Potential Impact

Dam failure could affect portions of Gosper County and impacts from the resulting flooding could last for days or even weeks. If a dam failure were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total

valuation of Gosper County. Since there were no historical occurrences available of a dam failure in Gosper County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$354 million, resulting in approximately \$3.54 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

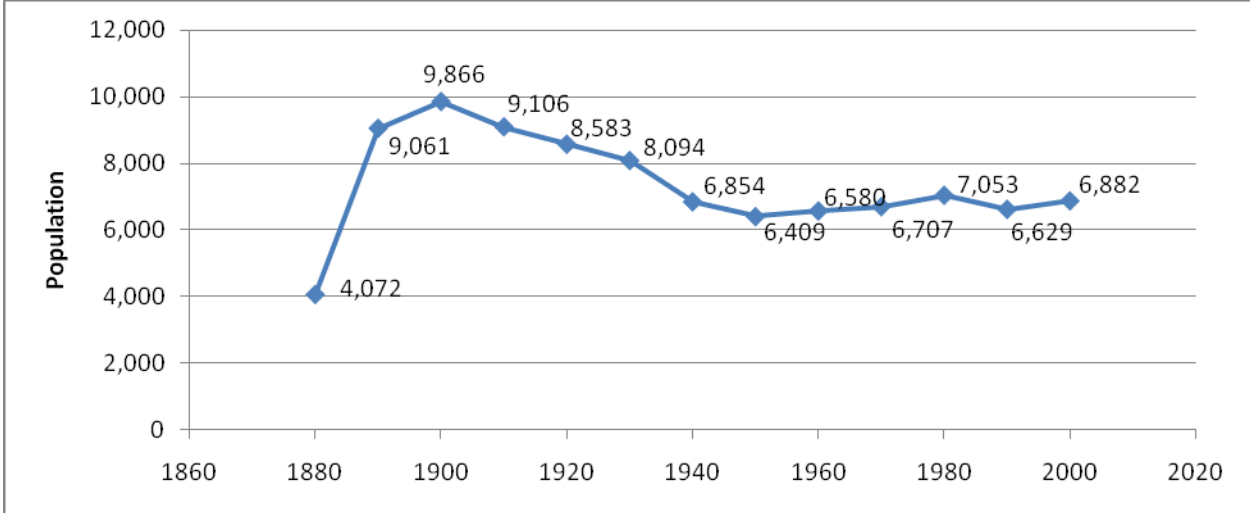
It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

APPENDIX B: KEARNEY COUNTY

DEMOGRAPHIC SUMMARY

According to the U.S Census Bureau, the total population of Kearney County in 2008 was 6,479. The population in the county has decreased slightly during the past few years, as the population in 2000 was 6,882. Figure B-1 shows the population trend in the Kearney County since 1880.

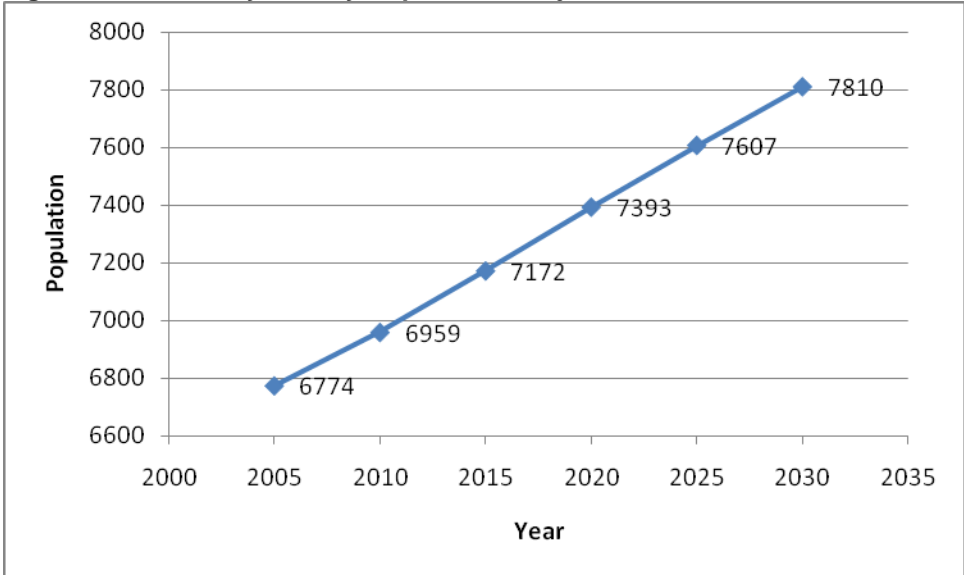
Figure B-1. Kearney County Population, 1880 to 2000



Sources: Nebraska State Data Center, Center for Public Affairs Research, University of Nebraska – Omaha, U.S. Bureau of Census, '1990 Census of Population and Housing', 'CPH-2-29, Population and Housing Unit Counts, Nebraska', Census Web Site (www.census.gov) and similar publications for preceding years.

The population of the Kearney County is projected to increase over time, as shown in Figure B-2.

Figure B-2. Kearney County Population Projection, 2005 to 2030



*2005 numbers are Census counts; other numbers are projections
Source: University of Nebraska, Bureau of Business Research, Nebraska County Population Projections

The gender breakdown for the Kearney County as per the 2000 U.S. Census Bureau Information (most recent information) is 49.6 percent male and 50.4 percent female. Table B-1 depicts the age characteristics of the project area.

Table B-1. Age Characteristics of Kearney County, 2000		
Age	Number of People	Percent of Total
Under 5 years	424	6.2%
5 to 9 years	499	7.3%
10 to 14 years	545	7.9%
15 to 19 years	519	7.5%
20 to 24 years	294	4.3%
25 to 34 years	772	11.2%
35 to 44 years	1,121	16.3%
45 to 54 years	920	13.4%
55 to 59 years	367	5.3%
60 to 64 years	274	4.0%
65 to 74 years	542	7.9%
75 to 84 years	399	5.8%
85 years and older	206	3.0%
Age	Number of People	Percent of Total
18 years and over	5,040	73.2%
21 years and over	4,846	70.4%
62 years and over	1,320	19.2%
65 years and over	1,147	16.7%

Source: U.S. Census Bureau, DP-1. General Demographic Characteristics: 2000

As shown in Table B-1, the population varies among the age brackets; however there is a higher percentage of the population between the ages of 35 to 54 than any other age bracket. There also is a significant amount of the population older than age 65, which is important to consider when determining the best method of protection from hazards for citizens and communities.

Another important demographic detail that should not be overlooked is the housing occupancy and the age of the existing structures. Table B-2 below shows the housing occupancy and tenure in Kearney County.

Table B-2. Housing Occupancy and Tenure of Kearney County, 2000 Census		
Subject	Number of People	Percent of Total
Total Housing Units	2,846	100.0%
Occupied Housing Units	2,643	92.9%
Vacant Housing Units	203	7.1%
For Seasonal, recreational, or occasional use	42	1.5%
Occupied Housing Units	2,643	100.0%
Owner Occupied	1,963	74.3%
Renter Occupied	680	25.7%

Source: U.S. Census Bureau, DP-1. Profile of General Demographic Characteristics: 2000

In addition to the occupancy of homes shown in Table B-2, the homeowner vacancy rate is 2.1 percent and the rental vacancy rate is 7.4 percent throughout Kearney County. Table B-3 shows the age of homes within Kearney County. The age of the home is helpful in determining the

level of damage that could be seen in the event of a hazard occurrence. In addition, the median value of a home in Kearney County is \$77,600, which is also considered in events.

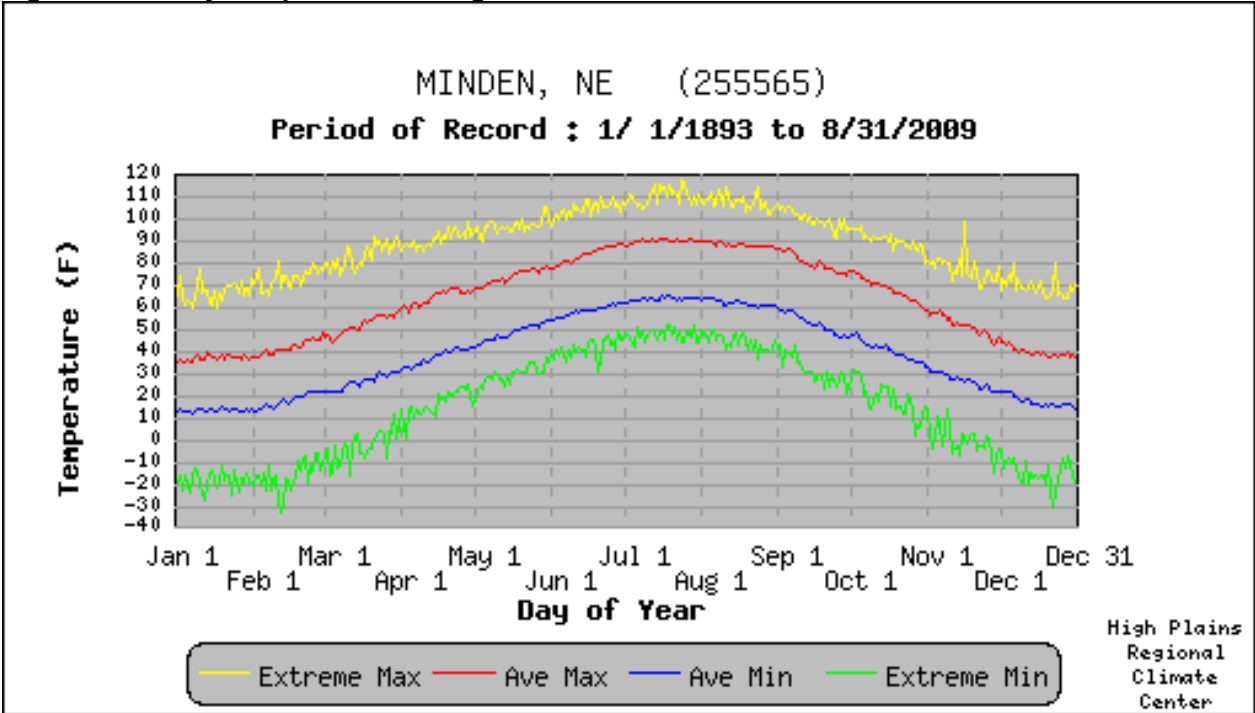
Table B-3. Age of Structures in Kearney County, 2000 Census		
Year Structure Built	Number	Percent of Total
1999 to March 2000	10	0.4%
1995 to 1998	127	4.5%
1990 to 1994	83	2.9%
1980 to 1989	168	5.9%
1970 to 1979	594	20.9%
1960 to 1969	345	12.1%
1940 to 1959	445	15.6%
1939 or earlier	1,074	37.7%

Source: U.S. Census Bureau, DP-4. Profile of Selected Housing Characteristics: 2000

CLIMATE SUMMARY

This plan will focus on the City of Minden as the most centrally located community with the most sufficient information available to provide information about the climate for Kearney County as a whole. Nebraska has a continental climate, meaning the state experiences highly variable temperatures from season to season. In general, Kearney County sees average temperatures of 27.6 degrees in winter; 50.2 degrees in spring; 74.4 degrees in summer; and 53.1 in fall. The record high was 118 degrees F on July 24, 1936. The record low was minus 33 degrees F and occurred on February 12, 1899. The average annual precipitation is 25.12 inches, with a maximum daily rainfall amount of 15.07 inches occurring on September 23, 1926, and the average annual snowfall is 26.6 inches. Figure B-3 below depicts the daily temperature averages and extremes, in a period from 1893 to 2009 in Minden. According to the High Plains Regional Climate Center, the daily extreme maximum temperature is the maximum of all daily maximum temperatures recorded for that day of the year. The average maximum is the average of all daily maximum temperatures recorded for that day of the year. The average minimum is the average of all daily minimum temperatures recorded for that day of the year. The extreme minimum is the minimum of all daily minimum temperatures recorded for the day of the year.

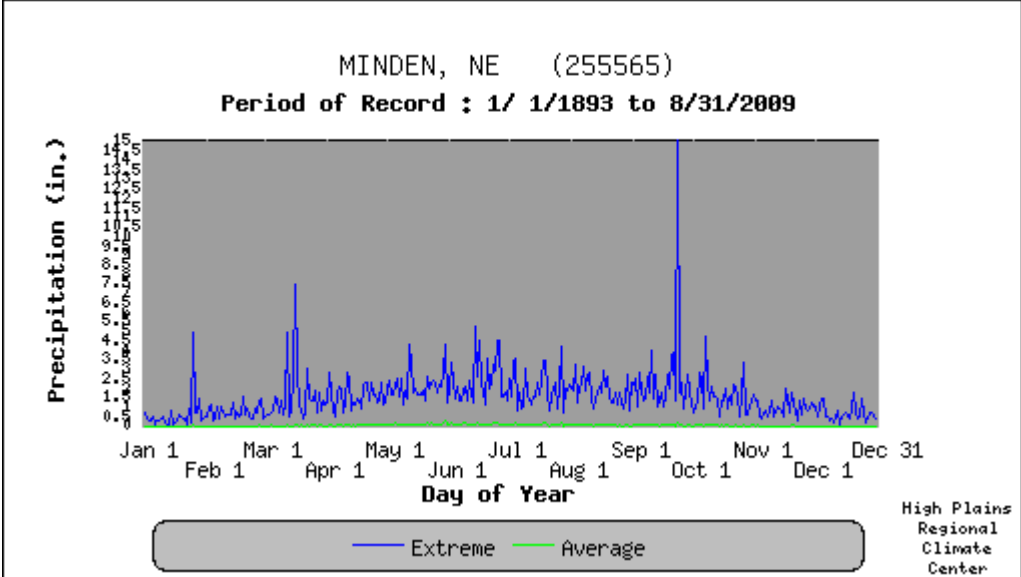
Figure B-3. Daily Temperature Averages and Extremes



Source: High Plains Regional Climate Center

Figure B-4 shows the precipitation averages and extremes for Kearney County.

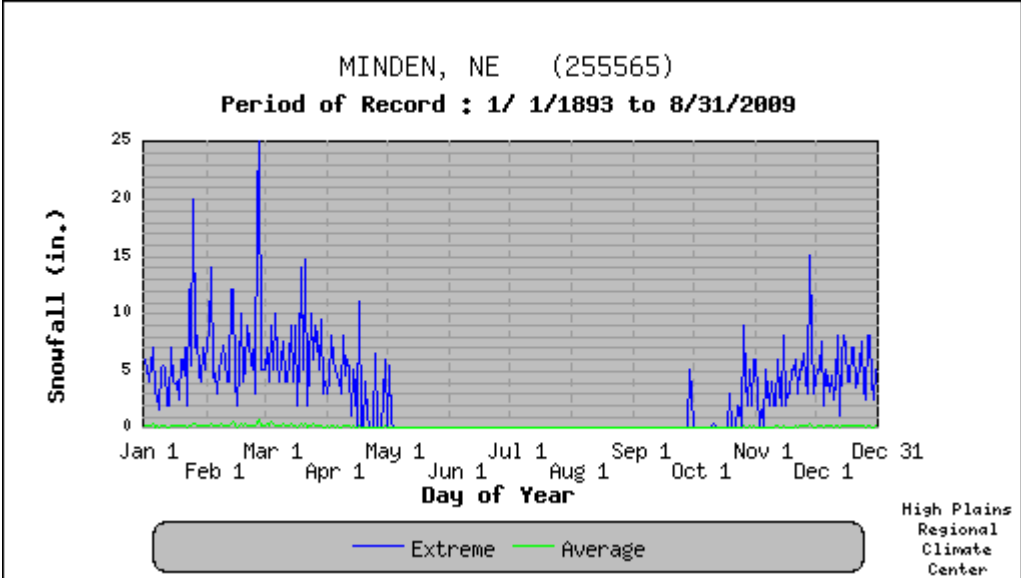
Figure B-4. Daily Precipitation Averages and Extremes



Source: High Plains Regional Climate Center

Figure B-5 details the snowfall averages and extremes for Kearney County. The daily extreme is the greatest precipitation or snowfall recorded for that day of the year and the daily average is the average of all daily precipitation of snowfall recorded for that day of the year.

Figure B-5. Daily Snowfall Averages and Extremes



Source: High Plains Regional Climate Center

HAZARD IDENTIFICATION

There are a wide range of hazards that affect the Kearney County and history has proven that many different types of hazards can cause extensive damage. In fact, from 2004 through 2008 there have been five federally declared disasters that have affected Kearney County.

The federally declared disasters did not have a significant time span between each, reinforcing the fact that another extensive disaster could occur at any time. In fact, there was a disaster declared in 2004, 2005, 2006 and two in 2007, which makes this planning effort even more beneficial in Kearney County.

To obtain support from the communities, public meetings discussing the planning process were scheduled in the beginning stages of the planning process. The public meeting results for Kearney County is detailed in the following section.

The information obtained through public input was analyzed by Olsson Associates to determine the hazards that are of biggest concern to the entities throughout the county. Table B-4 below summarizes the results of the Kearney County survey forms. The hazards are listed in the order starting with the hazard of most concern, which was identified as severe summer storms, and proceeding to the hazard of least concern, which was identified as dam failure. The probabilities of occurrence, risk, and vulnerability are based solely on public opinion. The column listing past occurrences indicates whether the hazard has affected Kearney County in previous years. This information was provided by the National Climatic Data Center (NCDC) and the county emergency management directors.

Table B-4. Kearney County Hazard Identification				
Hazard	Probable	Risk	Vulnerability	Past Occurrence
Severe Summer Storms	Yes	High	Severe	Yes
Severe Winter Storms	Yes	High	Severe	Yes
Tornado	Yes	High	Severe	Yes
Drought	Yes	Medium	Low	Yes
Flood	Yes	Medium	Limited	Yes
Wildfire	Yes	Medium	Limited	No
Man-Made and Technological Hazards	No	Low	Limited	No
Earthquake	No	Low	None	No
Landslide	No	Low	None	No
Dam Failure	No	Low	Low	No

The information summarized above is an average of the results for all entities in Kearney County, to view the individual entity survey forms, please refer to the end of this appendix.

The subsequent portions of this plan will discuss the hazards that have been identified as potential threats to Kearney County, including all items listed in Table B-4 above. A summary of previous occurrences of each hazard will be listed as well.

SEVERE SUMMER STORMSHazard Summary

A summary of information regarding severe summer storms may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Summer Storms” to view this summary.

Historical Occurrences

Table B-5 below provides a list of past occurrences of severe summer storms, causing \$100,000 or more in damage, in Kearney County according to the NCDC. The extensive list of past occurrences of severe summer storms indicates the need to protect the communities and residents of the area from the impact of these storms, as the likelihood of Kearney County experiencing the effects of severe summer storms in the future is statistically certain.

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Axtell	07/22/1996	Thunder/Wind	N/A	\$5,000	\$100,000
Minden, Axtell, Heartwell	05/21/1997	Hail	4.50 in.	\$70,000	\$950,000
Minden	07/07/1997	Hail	2.00 in.	\$25,000	\$250,000
Norman	07/08/1997	Hail	1.50 in.	\$25,000	\$250,000
Minden	08/21/1997	Thunder/ Wind	N/A	\$150,000	\$750,000
Wilcox	09/08/1997	Hail	1.00 in.	\$10,000	\$250,000
Kearney County	10/08/1997	High Wind	63 mph (55 knots)	\$100,000	\$0
Minden	05/29/1998	Hail	0.75 in.	\$0	\$100,000
Minden	06/23/1999	Thunder/Wind	N/A	\$0	\$150,000
Wilcox, Minden, Norman	06/27/1999	Thunder/Wind	N/A	\$400,000	\$1,750,000
Minden	08/17/1999	Thunder/Wind	N/A	\$25,000	\$100,000
Heartwell	06/19/2000	Thunder/Wind	N/A	\$0	\$500,000
Minden	06/19/2000	Hail	0.75 in.	\$30,000	\$700,000
Axtell	07/24/2000	Hail	0.88 in.	\$0	\$100,000
Axtell	07/25/2000	Hail	0.88 in.	\$0	\$100,000
Wilcox, Axtell	06/02/2002	Thunder/Wind	N/A	\$200,000	\$0
Minden Axtell, Newark	06/12/2002	Hail	4.50 in.	\$25,000,000	\$5,500,000
Heartwell	07/24/2002	Hail	1.75 in.	\$50,000	\$1,000,000
Kearney County	06/23/2003	High Wind	64 mph (56 knots)	\$725,000	\$0
Kearney County	04/18/2004	High Wind	59 mph (52 knots)	\$250,000	\$0
Minden	05/10/2005	Hail	2.75 in.	\$100,000	\$0
Minden	06/03/2005	Hail	0.88 in.	\$0	\$500,000
Axtell	06/16/2006	Hail	1.00 in.	\$30,000	\$800,000
Minden	07/13/2006	Hail	1.25 in.	\$35,000	\$175,000
Heartwell	09/15/2006	Hail	1.50 in.	\$25,000	\$75,000

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Wilcox, Axtell, Minden	05/22/2008	Hail	1.75 in.	\$42,000	\$700,000
Newark	06/04/2008	Hail	2.75 in.	\$35,000	\$900,000
Axtell	06/07/2008	Hail	1.00 in.	\$2,000	\$100,000
Heartwell	06/19/2009	Hail	1.75 in.	\$10,000	\$150,000
Axtell	07/22/2009	Thunder/ Wind	N/A	\$20,000	\$500,000

Vulnerability Assessment

Severe summer storms pose a serious threat to Kearney County. The biggest threat is to properties and the potential loss of life. As mentioned above, severe summer storms can produce tornadoes, hail, high wind, lightning strikes, and intense rain. Tornadoes and flooding events will be detailed in separate sections of this plan. If a severe summer storm were to produce any of the above-mentioned conditions the affected area could experience flooding, fires resulting from lightning strikes, structural damage from high winds, hail, downed trees or tree limbs, power outages, downed power lines, and loss of life. If residents were caught outside in such a storm, they would be at risk to lightning strikes, hail, downed trees or tree limbs catching them unaware, or being caught in flash flooding situations. In the event of flash flooding, emergency response vehicles may not have direct access to the residents of the area. If power outages were to occur, critical infrastructure may be affected. Businesses and schools could be closed due to the impacts of lightning strikes, flooding, or hail. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Severe summer storms tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for Kearney County is quite difficult, due to the localized nature of these storms. If a severe summer storm were to affect the county, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table B-5. Next, take this total damage amount and divide by the total number of events listed in Table B-5. Lastly, take this damage per event value and divide it by the total valuation of the County. Using this formula, the total property damage resulting from the 30 historical occurrences was approximately \$27.36 million and the total crop damage approximately equaled \$16.45 million. The total for all 30 events equaled approximately \$43.81 million. This number was then divided by the 30 historical occurrences to arrive at a total damage estimate of approximately \$1.46 million per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$838 million. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe summer storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$8.38 million in damage. This estimate, since it was rounded up, should encompass both existing and

future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

SEVERE WINTER STORMS

Hazard Summary

A summary of information regarding severe winter storm may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Winter Storms” to view this summary.

Historical Occurrences

Table B-6 below provides a list of past occurrences of severe winter storms, which caused \$100,000 or more in damage, in Kearney County according to the NCDC. The list of severe winter storm events in the project area indicates the need for mitigation efforts to prevent the catastrophic effects of these storms. Based on the historic occurrences and on current trends, it is reasonable to assume the risk for Kearney County to experience severe winter storms in the future is virtually definite.

Table B-6. Kearney County Historical Severe Winter Storm Occurrences				
Location	Date	Hazard Type	Property Damage	Crop Damage
Kearney County	04/11/1994	Heavy Snow	\$500,000*	\$0
Kearney County	09/21/1995	Freeze	\$0	\$50,000,000*
Kearney County	10/25/1997	Winter Storm	\$15,000,000*	\$1,500,000*
Kearney County	12/7/1997	Ice Storm	\$100,000*	\$0
Kearney County	12/21/1997	Ice Storm	\$100,000*	\$0
Kearney County	03/07/1998	Winter Storm	\$100,000*	\$0
Kearney County	03/01/2002	Winter Storm	\$120,000*	\$0
Kearney County ¹	02/04/2004	Winter Storm	\$230,000*	\$0
Kearney County	02/08/2005	Winter Weather	\$250,000*	\$0
Kearney County	11/27/2005	Blizzard	\$3,000,000*	\$0
Kearney County	03/20/2006	Winter Storm	\$1,700,000*	\$0
Kearney County	12/20/2006	Ice Storm	\$100,000*	\$0
Kearney County	12/29/2006	Ice Strom	\$10,000,000*	\$0

¹ 1 death and 4 injuries resulted from this event

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Severe winter storms pose a threat to the Kearney County in terms of property damage and the potential loss of life. Severe winter storms, as described above, can produce heavy snowfall, dangerous wind chills, and extreme cold, ice, and blizzard conditions. If a storm were to produce any of the these conditions the county could experience power outages, downed trees or tree limbs, and downed power lines resulting from the weight of the ice or snow; treacherous driving conditions; and, loss of life, typically resulting from residents not being prepared for severe weather, or due to automobile accidents. If residents were caught outside in such a storm, the risk of death increases due to the threat of hypothermia. In the event of heavy, accumulating snowfall, emergency response vehicles may have limited access to reach residents of Kearney County.

Emergency snow routes would be the primary access throughout communities. In addition to the obvious vulnerabilities, such as downed trees and icy roadways, another potential vulnerability in the county is to critical infrastructure, such as water lines, sanitary sewer lines, and other vital underground utilities that could freeze if conditions persisted for days or even weeks at a time. The functional downtime resulting from infrastructure failure or power outages would be extremely costly in the area. Businesses and schools may need to be closed and residents may need to be relocated to facilities that are able to provide heat and other necessities. While it is possible for a severe winter storm to affect the entire county in one storm event, the likelihood that the entire county, and all of the critical facilities in Kearney County, would be rendered inoperable is unlikely. The damage resulting from such an event would have impacts both on existing structures, facilities, and population, as well as future structures, facilities and population, depending on the areas impacted.

Potential Impact

Severe winter storms tend to be unpredictable and affect a large area with one storm. Determining an estimated loss for the three-county planning area is quite difficult, due to the large scale nature of these storms. If a severe winter storm were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula (the entire NRD valuation is used because the storm damage values encompass more than Kearney County). First, add up the damage totals for all historical occurrences listed in Table B-6. Next, take this total damage amount and divide by the total number of events listed in Table B-6. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 13 historical occurrences was approximately \$17.70 million and the total crop damage approximately equaled \$51.50 million. The total for all 13 events equaled approximately \$69.2 million. This number was then divided by the 13 historical occurrences to arrive at a total damage estimate of approximately \$5.32 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe winter storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used. For Kearney County, the result would be 1 percent of the \$838 million valuation, or \$8.38 million in damage per event.. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TORNADOES

Hazard Summary

A summary of information regarding tornadoes may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Tornadoes” to view this summary.

Historical Occurrences

Table B-7 below provides a list of past occurrences of tornadoes or funnel clouds, causing \$100,000 or more in damage, in Kearney County according to the NCDC. As is evident from the historic records of tornado incidences, Kearney County is highly susceptible to tornadoes and it is statistically certain that Kearney County will experience a tornado at some point in the future. Hopefully, through this planning effort, the damage and risk to the public will be reduced.

Table B-7. Kearney County Historical Tornado Occurrences					
Location	Date	Type	Magnitude	Property Damage	Crop Damage
Kearney County	04/13/1986	Tornado	F2	\$250,000	\$0
Kearney County	07/14/1989	Tornado	F0	\$250,000	\$0
Kearney County	03/13/1990	Tornado	F3	\$2,500,000	\$0
Kearney County	03/13/1990	Tornado	F2	\$250,000	\$0

Vulnerability Assessment

Tornadoes pose a serious threat to the all of Kearney County in terms of property damage and the potential loss of life. Tornadoes produce high winds and may accompany storms producing heavy rainfall and hail. If a major tornado event were to occur in Kearney County damage could include structural damage to homes, business, and critical facilities, downed trees or limbs, power outages and downed power lines, and loss of life. If residents were outside or not in a shelter during a tornado, the risk of loss of life increases dramatically. If debris from structural damage, downed trees, and other sources affect the county it could potentially block roads limiting access to residents for emergency response vehicles. In addition to structural damage, infrastructure damage also could result, including damage to roads, rail lines, water wells, and water towers. Critical facilities, including hospitals, fire stations, and emergency operations centers may see extensive damage. The downtime resulting from a major tornado strike could be extensive. Rebuilding a community could take years if the majority of structures and infrastructure were affected. Residents may need to be relocated if they lose their home. Businesses and schools could be closed due to damage. The loss of life that could be associated with such an event could be devastating. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Tornadoes tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for the county is quite difficult, due to the localized nature of these storms. If a tornado were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table B-7. Next, take this total damage amount and divide by the total number of events listed in Table B-7. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Using this formula, the total property damage resulting from the 4 historical occurrences was approximately \$3.25 million and no reported crop damage. The total for all 4 events equaled approximately \$3.25 million. This number was then divided by the 4 historical occurrences to arrive at a total damage estimate of approximately \$813 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$838 million. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For tornadoes, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$8.38 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DROUGHTS

Hazard Summary

A summary of information regarding droughts may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Droughts” to view this summary.

Historical Occurrences

Table B-8 below lists the occurrences of drought in Kearney County according to the NCDC and NDMC. While the records of drought in Kearney County are not great in number, the impacts of these periods of drought were intense. With the importance of agricultural production in the project area, the effect of drought conditions has been severe in the past. Although there is not a long record of drought incidences in Kearney County, it is probable that a drought will occur in the future and the effect of these conditions could be catastrophic.

Table B-8. Kearney County Historical Drought Occurrences				
Location	Date	Type	Property Damage	Crop Damage
Kearney County	Fall 1999 to Spring 2001	Drought	\$0	\$240,000,000*
Kearney County	Spring 2002 to Summer 2004	Drought	\$0	\$480,000,000*

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Drought poses a severe threat to all of Kearney County in terms of property damage, crop damage and the potential loss of animal life. Drought, as described above, can be defined in various ways and can affect various aspects of the county. If a drought were to affect Kearney County for an extended period of time, the county could see an increased risk of fire and the potential for the drinking water supply to be depleted. Typically, during severe droughts, water conservation practices would be implemented to limit the depletion of these drinking water supplies. In addition to these threats, there would be an increased chance for animals to be at risk of losing their lives, which includes both livestock and domestic pets. The lack of water and high temperatures associated with summertime droughts increase the risk of heat-related deaths, as well as dehydration, if animals were to be outside for extended periods of time. The amount of damage to Kearney County in crop damage alone would be extremely high, which in turn, could cause economic hardship for residents in Kearney County. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Droughts can be wide spread and span many months or years. Determining an estimated loss for the three-county planning area is quite difficult, due to the broad nature of these and length of time involved with these events. If a drought were to affect the project area, it was estimated that damage of 17 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table B-8. Next, take this total damage amount and divide by the total number of events listed in Table B-8. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the no property damage is recorded resulting from the 2 historical occurrences. The total crop damage approximately equaled \$720 million. The total for the 2 events equaled approximately \$720 million. This number was then divided by the 2 historical occurrences to arrive at a total damage estimate of approximately \$360 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For drought, this value was less than 17 percent. For purposes of this planning effort an estimate that 17 percent of the planning area would be affected was used. For Kearney County, the result would be 17 percent of the \$838 million valuation, or \$142.46 million in damage per event. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

FLOODING

Hazard Summary

A summary of information regarding flooding may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Flooding” to view this summary.

Historical Occurrences

In Kearney County it would not be unreasonable to see flooding resulting from ravine flooding, flash flooding, ice jams, and urban drainage system flooding. The City of Minden could experience ravine flooding from a tributary of Sand Creek. There are approximately 3,000 existing structures in Kearney County and of those structures approximately 15 structures are within the FEMA-designated floodplain. Table B-9 below details the flood events, causing \$100,000 or more in damage, within Kearney County according to NCDC. There have been several major flood incidents in recent years and the probability of another flood event in Kearney County is certain.

Table B-9. Kearney County Historical Flood Occurrences				
Location	Date	Type	Property Damage	Crop Damage
Kearney County	06/01/1995	Flood	\$20,000	\$80,000
Kearney County	06/19/2000	Flash Flood	\$250,000	\$3,000,000
Kearney County	05/11/2005	Flash Flood	\$3,000,000	\$1,000,000
Newark	05/29/2008	Flash Flood	\$25,000	\$500,000

According to FEMA’s Repetitive Loss list there are no repetitive loss properties in Kearney County. This does not necessarily mean there are no repetitive loss structures; it simply means that there is no record of flood insurance claims. This could be the result of a lack of flooding, or a lack of flooding victims having flood insurance.

Vulnerability Assessment

Flooding poses a threat to the Kearney County. The county has various streams meandering through it, the Platte River along the north county line and the beginning of the Little Blue River. There also is a threat of urban flooding in the communities of the Kearney County, if the storm sewer system’s capacity was overwhelmed by the runoff resulting from such an event. If a flood event were to affect the county, the resulting damage could include structural damage, especially if these structures are located in a FEMA-designated floodplain or floodway; downed trees or limbs; downed power lines; dam or levee failure; roadway and bridge failures; crop damage; and potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the county, especially in the event of road or bridge failures, downed trees, or other debris or flood waters blocking access routes. Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Dam or levee failure could cause

large portions of communities to be affected by flood waters and could threaten the lives of residents of each downstream community if proper warning is not given. Critical infrastructure also could be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as potentially contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of Kearney County. While it is possible for flooding to affect the entire county in one flood event, it is highly unlikely that the entire county, and the critical facilities in the county, would be affected. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Flooding tends to be erratic and does not necessarily affect a large area with one event. Determining an estimated loss for the county is quite difficult, due to the localized nature of these events. If a flood were to affect the county, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table B-9. Next, take this total damage amount and divide by the total number of events listed in Table B-9. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Using this formula, the total property damage resulting from the 4 historical occurrences was approximately \$3.30 million and the total crop damage approximately equaled \$4.58 million. The total for all 4 events equaled approximately \$7.88 million. This number was then divided by the 4 historical occurrences to arrive at a total damage estimate of approximately \$1.97 million per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$838 million. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For flooding, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$8.38 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

WILDFIRES

Hazard Summary

A summary of information regarding wildfires may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Wildfires” to view this summary.

Historical Occurrences

According to the NCDC there are no records of past occurrences of wildfires in Kearney County. There have been wildfires in crop areas and pastures (not recorded with the NCDC), in very windy and dry conditions. The likelihood of a wildfire affecting Kearney County is moderate.

Vulnerability Assessment

Wildfires pose a threat to Kearney County and could result in property damage, crop damage, livestock, and potential loss of life. If a wildfire were to affect the county the resulting damage could include structural damage, if homes or businesses were in the path of the fire; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk to wildfires, depending on their proximity to the fire, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a wildfire and, depending on the damage, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in Kearney County. If power outages result from such an event, the losses could be catastrophic. Businesses, schools, and homes lose power, and without a backup power source critical infrastructure, such as water wells, may stop working. Residents may be required to relocate until the wildfire is under control. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Wildfires could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a wildfire were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of wildfires in the Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock,

past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

MAN-MADE AND TECHNOLOGICAL HAZARDS

Kearney County, like most areas, could be subject to technological issues either directly associated with an emergency or disaster or as a single event affecting citizens, facilities, government infrastructure and public safety. For Kearney County, potential technological hazards will be placed into eight categories.

HAZARDOUS MATERIALS

Hazard Summary

A summary of information regarding hazardous materials may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

Due to the BNSF and Amtrak mainline tracks and transportation routes, including U.S. 6, U.S. 34 and Nebraska Highways 10, 44, and 74, running through Kearney County, the probability is high of a future hazardous material spill.

Vulnerability Assessment

Hazardous materials pose a threat to the Kearney County and could result in property damage, crop damage, and potential loss of life. If a hazardous materials spill were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Critical facilities are also at risk to hazardous materials spills, as hospital and retirement homes store chemicals required for the equipment within the facilities, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a hazardous materials spill and depending on the location of the spill, roads could be closed, thus blocking access routes for emergency response vehicles, and limiting their ability to reach residents in the county. Residents may be required to evacuate until the spill is under control, to avoid risks from fumes and the chemicals until the spill is cleaned up. Water sources could be contaminated with the chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Hazardous materials could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a hazardous material spill were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a hazardous material spill in Kearney County, it is estimated that 1 percent of the county valuation would be

impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TRAIN DERAILMENT

Hazard Summary

A summary of information regarding train derailment may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

In Kearney County, BNSF operates a mainline running in an east/west direction through the communities of Axtell, Minden and Heartwell. Amtrak also utilizes lines through Kearney County, which poses a derailment risk as well. There may have been train derailments in Kearney County, but due to the nature of derailments the railroad companies are unable to release the information. Despite the lack of records of train derailment, the risk for a train derailment occurring is moderate, with BNSF and Amtrak operating tracks through Kearney County.

Vulnerability Assessment

Train derailments pose a threat to the Kearney County and could result in property damage, crop damage, and potential loss of life. If a train derailment were to occur in the area, the resulting damage could include structural damage, crop damage and loss of life, both human and livestock. Critical facilities also could be at risk to train derailments, depending on their location. Critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a train derailment and, depending on the location of the incident, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the debris is cleaned up, fumes and the chemicals that may be present within the train cars may pose a risk. Water sources could be contaminated with chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Train derailments could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a train derailment were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a train derailment in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

PIPELINE EXPLOSION OR LEAK

Hazard Summary

A summary of information regarding pipeline explosion may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

The likelihood of any single pipeline exploding is low, due to the number of pipelines in Kearney County, the likelihood of a pipeline explosion occurring in the Kearney County is moderate. There are no records of pipeline explosions in Kearney County.

Vulnerability Assessment

Pipeline explosions or leaks pose a threat to Kearney County and could result in property damage, crop damage, and potential loss of life. If an explosion were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Roads and bridges could be affected in the event of an explosion and, depending on the location of the explosion, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the leak is under control, to avoid risks from fumes and the chemicals until the leak is contained. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

A pipeline explosion or leak could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a pipeline explosion or leak were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a pipeline explosion or leak in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

URBAN FLOODING

Hazard Summary

Within Kearney County, many of the identified flood zones are not heavily populated. While some communities have joined the National Flood Insurance Program (NFIP) and have FEMA approved Flood Insurance Rate Maps (FIRM) not all communities do. The main concern within these communities is urban flooding. In Kearney County, when heavy rains occur it is common for city streets to flood. In cases where the rain water does not permeate into the ground quickly enough, the risk for basement flooding increases as well. Some homeowners have installed sump pumps and generators, but since these homes are not in a floodplain, flood insurance may not be available or may be too expensive to be purchased. In order to alleviate urban flooding, drainage ditches should be cleared of debris, storm drainage systems added and building homes with basements on higher ground should all be considered. Another concern contributing to urban flooding is the impacts of irrigation. During the irrigating season, it is not uncommon for crops to receive up to one-quarter of an inch of water per day. If a heavy rain occurs when soils are saturated, the amount of storm water runoff increases, carrying with them considerable debris which are subject to block culverts and small bridges. The result of this increased runoff can be roadway flooding and erosion.

Historical Occurrences

There are no detailed records of urban flooding in Kearney County, however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a high chance for urban flooding to occur.

Vulnerability Assessment

There is a threat of urban flooding in the communities of the Kearney County if the storm sewer system's capacity was overwhelmed by the runoff resulting from a heavy rain. If a flood event were to affect the county the resulting damage could include structural damage; downed trees or limbs; roadway failures; and, potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the community, especially in the event of road failures, downed trees, or other debris or flood waters blocking access routes. Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Critical infrastructure could also be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure are once again operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of these communities. While it is possible for flooding to affect the entire county in one flood event, the likelihood that the entire county, and the critical facilities in the county, would be affected is unlikely. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Urban flooding could affect portions of Kearney County. Impacts from the event could last for days or even weeks. If urban flooding were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of urban flooding in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

GROUNDWATER CONTAMINATION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

While there are no records of groundwater contamination damage in the Kearney County, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an occurrence, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Groundwater contamination poses a threat to the entire county and could result in potential loss of life. If a groundwater contamination were to occur in Kearney County, the resulting damage could include economic hardships, if businesses and schools were forced to find other sources for water and if communities were required to finance efforts to eliminate the contaminants. Lives could be lost if hospitals and other care facilities became overburdened with patients suffering the effects of contaminated water. The damage resulting from such an event would have impacts both on existing and future facilities and population.

Potential Impact

Groundwater contamination could affect portions of Kearney County and impacts from the event could last for days, weeks, months or even years. If groundwater contamination were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of groundwater contamination in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life

and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

ELECTRICAL, PROPANE OR NATURAL GAS INTERRUPTION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

In December 2006 a major ice storm interrupted electrical services for several weeks in certain areas of the county. There are no records of long-term propane or natural gas interruptions in Kearney County.

Vulnerability Assessment

Electrical, propane, or natural gas interruptions pose a threat to the entire county and could result in property damage and potential loss of life. If a service interruption were to occur in Kearney County the resulting damage could include property damage, if homes or businesses experienced freezing pipes, and loss of life, both human and livestock. Critical facilities are also at risk to these service interruptions, depending on the location of the incident. Critical infrastructure potentially could be affected as well if it is dependent on these services to operate. Residents may be required to evacuate until services are restored, as they are at risk from extreme temperatures and the inability to operate devices dependent on these services for food and water. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Electrical, propane or natural gas interruption could affect portions of Kearney County and impacts from the event could last for days or even weeks. If an electrical, propane or natural gas interruption were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a electrical, propane or natural gas interruptions in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TERRORISM

Hazard Summary

A summary of information regarding terrorism may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

While there are no records of terrorism occurrences in the project area, the risk for such activities will always exist, which is why it is so vital to include the possibility in this all-hazards mitigation plan. Despite the lack of occurrences, there is still a low chance of terrorism activities in Kearney County in the future.

Vulnerability Assessment

Terrorism poses a threat to all of Kearney County and could result in property damage, crop damage, and potential loss of life. If a terroristic activity were to occur in the area the resulting damage could include structural damage, if homes or businesses were in the path of attack, crop damage and loss of life, both human and livestock. Critical facilities are also at risk to terroristic attacks, as they may be targets for such activity, and critical infrastructure could potentially be affected as well. Roads and bridges could be impacted in the event of a terrorist attack and depending on the location of the incident; roads could be closed, thus blocking access routes for emergency response vehicles, limiting their ability to reach residents in the county. Residents may be required to evacuate until the clean-up is completed, as they could be at risk from fumes, chemicals, and other toxins until the attack site is properly cleaned up. Water sources could be contaminated, thus infiltrating into the groundwater and impacting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Terrorism could affect portions of Kearney County and impacts from the event could last for days or even weeks. If terrorism were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of terrorism in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million,

resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DISEASE

Hazard Summary

A summary of information regarding disease may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

There are no records of a major disease outbreak in Kearney County; however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an outbreak, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Disease outbreak poses a threat to all of Kearney County and could result in potential loss of life. If a disease outbreak were to occur in the county the resulting damage could include economic hardships, if businesses and schools were forced to close and communities were required to quarantine residents, and lives could be lost if hospitals and other care facilities became overburdened with patients. Residents may be required to evacuate or quarantine themselves until the outbreak is under control, as they are at risk of spreading the disease. The damage resulting from such an event would have impacts both on existing and future facilities, and population.

Potential Impact

Disease outbreak could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a disease outbreak were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a disease outbreak in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities

county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

EARTHQUAKES

Hazard Summary

A summary of information regarding earthquakes may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Earthquakes” to view this summary.

Historical Occurrences

According to the NCDC and the USGS, there are no records of damaging earthquakes impacting Kearney County. The risk of a damaging earthquake impacting Kearney County is low, as there is no major fault line in the area.

Vulnerability Assessment

While earthquakes are not common in Kearney County, all portions of the county are equally susceptible to experiencing the effects of an earthquake. Earthquakes, as described earlier occur when there is a slip on a fault, causing the ground to shake. The damage resulting from an earthquake would depend on the magnitude of the event. If an earthquake were to occur, the county could experience power outages, structural damage, landslides, dam failure, and potential loss of life. In the event of an extreme earthquake, structures, including homes, businesses, schools, and critical facilities, could all suffer structural damage. Critical infrastructure, including water lines, sanitary sewer lines, other pipelines, water wells, roads, and bridges all could suffer from damage leaving the affected area in ruins. Emergency response vehicles would have limited access to residents, increasing the risk of loss of life. Residents caught unaware could be injured from falling debris, or even trapped in buildings, or on roadways undergoing structural damage. The functional downtime resulting from aftermath of such an event is unimaginable. Businesses, schools, and critical facilities could be closed for weeks, which would be detrimental for the economy of the county. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Earthquakes could affect portions of Kearney County and impacts from the event could last for days or even weeks. If an earthquake were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of an earthquake in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

LANDSLIDE

Hazard Summary

A summary of information regarding landslide may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Landslide” to view this summary.

Historical Occurrences

The University of Nebraska – Lincoln School of Natural Resources (UNL-SNR) documents landslides in the state of Nebraska and maintains a database of these landslides. According to this database there is no record of landslides in Kearney County. The probability of Kearney County experiencing a damaging landslide is low; however, it is not impossible that a landslide could be seen in this area.

Vulnerability Assessment

Landslides pose a threat to Kearney County in terms of property damage, downed trees, power outages, and potential loss of life. In the event of a landslide in the area, potential damage resulting from the landslide could include property damage to homes, businesses, and critical facilities; power outages resulting from downed power lines; and, potential loss of life if residents are caught unaware. Roads or bridges may fail depending on the location of the landslide, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Landslides could affect portions of Kearney County and impacts from the event could last for days or even weeks. If a landslide were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a landslide in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DAM FAILURE

Hazard Summary

A summary of information regarding dam failure may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Dam Failure” to view this summary.

Historical Occurrences

There are currently 13 dams in Kearney County, which all are low hazard dams. A low hazard dam would only damage minor resources in the event of failure. There are currently no records of dam failure in Kearney County.

Even though there is little risk for the dams located within the county, there are dams in surrounding counties that could impact residents of Kearney County. In fact, according to the Kearney County Local Emergency Operations Plan (LEOP), the Kingsley Dam could affect the area. The dam is owned by the Central Nebraska Public Power & Irrigation District and is located in Ogallala upstream from Kearney County. In the event of a failure the inundation area would likely affect portions of the county along the Platte River.

Vulnerability Assessment

Dam failure poses a threat to the property located downstream. In the event of a dam failure, the inundation areas contained within the emergency action plans, which are on file with the NDNR, show the areas that would be affected in such an event. The action plans are not available for release because of security concerns.

If a dam were to fail in Kearney County, potential damage could include structural damage to homes, businesses, and critical facilities; power outages; and, potential loss of life. Roads or bridges may fail depending on the location of the dams, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population, especially if future development occurs downstream of a dam site.

Potential Impact

Dam failure could affect portions of Kearney County and impacts from the resulting flooding could last for days or even weeks. If a dam failure were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Kearney County. Since there were no historical occurrences available of a dam failure in Kearney County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$838 million, resulting in approximately \$8.38 million in damage.

This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

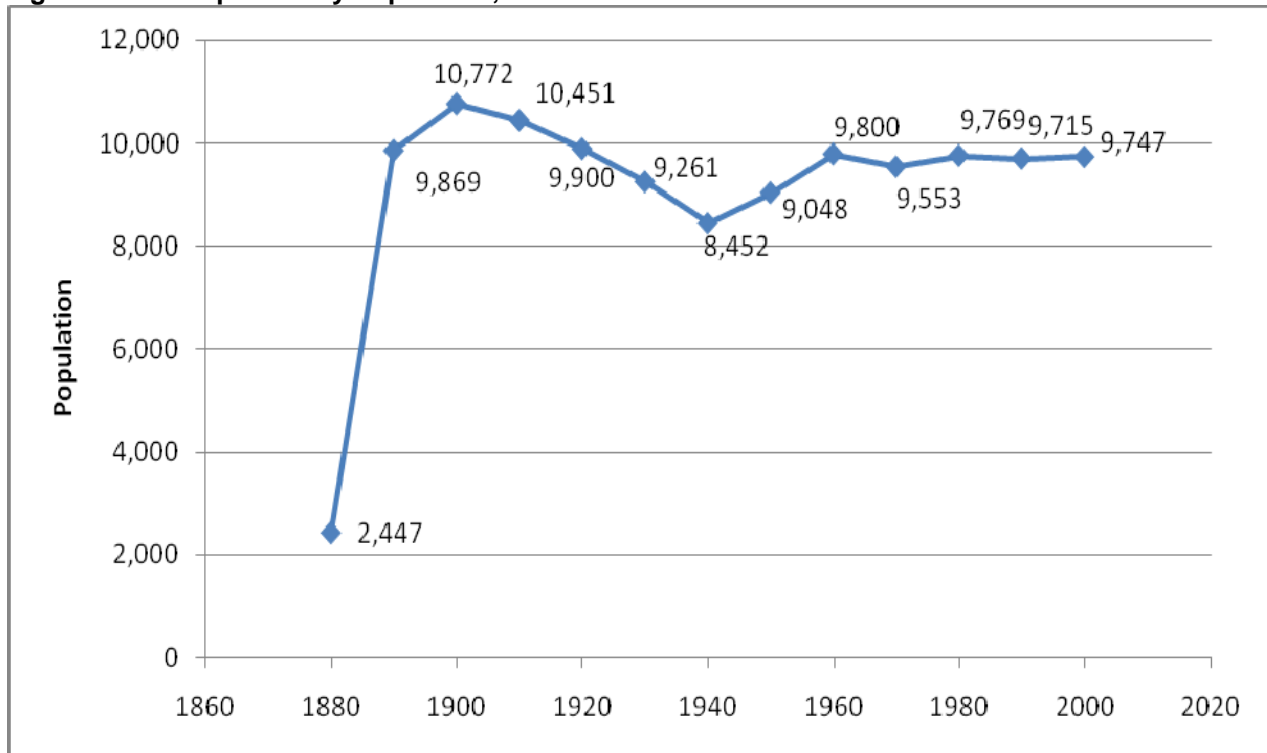
It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

APPENDIX C: PHELPS COUNTY

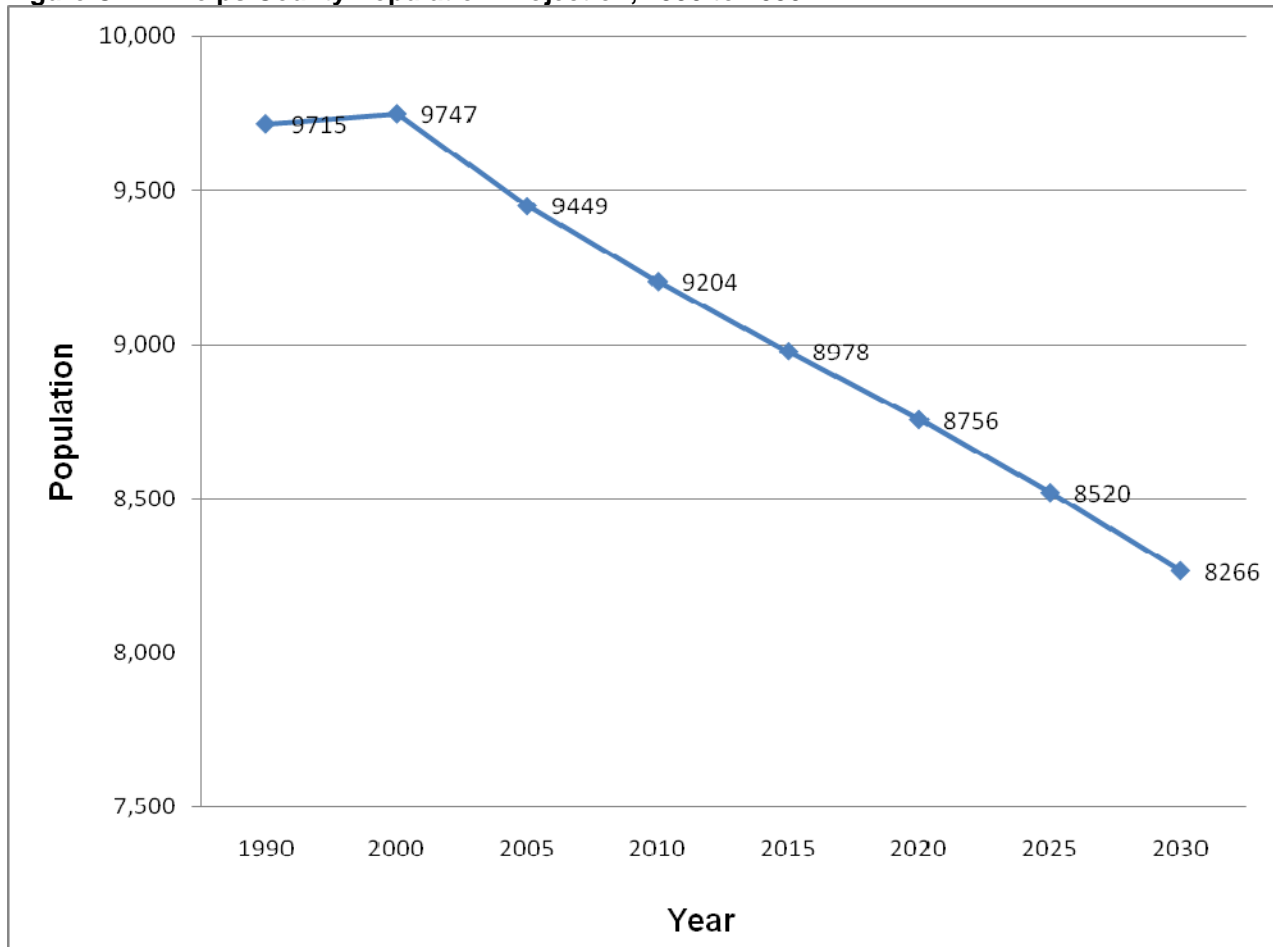
DEMOGRAPHIC SUMMARY

According to the U.S Census Bureau, the total population of Phelps County in 2008 was 9,127. The population in the county has decreased slightly during the past few years, as the population in 2000 was 9,747. Figure C-1 shows the population trend in the Phelps County since 1880.

Figure C-1. Phelps County Population, 1880 to 2000



The population of the Phelps County is projected to decrease over time, as shown in Figure C-2. Based on the information found on the U.S. Census Bureau Web site, the population in the county has decreased slightly from 2000 to 2008.

Figure C-2. Phelps County Population Projection, 1990 to 2030

Source: University of Nebraska, Bureau of Business Research, Nebraska County Population Projections

The gender breakdown for Phelps County as per the 2000 U.S. Census Bureau information (most recent information) is 49 percent male and 51 percent female. Table C-1 depicts the age characteristics of the Phelps County.

Age	Number of People	Percent of Total
Under 5 years	606	6.2%
5 to 9 years	727	7.5%
10 to 14 years	764	7.8%
15 to 19 years	705	7.2%
20 to 24 years	373	3.8%
25 to 34 years	1,043	10.7%
35 to 44 years	1,468	15.1%
45 to 54 years	1,359	13.9%
55 to 59 years	506	5.2%
60 to 64 years	432	4.4%
65 to 74 years	838	8.6%
75 to 84 years	606	6.2%
85 years and older	320	3.3%

Table C-1. Age Characteristics of Phelps County, July 2006 (Continued)		
Age	Number of People	Percent of Total
18 years and over	7,163	73.5%
21 years and over	6,879	70.6%
62 years and over	2,023	20.8%
65 years and over	1,764	18.1%

Source: U.S. Census Bureau, DP-1. General Demographic Characteristics: 2000

As shown in Table C-1, the population varies among the age brackets; however there is a higher percentage of the population between the ages of 35 to 54 than any other age bracket. There also is a significant amount of the population older than age 65, which is important to consider when determining the best method of protection from hazards for citizens and communities.

Another important demographic detail that should not be overlooked is the housing occupancy and the age of the existing structures. Table C-2 below shows the housing occupancy and tenure in Phelps County.

Table C-2. Housing Occupancy and Tenure of Phelps County, 2000 Census		
Subject	Number of People	Percent of Total
Total Housing Units	4,191	100.0%
Occupied Housing Units	3,844	91.7%
Vacant Housing Units	347	8.3%
For Seasonal, recreational, or occasional use	32	0.8%
<hr/>		
Occupied Housing Units	3,844	100.0%
Owner Occupied	2,821	73.4%
Renter Occupied	1,023	26.6%

Source: U.S. Census Bureau, DP-1. Profile of General Demographic Characteristics: 2000

In addition to the occupancy of homes shown in Table C-2, the homeowner vacancy rate is 8.3 percent. Table C-3 shows the age of homes within Phelps County, to help determine the level of damage that could be seen in the event of a hazard occurrence.

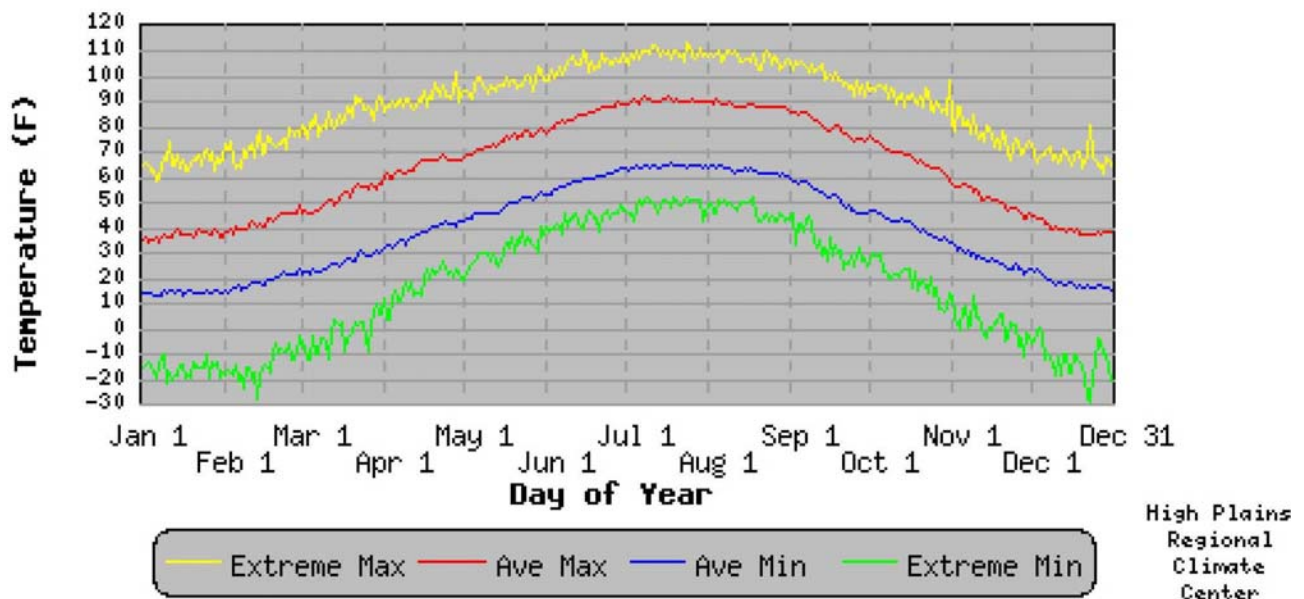
Table C-3. Age of Structures in Phelps County, 2000 Census		
Year Structure Built	Number	Percent of Total
1999 to March 2000	50	1.3%
1995 to 1998	151	3.9%
1990 to 1994	83	2.2%
1980 to 1989	277	7.2%
1970 to 1979	637	16.6%
1960 to 1969	364	9.5%
1950 to 1959	510	13.2%
1940 to 1949	376	9.8%
1939 or earlier	1,396	36.3%

Source: U.S. Census Bureau, DP-4. Profile of Selected Housing Characteristics: 2000

CLIMATE SUMMARY

Nebraska has a continental climate, meaning the state experiences highly variable temperatures from season to season. In general, Phelps County sees average maximum temperatures in the mid- to upper-30s in January and December; temperatures in the 40s in February, March, and November; the mid- to upper-60s in April and October; the mid- to upper-70s in May and September; and temperatures in the 80s from June through August. The record high was 113 degrees F on July 24, 1936. The average minimum temperatures range from being in the teens in January, February, and December; the mid- to upper-20s in March and November; the upper-30s in April and October; the low-40s to mid-50s in May, June, August, and September; to temperatures in mid-60s in July. The record low was minus 29 degrees F and occurred on Dec 23, 1989. The average annual precipitation is just more than 26 inches, with the maximum daily rainfall of 4.85 inches on July 19, 1988, and the average annual snowfall is nearly 29 inches, with the maximum daily snowfall amount of 22 inches occurred on March 29, 1901. Figure C-3 below depicts the daily temperature averages and extremes, in a period from 1893 to 2008, in Holdrege). According to the High Plains Regional Climate Center, the daily extreme maximum temperature is the maximum of all daily maximum temperatures recorded for that day of the year. The average maximum is the average of all daily maximum temperatures recorded for that day of the year. The average minimum is the average of all daily minimum temperatures recorded for that day of the year. The extreme minimum is the minimum of all daily minimum temperatures recorded for the day of the year.

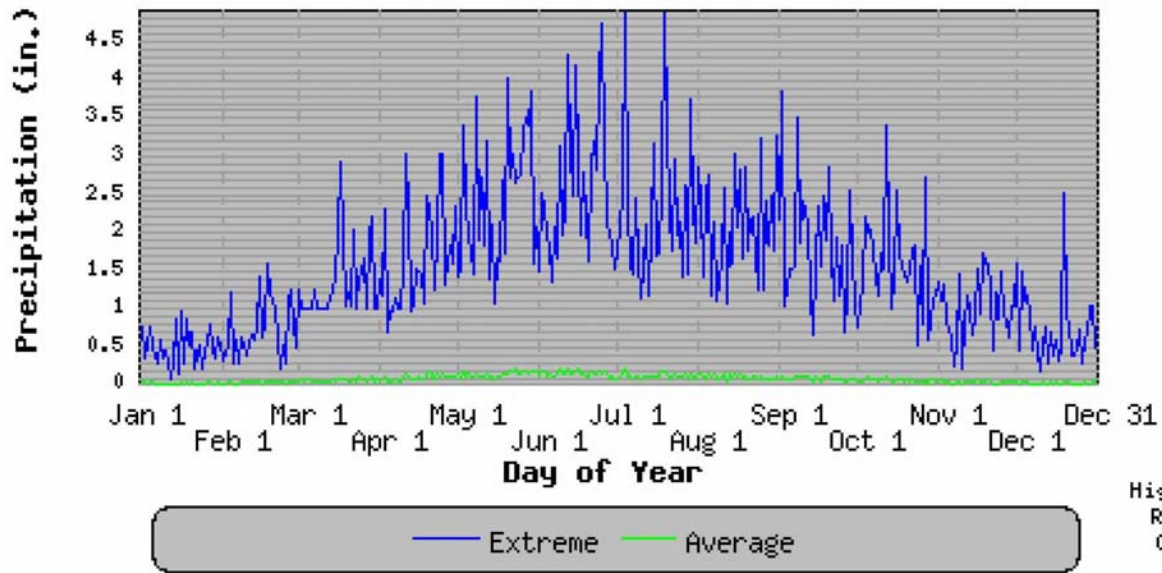
Figure C-3. Daily Temperature Averages and Extremes



Source: High Plains Regional Climate Center

Figure C-4 shows the precipitation averages and extremes for Phelps County. Figure C-5 details the snowfall averages and extremes for Phelps County. The daily extreme is the greatest precipitation or snowfall recorded for that day of the year and the daily average is the average of all daily precipitation or snowfall recorded for that day of the year.

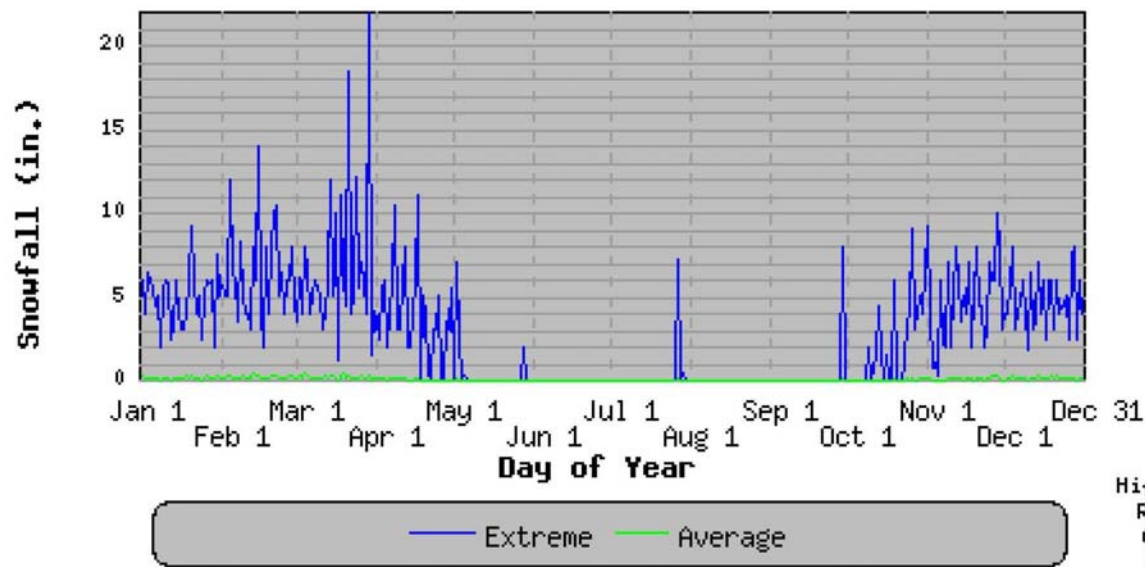
Figure C-4. Daily Precipitation Averages and Extremes



High Plains
Regional
Climate
Center

Source: High Plains Regional Climate Center

Figure C-5. Daily Snowfall Averages and Extremes



High Plains
Regional
Climate
Center

Source: High Plains Regional Climate Center

HAZARD IDENTIFICATION

There are a wide range of hazards that affect the Phelps County and history has proven that many different types of hazards can cause extensive damage. In fact, from 1999 through 2008 there have been four federally declared disasters that have affected Phelps County.

The federally declared disasters did not have a significant time span between each, reinforcing the fact that another extensive disaster could occur at any time. In fact, there was a disaster declared in 2004, 2005, 2007 and 2008, which makes this planning effort even more beneficial in Phelps County.

To obtain support from the communities, public meetings discussing the planning process were scheduled in the beginning stages of the planning process. The public meeting results for Phelps County is detailed in the following section.

The information obtained through public input was analyzed by Olsson Associates to determine the hazards that are of biggest concern to the entities throughout the county. Table C-4 below summarizes the results of the Phelps County survey forms. The hazards are listed in the order starting with the hazard of most concern, which was identified as severe summer storms, and proceeding to the hazard of least concern, which was identified as dam failure. The probabilities of occurrence, risk, and vulnerability are based solely on public opinion. The column listing past occurrences indicates whether the hazard has affected Phelps County in previous years. This information was provided by the National Climatic Data Center (NCDC) and the county emergency management directors.

Hazard	Probable	Risk	Vulnerability	Past Occurrence
Severe Summer Storms	Yes	High	Severe	Yes
Tornado	Yes	High	Severe	Yes
Severe Winter Storms	Yes	High	Severe	Yes
Drought	Yes	High	Severe	Yes
Flood	Yes	Medium	Limited	Yes
Landslide	No	Low	None	No
Man-Made and Technological Hazards	Yes	High	Severe	No
Wildfire	No	Low	Limited	No
Earthquake	No	Low	Limited	No
Dam Failure	No	Low	None	No

The information summarized above is an average of the results for all entities in Phelps County, to view the individual entity survey forms, please refer to the end of this appendix.

The subsequent portions of this plan will discuss the hazards that have been identified as potential threats to Phelps County, including all items listed in Table C-4 above. A summary of previous occurrences of each hazard will be listed as well.

SEVERE SUMMER STORMSHazard Summary

A summary of information regarding severe summer storms may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Summer Storms” to view this summary.

Historical Occurrences

Table C-5 below provides a list of past occurrences of severe summer storms, causing \$100,000 or more in damage, in Phelps County according to the NCDC. The extensive list of past occurrences of severe summer storms indicates the need to protect the communities and residents of Phelps County from the impact of these storms, as the likelihood of Phelps County experiencing the effects of severe summer storms in the future is statistically certain.

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Loomis, Holdrege, Funk	07/07/1996	Hail	2.00 in.	\$70,000	\$3,000,000
Phelps County	10/08/1997	High Wind	63 mph(55 knots)	\$100,000	\$0
Holdrege, Funk, Bertrand	05/21/1998	Hail	2.75 in.	\$1,000,000	\$1,200,000
Bertrand	08/02/1998	Thunder/Wind	N/A	\$5,000	\$200,000
Westmark	09/25/1998	Thunder/Wind	N/A	\$30,000	\$200,000
Funk	05/14/1999	Hail	1.75 in.	\$5,000	\$100,000
Loomis	05/30/1999	Hail	1.75 in.	\$40,000	\$400,000
Atlanta, Holdrege	06/27/1999	Thunder/Wind	N/A	\$75,000	\$200,000
Holdrege	07/25/1999	Thunder/Wind	N/A	\$15,000	\$150,000
Bertrand, Holdrege	06/19/2000	Hail	1.75 in.	\$0	\$1,000,000
Phelps County	06/19/2000	Heavy Rain	N/A	\$20,000	\$2,500,000
Atlanta	06/29/2000	Thunder/Wind	N/A	\$100,000	\$2,000,000
Holdrege	07/03/2000	Hail	0.75 in.	\$0	\$100,000
Loomis, Holdrege, Funk	07/20/2000	Hail	2.75 in.	\$557,000	\$4,750,000
Holdrege	07/25/2000	Hail	1.75 in.	\$20,000	\$250,000
Loomis	05/26/2002	Hail	1.25 in.	\$45,000	\$200,000
Atlanta	06/15/2002	Hail	1.00 in.	\$5,000	\$600,000
Holdrege	05/04/2003	Hail	1.75 in.	\$250,000	\$0
Phelps County	06/23/2003	Strong Wind	64mph(56 knots)	\$725,000	\$0
Atlanta	07/05/2003	Hail	1.00 in.	\$10,000	\$100,000
Phelps County	07/06/2003	High Wind	80mph(70 knots)	\$1,300,000	\$0
Funk	09/09/2003	Hail	1.25 in.	\$10,000	\$100,000
Phelps County	04/18/2004	High Wind	59mph(52 knots)	\$250,000	\$0
Atlanta	07/05/2004	Hail	1.00 in.	\$10,000	\$250,000
Loomis	07/05/2004	Thunder/Wind	N/A	\$50,000	\$2,500,000
Loomis, Holdrege	05/07/2005	Hail	1.75 in.	\$50,000	\$150,000

Location	Date	Hazard Type	Magnitude	Property Damage	Crop Damage
Funk	05/17/2005	Hail	1.75 in.	\$25,000	\$100,000
Bertrand	09/05/2005	Hail	1.00 in.	\$100,000	\$700,000
Phelps County	04/02/2006	High Wind	46mph(40 knots)	\$100,000	\$0
Bertrand	06/20/2006	Thunder/Wind	N/A	\$25,000	\$100,000
Loomis	07/13/2006	Hail	1.75 in.	\$25,000	\$400,000
Holdrege	07/21/2006	Thunder/Wind	N/A	\$10,000	\$100,000
Holdrege	08/01/2006	Thunder/Wind	N/A	\$65,000	\$250,000
Holdrege	09/15/2006	Hail	2.00 in.	\$40,000	\$100,000
Holdrege	04/24/2007	Heavy Rain	N/A	\$0	\$100,000
Holdrege	09/06/2007	Hail	1.50 in.	\$25,000	\$150,000
Funk	05/22/2008	Hail	1.75 in.	\$10,000	\$200,000
Funk	06/07/2008	Hail	1.00 in.	\$2,000	\$100,000
Funk	07/22/2009	Thunder/Wind	N/A	\$10,000	\$1,500,000

Vulnerability Assessment

Severe summer storms pose a serious threat to Phelps County. The biggest threat is to properties and the potential loss of life. As mentioned above, severe summer storms can produce tornadoes, hail, high wind, lightning strikes, and intense rain. Tornadoes and flooding events will be detailed in the following sections of this plan. If a severe summer storm were to produce any of the above-mentioned conditions the affected area could experience flooding, fires resulting from lightning strikes, structural damage from high winds, hail, downed trees or tree limbs, power outages, downed power lines, and loss of life. If residents were caught outside in such a storm, they would be at risk to lightning strikes, hail, downed trees or tree limbs catching them unaware, or being caught in flash flooding situations. In the event of flash flooding, emergency response vehicles may not have direct access to the residents of the area. If power outages were to occur, critical infrastructure may be affected. Businesses and schools could be closed due to the impacts of lightning strikes or flooding. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Severe summer storms tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for the county is quite difficult, due to the localized nature of these storms. If a severe summer storm were to affect the county, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table C-5. Next, take this total damage amount and divide by the total number of events listed in Table C-5. Lastly, take this damage per event value and divide it by the total valuation of the Phelps County. Using this formula, the total property damage resulting from the 39 historical occurrences was approximately \$5.18 million and the total crop damage approximately equaled \$23.75 million. The total for all 39 events equaled approximately

\$28.93 million. This number was then divided by the 39 historical occurrences to arrive at a total damage estimate of approximately \$742 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$1.03 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe summer storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$10.3 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TORNADOES

Hazard Summary

A summary of information regarding tornadoes may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Tornadoes” to view this summary.

Historical Occurrences

Table C-6 below provides a list of past occurrences of tornadoes or funnel clouds in Phelps County according to the NCDC. As is evident from the historic records of tornado incidences, Phelps County is highly susceptible to tornadoes and it is statistically certain that Phelps County will experience a tornado at some point in the future. Hopefully, through this planning effort, the damage and risk to the public will be reduced.

Location	Date	Type	Magnitude	Property Damage	Crop Damage
Phelps County ¹	07/18/1958	Tornado	F2	\$250,000	\$0
Phelps County	06/29/1988	Tornado	F1	\$2,500,000	\$0
Holdrege	10/17/1994	Tornado	F2	\$250,000	\$0
Loomis	10/16/1998	Tornado	F2	\$400,000	\$1,000,000
Holdrege	05/02/1999	Tornado	F1	\$100,000	\$0
Holdrege	05/07/2005	Tornado	F0	\$250,000	\$0

¹ 2 injuries resulted from this event

Vulnerability Assessment

Tornadoes pose a serious threat to the all of Phelps County in terms of property damage and the potential loss of life. Tornadoes produce high winds and may accompany storms producing heavy rainfall and hail. If a major tornado event were to occur in Phelps County, damage could include structural damage to homes, business, and critical facilities; downed trees or limbs; power outages and downed power lines; and, loss of life. If residents were outside or not in a shelter during a tornado, the risk of loss of life increases dramatically. If debris from structural damage, downed trees, and other sources affect the county it could potentially block roads limiting access to residents for emergency response vehicles. In addition to structural damage, infrastructure damage also could result, including damage to roads, rail lines, water wells, and water towers. Critical facilities, including hospitals, fire stations, and emergency operations centers may see extensive damage. The downtime resulting from a major tornado strike could be extensive. Rebuilding a community could take years, if the majority of structures and infrastructure were affected. Residents may need to be relocated if they lose their home. Businesses and schools could be closed due to damage. The loss of life that could be associated with such an event could be devastating. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Tornadoes tend to be erratic and do not necessarily affect a large area with one storm. Determining an estimated loss for the county is quite difficult, due to the localized nature of these storms. If a tornado were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table C-6. Next, take this total damage amount and divide by the total number of events listed in Table C-6. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Using this formula, the total property damage resulting from the 6 historical occurrences was approximately \$3.75 million and the total crop damage approximately equaled \$1.00 million. The total for all 6 events equaled approximately \$4.75 million. This number was then divided by the 6 historical occurrences to arrive at a total damage estimate of approximately \$792 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$1.03 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For tornadoes, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the county would be affected was used, resulting in approximately \$10.3 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

SEVERE WINTER STORMS

Hazard Summary

A summary of information regarding severe winter storms may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Severe Winter Storms” to view this summary.

Historical Occurrences

Table C-7 below provides a list of past occurrences of severe winter storms in Phelps County according to the NCDC. The overwhelming list of severe winter storm events in the project area indicates the need for mitigation efforts to prevent the catastrophic effects of these storms. Based on the historic occurrences and on current trends, it is reasonable to assume the risk for Phelps County to experience severe winter storms in the future is virtually definite.

Location	Date	Hazard Type	Property Damage	Crop Damage
Phelps County	04/11/1994	Heavy Snow	\$500,000*	\$0
Phelps County	09/21/1995	Freeze	\$0	\$50,000,000*
Phelps County	10/25/1997	Winter Storm	\$15,000,000*	\$1,500,000*
Phelps County	12/07/1997	Ice Storm	\$100,000*	\$0
Phelps County	12/21/1997	Ice Storm	\$100,000*	\$0
Phelps County	03/07/1998	Winter Storm	\$100,000*	\$0
Phelps County	03/01/2002	Winter Storm	\$120,000*	\$0
Phelps County ¹	02/04/2004	Winter Storm	\$230,000*	\$0
Phelps County	11/27/2005	Blizzard	\$3,000,000*	\$0
Phelps County	03/20/2006	Winter Storm	\$1,700,000*	\$0
Phelps County	12/19/2006	Ice Storm	\$300,000*	\$0
Phelps County	12/29/2006	Ice Storm	\$2,000,000*	\$0
Phelps County	12/10/2007	Winter Storm	\$100,000*	\$0

¹ 1 death and 4 injuries resulted from this event

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Severe winter storms pose a threat to the Phelps County in terms of property damage and the potential loss of life. Severe winter storms, as described above, can produce heavy snowfall, dangerous wind chills, and extreme cold, ice, and blizzard conditions. If a storm were to produce any of these conditions the county could experience power outages, downed trees or tree limbs, and downed power lines resulting from the weight of the ice or snow; treacherous driving conditions; and, loss of life, typically resulting from residents not being prepared for severe weather, or due to automobile accidents. If residents were caught outside in such a storm, the risk of death increases due to the threat of hypothermia. In the event of heavy, accumulating snowfall, emergency response vehicles may have limited access to reach residents of Phelps County.

Emergency snow routes would be the primary access throughout communities. In addition to the obvious vulnerabilities, such as downed trees and icy roadways, another potential vulnerability in the county is to critical infrastructure, such as water lines, sanitary sewer lines, and other vital underground utilities that could freeze if conditions persisted for days or even weeks at a time. The functional downtime resulting from infrastructure failure or power outages would be extremely costly in the area. Businesses and schools may need to be closed and residents may need to be relocated to facilities that are able to provide heat and other necessities. While it is possible for a severe winter storm to affect the entire county in one storm event, the likelihood that the entire county, and all of the critical facilities in Phelps County, would be rendered inoperable is unlikely. The damage resulting from such an event would have impacts both on existing structures, facilities, and population, as well as future structures, facilities and population, depending on the areas impacted.

Potential Impact

Severe winter storms tend to be unpredictable and affect a large area with one storm. Determining an estimated loss for the county is quite difficult, due to the large scale nature of these storms. If a severe winter storm were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula (the entire NRD valuation is used because the storm damage values encompass more than Phelps County). First, add up the damage totals for all historical occurrences listed in Table C-7. Next, take this total damage amount and divide by the total number of events listed in Table C-7. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the total property damage resulting from the 13 historical occurrences was approximately \$23.25 million and the total crop damage approximately equaled \$51.50 million. The total for all 13 events equaled approximately \$74.75 million. This number was then divided by the 13 historical occurrences to arrive at a total damage estimate of approximately \$5.75 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per storm event. For severe winter storms, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used. For Phelps County, the result would be 1 percent of the \$1.03 billion valuation, or \$10.3 million in damage per event.. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DROUGHTS

Hazard Summary

A summary of information regarding droughts may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Droughts” to view this summary.

Historical Occurrences

Table C-8 below lists the occurrences of drought in Phelps County according to the NCDC and NDMC. While the records of drought in Phelps County are not great in number, the impacts of these periods of drought were intense. With the importance of agricultural production in the project area, the effect of drought conditions has been severe in the past. Although there is not a long record of drought incidences in Phelps County, it is probable that a drought will occur in the future and the effect of these conditions could be catastrophic.

Location	Date	Type	Property Damage	Crop Damage
Phelps County	Fall 1999 to Spring 2001	Drought	\$0	\$240,000,000*
Phelps County	Spring 2002 to Summer 2004	Drought	\$0	\$480,000,000*

* Values include multiple counties including outside of the planning area, no detailed breakdown on a per county basis is available.

Vulnerability Assessment

Drought poses a severe threat to all of Phelps County in terms of property damage, crop damage and the potential loss of animal life. Drought, as described above, can be defined in various ways and can affect various aspects of the county. If a drought were to affect Phelps County for an extended period of time, the county could see an increased risk of fire and the potential for the drinking water supply to be depleted. Typically, during severe droughts, water conservation practices would be implemented to limit the depletion of these drinking water supplies. In addition to these threats, there would be an increased chance for animals to be at risk of losing their lives, which includes both livestock and domestic pets. The lack of water and high temperatures associated with summertime droughts increase the risk of heat-related deaths, as well as dehydration, if animals were to be outside for extended periods of time. The amount of damage to Phelps County in crop damage alone would be extremely high, which, in turn, could cause economic hardship for residents in Phelps County. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Droughts can be wide spread and span many months or years. Determining an estimated loss for the county is quite difficult, due to the broad nature of these and length of time involved with these events. If a drought were to affect the project area, it

was estimated that damage of 17 percent of the property valuation within the planning area would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table C-8. Next, take this total damage amount and divide by the total number of events listed in Table C-8. Lastly, take this damage per event value and divide it by the total valuation of the Tri-Basin NRD. Using this formula, the no property damage is recorded resulting from the 2 historical occurrences. The total crop damage approximately equaled \$720 million. The total for the 2 events equaled approximately \$720 million. This number was then divided by the 2 historical occurrences to arrive at a total damage estimate of approximately \$360 million per event. The total damage estimate per event was then divided by the total valuation of the NRD, which is approximately \$2.22 billion. This result was multiplied by 100 to get the percentage of the planning areas valuation that is affected per event. For drought, this value was less than 17 percent. For purposes of this planning effort an estimate that 17 percent of the planning area would be affected was used. For Phelps County, the result would be 17 percent of the \$1.03 billion valuation, or \$175.1 million in damage per event. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

FLOODING

Hazard Summary

A summary of information regarding flooding may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Flooding” to view this summary.

Historical Occurrences

In Phelps County it would not be unreasonable to see flooding resulting from ravine flooding, flash flooding, ice jams, and urban drainage system flooding. There are approximately 4,500 existing structures in Phelps County and of those structures approximately 20 structures are within the FEMA-designated floodplain. Table C-9 below details the flood events, causing \$100,000 or more in damage, within Phelps County according to NCEM. There have been several major flood incidents in recent years and the probability of another flood event in Phelps County is certain.

Location	Date	Type	Property Damage	Crop Damage
Phelps County	06/01/1995	Flood	\$20,000	\$80,000
Phelps County	07/03/2000	Flash Flood	\$150,000	\$1,000,000
Phelps County	05/11/2005	Flash Flood	\$1,000,000	\$500,000
Northern Phelps County	09/05/2005	Flash Flood	\$25,000	\$250,000
Holdrege	04/24/2007	Flash Flood	\$75,000	\$250,000
Westmark	05/29/2008	Flash Flood	\$30,000	\$500,000

According to FEMA’s Repetitive Loss list there are no repetitive loss properties in Phelps County. This does not necessarily mean there are no repetitive loss structures; it simply means that there is no record of flood insurance claims. This could be the result of a lack of flooding, or a lack of flooding victims having flood insurance.

Vulnerability Assessment

Flooding poses a threat to the Phelps County, as the county has various streams meandering through it and the Platte River runs along the north border of the county. There also is a threat of urban flooding in the communities of the Phelps County, if the storm sewer system’s capacity was overwhelmed by the runoff resulting from such an event. If a flood event were to affect the county, the resulting damage could include structural damage, especially if these structures are located in a FEMA-designated floodplain or floodway; downed trees or limbs; downed power lines; dam or levee failure; roadway and bridge failures; crop damage; and, potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the county, especially in the event of road or bridge failures, downed trees, or other debris or flood waters blocking access routes. Residents could be in added

danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Dam or levee failure could cause large portions of communities to be affected by flood waters and could threaten the lives of residents of each downstream community if proper warning is not given. Critical infrastructure also could be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as potentially contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure is operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of Phelps County. While it is possible for flooding to affect the entire county in one flood event, it is highly unlikely that the entire county, and the critical facilities in the county, would be affected. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Floods tend to be erratic and do not necessarily affect a large area with one event. Determining an estimated loss for the county is quite difficult, due to the localized nature of these events. If a flood were to affect the project area, it was estimated that damage less than 1 percent of the property valuation within the county would be affected. This estimate was based on the following formula. First, add up the damage totals for all historical occurrences listed in Table C-9. Next, take this total damage amount and divide by the total number of events listed in Table C-9. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Using this formula, the total property damage resulting from the 6 historical occurrences was approximately \$1.30 million and the total crop damage approximately equaled \$2.58 million. The total for all 6 events equaled approximately \$3.88 million. This number was then divided by the 6 historical occurrences to arrive at a total damage estimate of approximately \$647 thousand per event. The total damage estimate per event was then divided by the total valuation of the county, which is approximately \$1.03 billion. This result was multiplied by 100 to get the percentage of the county's valuation that is affected per storm event. For flooding, this value was less than 1 percent. For purposes of this planning effort an estimate that 1 percent of the planning area would be affected was used, resulting in approximately \$10.3 million in damage. This estimate, since it was rounded up, should encompass both existing and future structures and facilities across the county. It is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

LANDSLIDE

Hazard Summary

A summary of information regarding landslide may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Landslide" to view this summary.

Historical Occurrences

The University of Nebraska – Lincoln School of Natural Resources (UNL-SNR) documents landslides in the state of Nebraska and maintains a database of these landslides. According to this database there is no record of landslides in Phelps County. The probability of Phelps County experiencing a damaging landslide is low; however, it is not impossible that a landslide could occur in this area.

Vulnerability Assessment

Landslides pose a threat to Phelps County in terms of property damage, downed trees, power outages, and potential loss of life. In the event of a landslide in the area, potential damage resulting from the landslide could include property damage to homes, businesses, and critical facilities; power outages resulting from downed power lines; and potential loss of life if residents are caught unaware. Roads or bridges may fail depending on the location of the landslide, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Landslides could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a landslide were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a landslide in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

MAN-MADE AND TECHNOLOGICAL HAZARDS

Phelps County, like most areas, could be subject to technological issues either directly associated with an emergency or disaster or as a single event affecting citizens, facilities, government infrastructure and public safety. For Phelps County, potential technological hazards will be placed into the following categories.

HAZARDOUS MATERIALS

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

Due to the BNSF and Amtrak mainline tracks and transportation routes, including U.S. Highway 6 (U.S. 6), U.S. 183, and Nebraska 23 running through the planning area, the probability is high of a future hazardous material spill.

Vulnerability Assessment

Hazardous materials pose a threat to the Phelps County and could result in property damage, crop damage, and potential loss of life. If a hazardous materials spill were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Critical facilities are also at risk to hazardous materials spills, as hospital and retirement homes store chemicals required for the equipment within the facilities, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a hazardous materials spill and, depending on the location of the spill, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the spill is under control, to avoid risks from fumes and the chemicals until the spill is cleaned up. Water sources could be contaminated with the chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Hazardous material could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a hazardous material spill were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a hazardous material spill

in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

URBAN FLOODING

Hazard Summary

Within Phelps County, many of the identified flood zones are not heavily populated. While some communities have joined the National Flood Insurance Program (NFIP) and have FEMA approved Flood Insurance Rate Maps (FIRM) not all communities do. The main concern within these communities is urban flooding. In Phelps County, when heavy rains occur it is common for city streets to flood. In cases where the rain water does not permeate into the ground quickly enough, the risk for basement flooding increases as well. Some homeowners have installed sump pumps and generators, but since these homes are not in a floodplain flood insurance may not be available or may be too expensive to be purchased. In order to alleviate urban flooding, drainage ditches should be cleared of debris, storm drainage systems added and building homes with basements on higher ground should all be considered. Another concern contributing to urban flooding is the impacts of irrigation. During the irrigating season, it is not uncommon for crops to receive up to one-quarter of an inch of water per day. If a heavy rain occurs when soils are saturated, the amount of storm water runoff increases, carrying with them considerable debris which are subject to block culverts and small bridges. The result of this increased runoff can be roadway flooding and erosion.

Historical Occurrences

There are no detailed records of urban flooding in Phelps County, however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a high chance for urban flooding to occur.

Vulnerability Assessment

There is a threat of urban flooding in the communities of the Phelps County if the storm sewer system's capacity was overwhelmed by the runoff resulting from a heavy rain. If a flood event were to affect the county the resulting damage could include structural damage; downed trees or limbs; roadway failures; and potential loss of life. In the event of heavy rainfall and flooding, emergency response vehicles may have limited access to residents in the community, especially in the event of road failures, downed trees, or other debris or flood waters blocking

access routes. Residents could be in added danger if they are stranded in a vehicle during a flash flood, as waters rapidly rise and can quickly wash cars downstream. Critical infrastructure could also be compromised, as flooding could cause sanitary sewer lines to back up, also posing a human safety risk, as well as contaminating drinking water sources. Residents may need to be relocated until the flood waters recede and critical infrastructure are once again operational. The functional downtime resulting from power outages and infrastructure failure would be extremely costly. Businesses and schools may need to be closed, which would have a detrimental effect on the economy of these communities. While it is possible for flooding to affect the entire county in one flood event, the likelihood that the entire county, and the critical facilities in the county, would be affected is unlikely. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Urban flooding could affect portions of Phelps County. Impacts from the event could last for days or even weeks. If urban flooding were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of urban flooding in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

GROUNDWATER CONTAMINATION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

While there are no records of groundwater contamination damage in the Phelps County, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a

moderate chance of an occurrence, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Groundwater contamination poses a threat to the entire county and could result in potential loss of life. If a groundwater contamination were to occur in Phelps County, the resulting damage could include economic hardships, if businesses and schools were forced to find other sources for water and if communities were required to finance efforts to eliminate the contaminants. Lives could be lost if hospitals and other care facilities became overburdened with patients suffering the effects of contaminated water. The damage resulting from such an event would have impacts both on existing and future facilities and population.

Potential Impact

Groundwater contamination could affect portions of Phelps County and impacts from the event could last for days, weeks, months or even years. If groundwater contamination were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of groundwater contamination in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

ELECTRICAL, PROPANE OR NATURAL GAS INTERRUPTION

Hazard Summary

A summary of information regarding technological events may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological dHazards" to view this summary.

Historical Occurrences

In December 2006 a major ice storm interrupted electrical services for several weeks in certain areas of the county. There are no records of long-term propane or natural gas interruptions in Phelps County.

Vulnerability Assessment

Electrical, propane or natural gas interruptions pose a threat to the entire county and could result in property damage and potential loss of life. If a service interruption were to occur in Phelps County the resulting damage could include property damage, if homes or businesses experienced freezing pipes, and loss of life, both human and livestock. Critical facilities are also at risk to these service interruptions, depending on the location of the incident. Critical infrastructure potentially could be affected as well if it is dependent on these services to operate. Residents may be required to evacuate until services are restored, as they are at risk from extreme temperatures and the inability to operate devices dependent on these services for food and water. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Electrical, propane or natural gas interruptions could affect portions of Phelps County and impacts from the event could last for days or even weeks. If electrical, propane or natural gas interruptions were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of electrical, propane or natural gas interruptions in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TERRORISM

Hazard Summary

A summary of information regarding terrorism may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

While there are no records of terrorism occurrences in the project area, the risk for such activities will always exist, which is why it is so vital to include the

possibility in this all-hazards mitigation plan. Despite the lack of occurrences, there is still a low chance of terrorism activities in Phelps County in the future.

Vulnerability Assessment

Terrorism poses a threat to all of Phelps County and could result in property damage, crop damage, and potential loss of life. If a terroristic activity were to occur in the area the resulting damage could include structural damage, if homes or businesses were in the path of attack, crop damage and loss of life, both human and livestock. Critical facilities are also at risk to terroristic attacks, as they may be targets for such activity, and critical infrastructure could potentially be affected as well. Roads and bridges could be impacted in the event of a terrorist attack and depending on the location of the incident; roads could be closed, thus blocking access routes for emergency response vehicles, limiting their ability to reach residents in the county. Residents may be required to evacuate until the clean-up is completed, as they could be at risk from fumes, chemicals, and other toxins until the attack site is properly cleaned up. Water sources could be contaminated, thus infiltrating into the groundwater and impacting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Terrorism could affect portions of Phelps County and impacts from the event could last for days or even weeks. If terrorism were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of terrorism in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DISEASE

Hazard Summary

A summary of information regarding disease may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

There are no records of a major disease outbreak in Phelps County; however, the risk will always exist, which is why it is so vital to include the possibility in this all-hazards plan. Despite the lack of occurrences, there is still a moderate chance of an outbreak, especially in the event a destructive hazard event strikes the area.

Vulnerability Assessment

Disease outbreak poses a threat to all of Phelps County and could result in potential loss of life. If a disease outbreak were to occur in the county the resulting damage could include economic hardships, if businesses and schools were forced to close and communities were required to quarantine residents, and lives could be lost if hospitals and other care facilities became overburdened with patients. Residents may be required to evacuate or quarantine themselves until the outbreak is under control, as they are at risk of spreading the disease. The damage resulting from such an event would have impacts both on existing and future facilities, and population.

Potential Impact

Disease outbreak could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a disease outbreak were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a disease outbreak in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

TRAIN DERAILMENT

Hazard Summary

A summary of information regarding train derailment may be found in the front portion of this plan. Please refer to the "Risk Assessment" section under "Man-Made and Technological Hazards" to view this summary.

Historical Occurrences

In Phelps County, BNSF operates a mainline running in an east/west direction through the communities of Atlanta, Holdrege and Funk. Amtrak also utilizes lines through Phelps County, which poses a derailment risk as well. There may have been train derailments in Phelps County, but due to the nature of derailments the railroad companies are unable to release the information. Despite the lack of records of train derailment, the risk for a train derailment occurring is moderate, with NKCR, BNSF, and Amtrak operating tracks through Phelps County.

Vulnerability Assessment

Train derailments pose a threat to the Phelps County and could result in property damage, crop damage, and potential loss of life. If a train derailment were to occur in the area, the resulting damage could include structural damage, crop damage and loss of life, both human and livestock. Critical facilities also could be at risk to train derailments, depending on their location. Critical infrastructure potentially could be affected as well. Roads and bridges could be affected in the event of a train derailment and, depending on the location of the incident, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the debris is cleaned up, fumes and the chemicals that may be present within the train cars may pose a risk. Water sources could be contaminated with chemicals, thus infiltrating the groundwater and affecting drinking water sources. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Train derailments could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a train derailment were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a train derailment in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

PIPELINE EXPLOSION OR LEAK

Hazard Summary

A summary of information regarding pipeline explosion may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Man-Made and Technological Hazards” to view this summary.

Historical Occurrences

The likelihood of any single pipeline exploding is low, due to the number of pipelines in Phelps County, the likelihood of a pipeline explosion occurring in the Phelps County is moderate. There are no records of pipeline explosions in Phelps County.

Vulnerability Assessment

Pipeline explosions or leaks pose a threat to Phelps County and could result in property damage, crop damage, and potential loss of life. If an explosion were to occur in the county the resulting damage could include structural damage, if homes or businesses were in the path of the spill, crop damage and loss of life, both human and livestock. Roads and bridges could be affected in the event of an explosion and, depending on the location of the explosion, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in the county. Residents may be required to evacuate until the leak is under control, to avoid risks from fumes and the chemicals until the leak is contained. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

A pipeline explosion or leak could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a pipeline explosion or leak were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a pipeline explosion or leak in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

WILDFIRES

Hazard Summary

A summary of information regarding wildfires may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Wildfires” to view this summary.

Historical Occurrences

According to the NCDC there are no records of past occurrences of wildfires in Phelps County. There have been wildfires in crop areas and pastures, in very windy and dry conditions. The likelihood of a wildfire affecting Phelps County is moderate

Vulnerability Assessment

Wildfires pose a threat to Phelps County and could result in property damage, crop damage, potential loss of human life and/or livestock. If a wildfire were to affect the county the resulting damage could include structural damage, if homes or businesses were in the path of the fire; crop damage; and, loss of life, both human and livestock. Critical facilities are also at risk to wildfires, depending on their proximity to the fire, and critical infrastructure could potentially be affected as well. Roads and bridges could be affected in the event of a wildfire and, depending on the damage, roads could be closed, thus blocking access routes for emergency response vehicles and limiting their ability to reach residents in Phelps County. If power outages result from such an event, the losses could be catastrophic. Businesses, schools, and homes lose power, and, without a backup power source critical infrastructure, such as water wells, may stop working. Residents may be required to relocate until the wildfire is under control. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Wildfires could affect portions of Phelps County and impacts from the event could last for days or even weeks. If a wildfire were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of wildfires in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

EARTHQUAKES

Hazard Summary

A summary of information regarding earthquakes may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Earthquakes” to view this summary.

Historical Occurrences

According to the NCDC and the USGS, there are no records of damaging earthquakes impacting Phelps County. The risk of a damaging earthquake impacting Phelps County is low, as there is no major fault line in the area.

Vulnerability Assessment

While earthquakes are not common in Phelps County, all portions of the county are equally susceptible to experiencing the effects of an earthquake. Earthquakes, as described earlier occur when there is a slip on a fault, causing the ground to shake. The damage resulting from an earthquake would depend on the magnitude of the event. If an earthquake were to occur, the county could experience power outages, structural damage, landslides, dam failure, and potential loss of life. In the event of an extreme earthquake, structures, including homes, businesses, schools, and critical facilities, could all suffer structural damage. Critical infrastructure, including water lines, sanitary sewer lines, water wells, roads, and bridges all could suffer from damage leaving the affected area in ruins. Emergency response vehicles would have limited access to residents, increasing the risk of loss of life. Residents caught unaware could be injured from falling debris, or even trapped in buildings, or on roadways undergoing structural damage. The functional downtime resulting from aftermath of such an event is unimaginable. Businesses, schools, and critical facilities could be closed for weeks, which would be detrimental for the economy of the county. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population.

Potential Impact

Earthquake could affect portions of Phelps County and impacts from the event could last for days or even weeks. If an earthquake were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of an earthquake in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is

approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.

DAM FAILURE

Hazard Summary

A summary of information regarding dam failure may be found in the front portion of this plan. Please refer to the “Risk Assessment” section under “Dam Failure” to view this summary.

Historical Occurrences

There are currently five dams in Phelps County, which all are low hazard dams. A low hazard dam would only damage minor resources in the event of failure. There are currently no records of dam failure in Phelps County, but it is still imperative to include dam failure in this plan.

Even though there is little risk for dam failure within the county, there are dams in the area that could impact residents of Phelps County. In fact, according to the Phelps County Local Emergency Operations Plan (LEOP), the failure of Kingsley Dam or Johnson Lake Dam could cause significant damage in the county wide. The Kingsley Dam is owned by the Central Nebraska Public Power & Irrigation District and is located in Ogallala upstream from Phelps County. In the event of a failure the inundation area would affect the entire county. The Johnson Lake Dam is owned by the Central Nebraska Public Power & Irrigation District and is located in northern Gosper County upstream from Phelps County. In the event of a failure the inundation area would affect the portions of the county.

Vulnerability Assessment

Dam failure poses a threat to the property located downstream. In the event of a dam failure, the inundation areas contained within the emergency action plans, which are on file with the NDNR, show the areas that would be affected in such an event. The action plans are not available for release because of security concerns.

Even though there is little risk for the dams located within the county, there are dams in surrounding counties that could impact residents of Phelps County. In fact, according to the Phelps County Local Emergency Operations Plan (LEOP), the Kingsley Dam could affect the area. The dam is owned by the Central Nebraska Public Power & Irrigation District and is located in Ogallala upstream from Phelps County. In the event of a failure the inundation area would affect the northern part of the county along the Platte River.

If Kingsley Dam or Johnson Lake Dam were to fail, potential damage could include structural damage to homes, businesses, and critical facilities; power outages; and, potential loss of life. Roads or bridges may fail depending on the location of the dams, thus cutting off access for emergency response vehicles. If power outages were to occur, businesses and schools may need to be closed for extended periods of time, which would have a severe impact on the local economy. If the dam were located just upstream of a community, loss of life in the inundation area could occur, especially if no warning is given and residents are caught unaware. The damage resulting from such an event would have impacts both on existing and future structures, facilities, and population, especially if future development occurs downstream of a dam site.

Potential Impact

Dam failure could affect portions of Phelps County and impacts from the resulting flooding could last for days or even weeks. If a dam failure were to occur in the county it was assumed that approximately 1 percent of the county would be affected. This information was based on the following formula. First, add up the damage totals for all historical occurrences. Next, take this total damage amount and divide it by the total number of events. Lastly, take this damage per event value and divide it by the total valuation of Phelps County. Since there were no historical occurrences available of a dam failure in Phelps County, it is estimated that 1 percent of the county valuation would be impacted for the purposes of this planning effort. The total valuation of the county is approximately \$1.03 billion, resulting in approximately \$10.3 million in damage. This estimate should encompass both existing and future structures and facilities county-wide, but it is possible that localized events would result in damage amounts much greater than this estimate.

It is impossible to account for the costs associated with loss of human life or livestock that could occur with these events. Events including loss of human life and/or livestock, past, present and future are not included in any of the previous estimates. Only property and crop damage estimates were used.