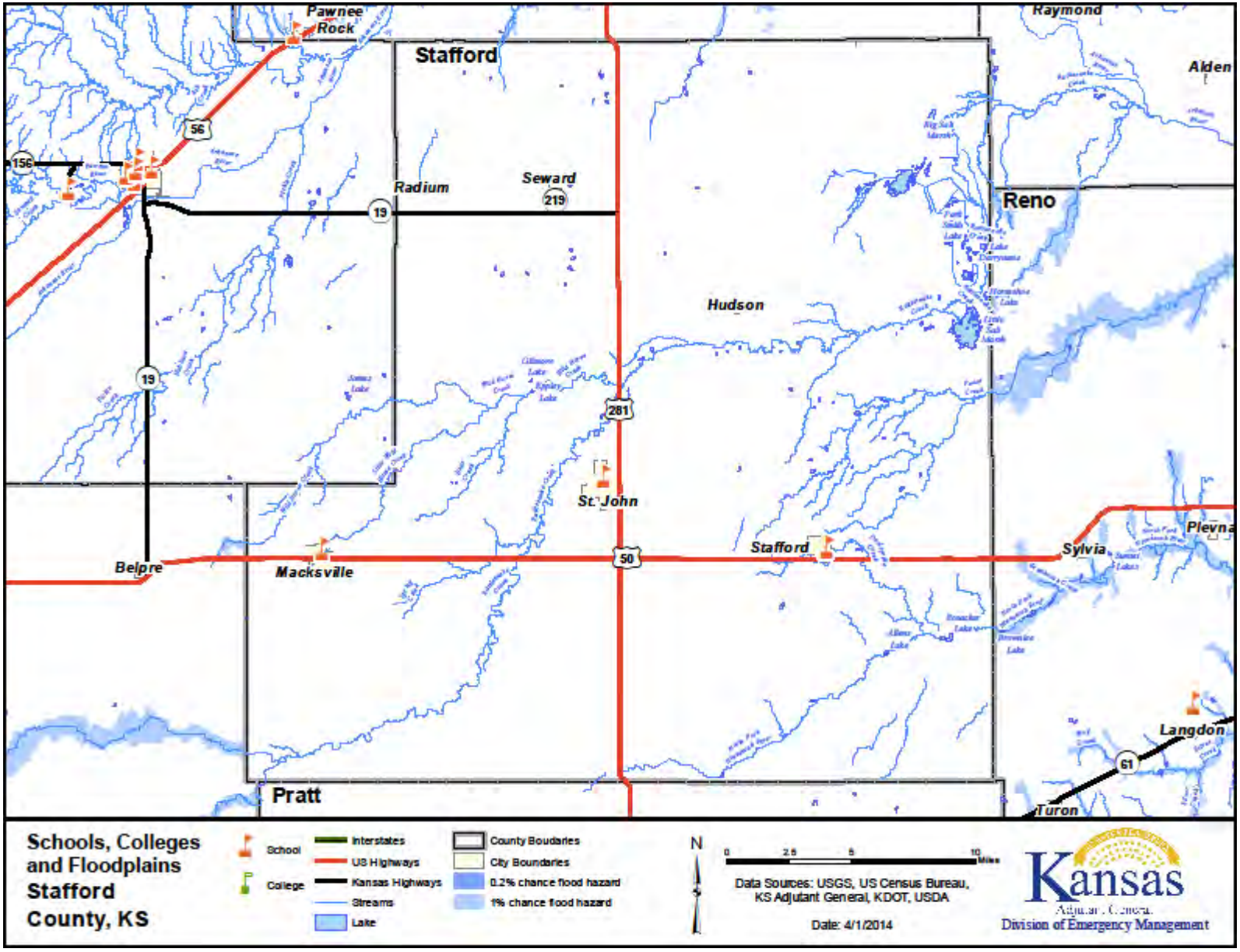
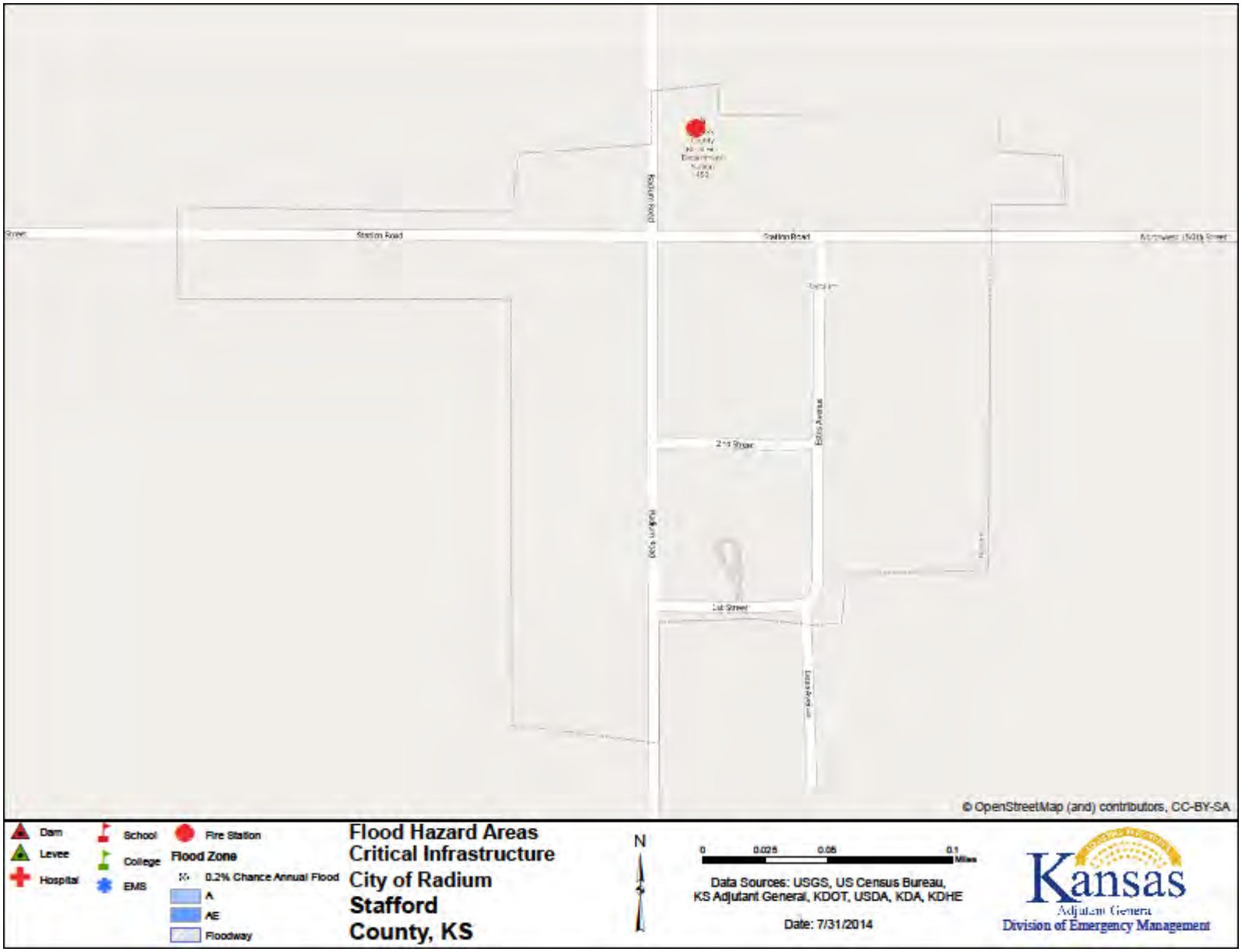

Pawnee Rock
Stafford
Raymond
Alden
56
156
Radium
Seward
219
19
Reno
Hudson
281
St. John
Plevna
Sylvia
Belpre
Macksville
50
Stafford
Langdon
61
Pratt
Turon
Schools, Colleges and Floodplains
Stafford County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boundaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2.5 5 10 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/1/2014
Kansas
Adjutant General
Division of Emergency Management


8th Street
7th Street
6th Street
5th Street
4th Street
3rd Street
2nd Street
1st Street
Northwest 150th Street
Northwest 50th Avenue
Power Avenue
Main Street
Seward
© OpenStreetMap (and) contributors, CC-BY-SA
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Seward
Stafford
County, KS
N
0
0.0475
0.095
0.19
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management


Station Road
Station Road
Radium Road
2nd Street
Eddy Avenue
1st Street
© OpenStreetMap (and) contributors, CC-BY-SA
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Radium
Stafford
County, KS
N
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0.025
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0.1
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management

	Magnitude/Severity
Flood	2.88

Local Concerns

The following detail specific local concerns as related to flooding:

- In Barber County properties located in or near the floodplains are the most vulnerable to flood events. The City of Medicine Lodge has some businesses, critical facilities, elderly, and low income families located in flood hazard area. The types of residential structures include brick and mortar, wood, and modular homes.
- In Barton County, the City of Albert, including most of the residential and commercial facilities, is in located in the flood zone, with Zone AH covering most of the southern portion of the town and Zone AE for the northern portion. The eastern corporate limits of the City of Ellinwood are designated Zone AE, with some Zone A in the southeast corner of the town. The majority of the City of Great Bend lies within Zone X, protected by levee, and is classified as outside the 100-year floodplain while smaller, unimproved areas of the city are located within Zone A. The City of Hoisington has a Zone AH flood area located within the city limits, which trends north to south along the western boundary of the town. The City of Pawnee Rock has residential and commercial improvements located within a Zone AH. The City of Claflin has one small flood area, less than one percent of the corporate limits, located along the extreme western boundary of the town.
- In Edwards County, the City of Kinsley is located within an identified flood areas, including Zones A, AE, AO.
- In Pawnee County, the City of Burdett has two primary flood zones, both Zone A, one in the northern portion of the city and one in the southeast corner of the corporate limits. The City of Garfield has two primary flood zones, one Zone A lying southeast of the Santa Fe rail line following Old Coon Creek and one Zones A, A2, and B zones northwest of the railroad tracks in proximity to Garfield Drain. The entirety of the corporate limits of the City of Rozel is a Zone A flood area. The City of Larned has one primary flood zone along the Pawnee River, including Zones A6, B and C.
- In Pratt County, the City of Pratt has several flood hazard areas within the town including one on the west side town identified as Big Ditch, one along the Valley View Ditch, and one in the central portion of town between School and Fourth Streets. The City of Preston has an identified flood hazard Zone A located northwest of the Chicago Rock Island and Pacific Railroad tracks and a small area in the southeast corner of the town bordering the city limits identified as Zone A. USD 382's Pratt High School is located in an identified SFHA Zone A. USD 382 does not currently have flood insurance for its facilities.

Future Development

Continuing land development in south Kansas could place more people and property in flood-prone areas, unless floodplain management is implemented. It is not known how much development is occurring in flood hazard areas, but for communities in these counties that

participate in the NFIP, any development in the floodplain should be built according to its corresponding floodplain management ordinance.

Modeling completed by HAZUS-MH 2.1 indicates that $213,826,000 in total direct building loss and income loss is vulnerable to flooding, with 9,588 persons vulnerable to displacement. However, regional population totals are estimated to decrease from 61,087 persons in 2013 to 42,250 by 2040. These decreases may be complemented as many of the flood prone cities have enacted floodplain ordinances limiting development in hazardous areas and/or are members of the NFIP.

In addition, according to the State's minimum standards, the first floor elevations of residential property must be a minimum of one foot above the base flood elevation. For non-residential properties, the standard is to either elevate or flood proof to one foot above the base flood elevation.

The Department of Agriculture, Division of Water Resources conducts Community Assistance Contacts which offer assistance to the participating communities and assess the floodplain program. Community Assistance Visits which are similar to full audits, are also conducted by the Division of Water Resources in order to ensure communities are in compliance with the floodplain management program.

Probability of Future Hazard Events

Based on the NCDC historical data available from 2004 to 2014, there were 452 flood and flash flood events in the region. On average, this equates to 45 events per year, with 2014 being an incomplete year as of this plan. And while past occurrences are no guarantee of future occurrences, considering that there are flood and flash flood occurring every year regionally, it is reasonable to determine that the overall probability of future flooding occurrence is likely.

	Probability
Flood	3.25

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Flood Consequence Analysis

Subject	Ranking	Impacts of Flood
Health and Safety of Persons in the Area of the Incident	Severe	Impact dependent on the level of flood waters. Individuals further away from the incident area are at a lower risk. Casualties are dependent on warning time.
Responders	Minimal	Impact to responders is expected to be minimal unless responders live within the affected area.
Continuity of Operations	Minimal to Severe	Temporary relocation may be necessary if inundation affects government facilities.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe in the inundation area of the incident to facilities and infrastructure. The further away from the incident area the damage lessens.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to the flood waters.
Environment	Severe	Impact will be severe for impacted area. Impact will lessen with distance.
Economic Conditions	Minimal to Severe	Impacts to the economy depend on the area flooded, depth of water, and the amount of time it takes for the water to recede.
Public Confidence in Governance	Minimal to Severe	Perception of whether the flood could have been prevented, warning time, and response and recovery time will greatly impact the public's confidence.

3.7.9 HAILSTORM

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Hailstorm	4.00	2.78	3.38	1.00	3.24

Description

According to the NOAA hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow. At the time when the updraft can no longer support the hailstone, it will fall down to the earth.

In the United States, hail causes more than $1 billion in damage to property, crops and livestock each year. Because of the large agricultural industry in south Kansas, crop damage and livestock losses due to hail are of great concern to the region. Even relatively small hail can cause serious damage to crops and trees. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury and the occasional fatality to humans, often associated with traffic accidents.

	Warning Time
Hailstorm	3.38

	Duration
Hailstorm	1.00

Hazard Location

Hailstorms occur over broad geographic regions. The entire planning area, including all participating jurisdictions, is at risk to hailstorms.

Previous Occurrences and Local Events

The following detail notable regional hail events.

> **May 11, 2014: Pawnee Count, USD #466 - Pawnee Heights:** Golf ball sized hail damaged school roofs, windows and vehicles causing $140,000 in insured losses.
>
> **Spring, 2013: Pratt County, USD #438 - Skyline Schools:** A windstorm/hailstorm caused a damages to the roof and gutters resulting in $74,666 in insured losses.
>
> **August 12, 2011: Barber County, USD #254 - Barber County North:** A hailstorm caused a damages to the roof and A/C unit of the shop building.

November 2011: Barton County, Hoisington: A large hail storm caused significant damage to residential and commercial properties.

April 26, 2009: Thunderstorms developed during the late morning and continued into the afternoon as they moved southeast across the region. Hail and wind reports were numerous along with heavy rainfall which produced some flooding.

June 3, 2008: A large storm entered Kiowa County from the north, out of Edwards County The storm broke numerous windows and totaled vehicles.

April 20, 2005 - Great Bend reported 3 inch hail. There were no injuries or crop damage associated with this event, but there was $500,000 in property damage.

July 3, 2005: The City of Offerle in Comanche County reported hail that measured two-inches in diameter.

July 16, 2007: Hail measuring 1.75 inches in diameter damaged vehicles in the region during the early morning hours prior to sunrise. There was a reported $15,000 in property damage.

The following table details NCDC hail event information.

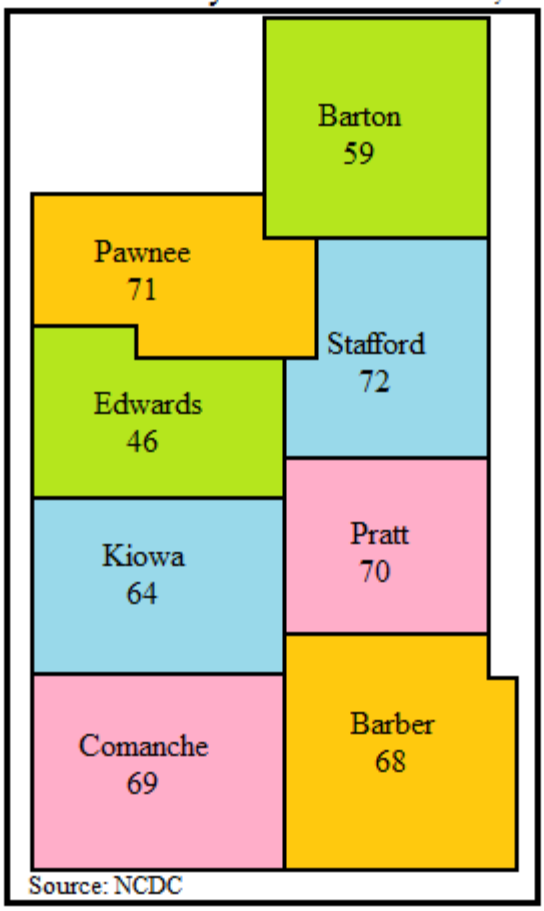
NCDC Hail Events, 2004 - 2014

County	Number of Days with Hail Events	Maximum Amount, in Inches	Property Damages	Crop Damages
Barber	68	4.00	$0	$0
Barton	59	4.25	$500,000	$2,415,000
Comanche	69	2.75	$0	$0
Edwards	46	2.75	$0	$0
Kiowa	64	2.75	$0	$0
Pawnee	71	3.50	$15,000	$0
Pratt	70	2.50	$20,000	$0
Stafford	72	3.00	$0	$0
Regional Total	519	3.2 (Average)	$535,000	$2,415,000

Source: NCDC Storm Events Database

The following map show the number of days with hail events in each county from 2004 - 2014, as per NCDC data.

NCDC Number of Days with Hail Events, 2004 - 2014



Hazard Vulnerability and Impact

Based on information provided by the Tornado and Storm Research Organization, the following table describes typical damage impacts of the various sizes of hail.

Tornado and Storm Research Organization Hail Damage Descriptions

Intensity Category	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	0.2-0.4	Pea	No damage
Potentially Damaging	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	0.6-0.8	Marble, grape	Significant damage to crop and vegetation
Severe	0.8-1.2	Walnut	Severe damage to crops, damage to glass and plastic, paint and wood scored
Severe	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Super Hailstorms	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization

The following are the data sources for the rating factors: Social Vulnerability Index for Kansas counties from the Hazards and Vulnerability Research Institute at the University of South Carolina, NCDC storm events (2004 – 2014), U.S. Census Bureau (2012), USDA's Census of Agriculture (2012) and USDA Risk Management Agency (2010 – 2014). Please note that the data on crop losses only applies to insured crops. According to the *2011 Kansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 82 percent of Kansas' row crops were insured in 2011.

It was determined that since hail is a common occurrence in Kansas, that using historical events and property damages from 2010 forward provides adequate events to describe the hail hazard in south Kansas. Additionally, please note that data for 2014 runs through June 1, making it an incomplete year.

Vulnerability Factor Amounts for Hail

County	SoVI Rating (1-5)	Prior Events 2004-2014	Property Damages	Annualized Property Damages	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 Census of Agriculture)	Crop Insurance Paid for Hail	Annualized Crop Insurance Paid
Barber	4	68	$0	$0	$388,136	4	$45,420,000	$417,700	$104,425
Barton	3	59	$500,000	$50,000	$1,772,118	21	$96,206,000	$1,439,884	$359,971
Comanche	5	69	$0	$0	$135,138	2	$21,783,000	$185,388	$46,347
Edwards	4	46	$0	$0	$232,382	5	$126,933,000	$1,054,360	$263,590
Kiowa	4	64	$0	$0	$237,655	3	$63,956,000	$1,695,988	$423,997
Pawnee	5	71	$15,000	$1,500	$449,592	9	$92,111,000	$1,326,716	$331,679
Pratt	3	70	$20,000	$2,000	$689,239	13	$52,353,000	$1,585,936	$396,484
Stafford	4	72	$0	$0	$295,331	6	$74,549,000	$1,521,052	$380,263
Regional Total	-	519	$535,000	$53,500	$4,199,591	8	$573,311,000	$9,227,024	$2,306,756

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1- 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Hail Data Rating Determination

Ratings	Social Vulnerability	NCDC Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density *	Crop Exposure	Annualized Crop Loss
1		18 - 55	0 - $10,000	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500	0 - $100,000
2	1	56 - 90	$10,001 - $50,000	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000	$100,001 - $300,000
3		91 - 125	$50,001 - $100,000	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500	$300,000 - $500,000
4	2	126 - 160	$100,001 - $300,000	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000	$500,001 - $700,000
5		161 - 195	$300,001 - $500,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500	$700,001 - $900,000
6	3	196 - 230	$500,001 - $700,000	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000	$900,001 - $1,100,000
7		231 - 265	$700,001 - $900,000	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500	$1,100,001 - $1,300,000
8	4	266 - 300	$900,001 - $1,100,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000	$1,300,001 - $1,700,000
9		301 - 335	$1,000,001 - $4,000,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500	$1,700,001 - $2,100,000
10	5	336 - 370	$4,000,000 - $32,012,357	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000	$2,100,000 - $2,300,000

Based on the above ratings system, ranges were applied to each county to determine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Low:** Score range of 9 -14
- **Medium-Low:** Score range of 15 - 21
- **Medium:** Score range of 22 - 28
- **Medium-High:** Score range of 29 - 35
- **High:** Score range of 36 - 41

Vulnerability of Regional Counties to Hail

County	SoVi Rating	NCDC Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Annualized Crop Loss Rating	Overall Vulnerability Rating	Hail Vulnerability
Barber	8	2	1	1	1	3	2	18	Medium-Low
Barton	6	2	2	1	1	7	3	22	Medium
Comanche	10	2	1	1	1	2	1	18	Low-Low
Edwards	8	1	1	1	1	9	2	23	Medium
Kiowa	8	2	1	1	1	5	3	21	Medium-Low
Pawnee	10	2	2	1	1	7	3	26	Medium
Pratt	6	2	1	1	1	4	3	18	Medium-Low
Stafford	8	2	1	1	1	6	3	22	Medium

	Magnitude/Severity
Hailstorm	2.78

Future Development

Future development of agricultural resources and/or increases in population would tend to increase the risk of this hazard. Agriculture has a more significant role and the bigger potential for an economic impact resulting from hail events. Regional counties with a large agricultural base would be more susceptible to hail damage if agricultural development is expanded. However, in general, the region is experiencing a population decline and a slight decrease in agricultural acreage which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Severe thunderstorms that create hail events are a common occurrence throughout south Kansas. According to the NCDC database, there were 519 days with hail events in south Kansas between 2004 and 2014, or an average of 52 events per year. Based on this information, there is a high probability that at least one hail event could occur in south Kansas in any given year.

	Probability
Hailstorm	4.00

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Hail Consequence Analysis

Subject	Ranking	Impacts of Hailstorm
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas depending on whether individuals are caught outside during the event.
Responders	Minimal	Impact to responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal to Moderate	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe to facilities and infrastructure in the incident area. Utility lines, roads, residential and business properties will be most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Impact could be severe for the immediate impacted area, depending on the size of the event. Impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to Severe	Local economy and finances may be adversely affected, depending on damages sustained.
Public Confidence in Governance	Minimal to Moderate	Response and recovery will be in question if not timely and effective. Warning systems in place and the timeliness of those warnings could be questioned.

3.7.10 HAZARDOUS MATERIALS

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Hazardous Materials	1.25	2.13	4.00	2.13	2.01

Description

Hazardous materials and waste are a concern for south Kansas because a sudden accidental or intentional release of such materials can be dangerous to human health, to nearby property, and to the quality of the environment. Such releases may come from both fixed sources, such as a manufacturing or storage facility, or from a transportation source, such as a truck or pipeline. Generally, with a fixed facility, the hazards are pre-identified, and the facility is required by law to prepare a risk management plan and provide a copy to the Local Emergency Planning Committee (LEPC) and local fire departments. Accidental releases may be due to equipment failure, human error, or a natural or manmade hazard event.

Agricultural facilities throughout south Kansas are likely to have dangerous materials present that could pose a threat to surrounding populations in the event of an emergency or disaster. Facilities that store or use chemicals considered unusually dangerous to human safety are required by Section 112R of the Clear Air Act Amendments to assess the potential impacts of an accidental release of the chemical at their facility and to prepare risk management plan (RMP). Of particular interest to south Kansas is that ammonia is one of the covered hazardous materials. Numerous south Kansas ammonia storage and distribution facilities have filed an RMP with the U.S. Environmental Protection Agency (EPA). A database with information about south Kansas facilities that have RMPs is available through the EPA.

The primary agency responsible for hazardous materials within the State of Kansas is the KDHE, Division of Environment. The Kansas Response Plan, Emergency Support Function #10 – Oil and Hazardous Materials is another resource for response information.

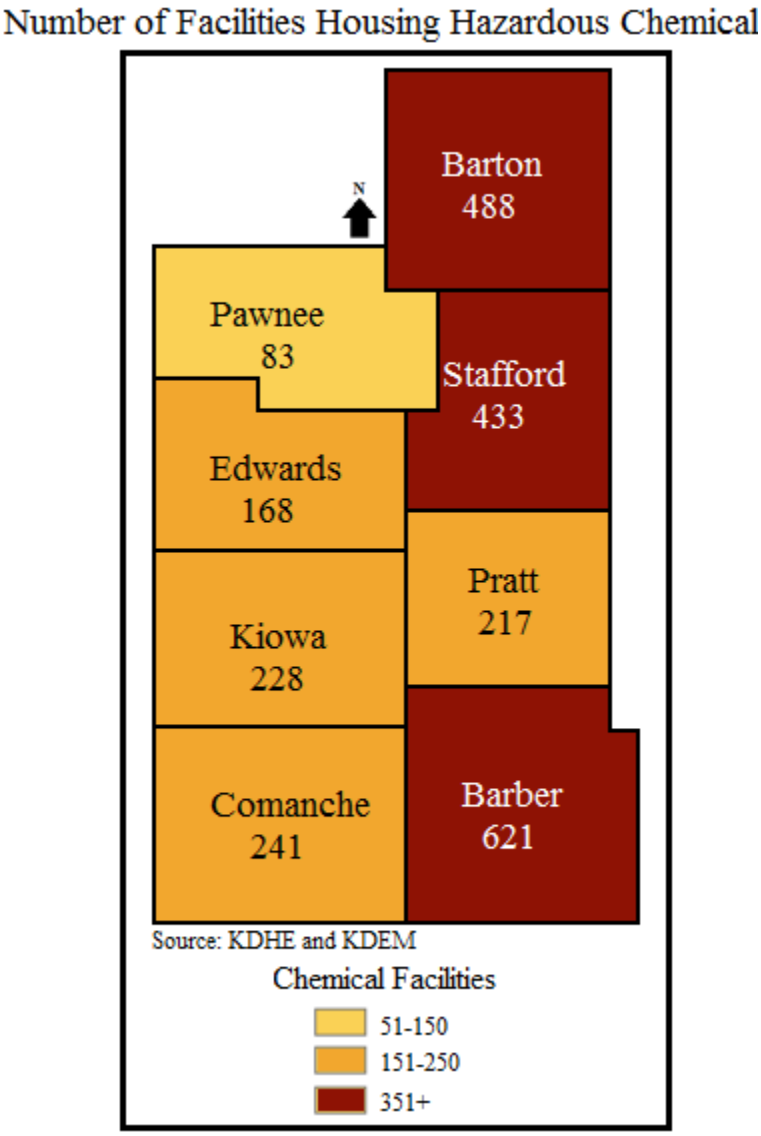
	Warning Time
Hazardous Materials	4.00

	Duration
Hazardous Materials	2.13

Hazard Location

Hazardous materials pose a threat to communities in south Kansas. Localities where hazardous materials are fabricated, processed, and stored as well as those where hazardous waste is treated, stored, and disposed of are most at risk for hazardous materials incidents. Additionally, localities along transportation corridors that carry these materials to their final destinations are also at risk.

In 2011, there were 2,479 facilities housing hazardous chemicals in south Kansas identified by the Community Right to Know Act. The number of facilities is illustrated in the following figure.

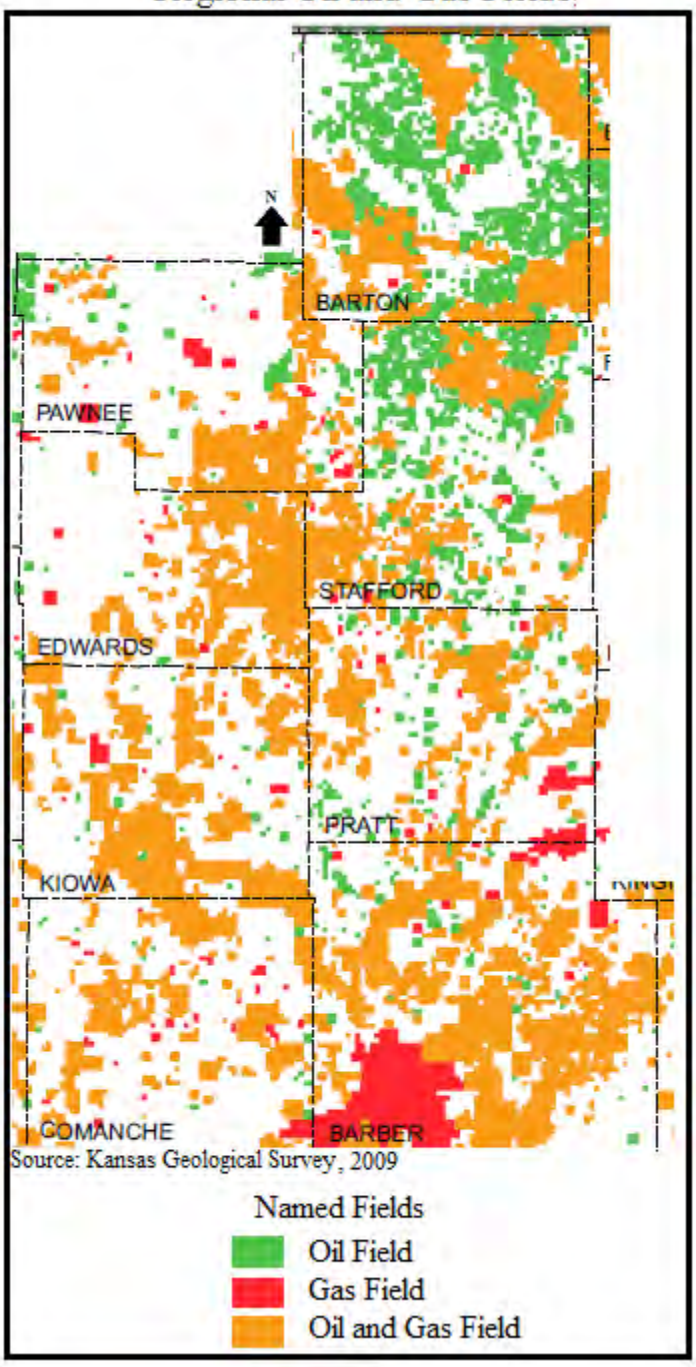


The EPA has indicated that there is one Superfund site in south Kansas, identified as Plating, Inc in Great Bend, Barton County. A Superfund site is an uncontrolled or abandoned location where hazardous waste is located which may affect local ecosystems and/or people. The Site is currently being assessed.

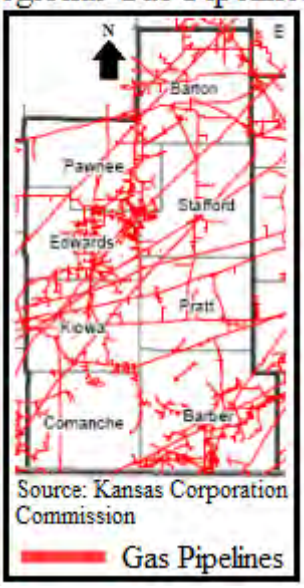
Pipelines and Production Fields

The following figures show production field locations, natural gas and oil pipelines in south Kansas.

Regional Oil and Gas Fields



Regional Gas Pipelines



Regional Petroleum Pipelines

The following table details the amount of gas and liquid pipeline miles per county in south Kansas.

2011 Pipeline Mileage

County	Gas Miles	Liquid Miles
Barber	88	90
Barton	275	121
Comanche	80	91
Edwards	211	16
Kiowa	434	165
Pawnee	132	73
Pratt	262	190
Stafford	251	150
Regional Total	1,733	896

Source: United States Department of Transportation Pipeline and Hazardous Materials Safety Administration

Previous Occurrences and Extent

Regionally, hazardous materials accidents are infrequent events. The following details notable hazardous material events.

> **September 8, 2003:** A train derailment in Barber County required the precautionary evacuation of people within a one-mile area. The train carried a hazardous material which was not identified and 6,000 gallons of diesel fuel spilled from the locomotive, but was contained.

Hazard Vulnerability and Impact

According to the KDEM, Technological Hazards Section there are 52 facilities subject to the Risk Management Plan requirements in south Kansas as of December 2012. However, there are no facilities ranked on the Risk Management Plan's Worst Case Scenario list.

In estimating potential losses, the most significant loss potential with hazardous materials incidents concerns people. Special populations are particularly vulnerable to the impacts of a hazardous materials incident because of the potential difficulties involved in the evacuation. The following shows the number of special population facilities in each county that is located within ½ mile of a chemical facility. The locations of colleges, educational and correctional institution facilities is from the Kansas Data Access & Support Center (DASC), health facilities is from FEMA's HAZUS-MH 2.1, aging facilities is from KDEM and child care facilities is from KDHE. A comparison was completed with the latitude and longitude of the facilities with the hazardous chemical facilities in Kansas.

Number of Special Population Facilities within One-Half Mile of a Chemical Facility

County	Health Facilities	Colleges	Educational Facilities	Aging Facilities	Child Care	Correctional Institutions
Barber	1	0	4	1	14	1
Barton	1	0	14	6	72	1
Comanche	1	0	3	1	8	0
Edwards	1	0	2	1	3	1
Kiowa	1	1	8	2	5	1
Pawnee	0	0	8	2	18	1
Pratt	0	0	5	2	25	1
Stafford	1	0	2	1	3	0
Regional Total	6	1	46	16	148	6

Source: DASC, HAZUS, KDHE, and KDEM

The following table lists the number of hazardous materials incidents, injuries, fatalities and people evacuated from the public and facilities by county in south Kansas over the 10-year period of 2003-2012.

Number of Hazardous Material Incidents, Injuries, Fatalities and Evacuations, 2003-2012

Incident County	Incidents	Injuries	Fatalities	People Evacuated
Barber	5	0	0	2
Barton	14	0	0	0
Comanche	4	0	0	0
Edwards	1	0	0	0
Kiowa	33	0	0	0
Pawnee	3	10	5	20
Pratt	30	7	3	260
Stafford	14	3	0	20
Regional Total	104	20	8	302

Source: Kansas Division of Emergency Management, Technological Hazards Section

For spill and releases, in general, the spiller is responsible to report to all the appropriate agencies depending on the material and volume spilled. To satisfy the requirement of Kansas Regulation K.A.R. 28-48 all spills that impact the soils or waters must be reported to the KDHE or in the case that it originates from an oil or gas production leases, be reported to the Kansas Corporation Commission. If the release is not contained or threatens the health or safety of the local population, the LEPC within the county of the release, must be notified first by dialing 911. Hazardous materials spills and air releases that meet federal reportable quantities and oil and petroleum spills over 110 gallons must also be reported to KDEM.

The following shows that the major cause of hazardous material incidents from 2003-2012.

Causes of Hazardous Materials Incidents in Kansas, 2003-2012

Year	Explosion	Fire	Spill	Equipment Failure	Operator Error	Natural	Dumping	Other
2003	6	14	194	191	29	6	2	51
2004	5	10	58	355	31	2	1	315
2005	1	5	49	181	21	2	6	0
2006	0	3	46	214	18	1	3	89
2007	1	6	41	238	13	3	0	94
2008	3	7	59	168	27	9	1	110
2009	1	7	142	207	25	14	4	112
2010	2	7	234	120	20	2	2	105
2011	1	6	154	91	10	3	2	21
2012	1	8	153	69	23	1	3	94
Total	21	73	1130	1834	217	43	24	991
10 Year Average	2.1	7.3	113	183.4	21.7	4.3	2.4	99.1

Source: Kansas Division of Emergency Management, Technological Hazards Section

The "Managing the Risk: 2011 Kansas Commission on Emergency Planning and Response Annual Report" shows the number of hazardous material releases reported to all three Kansas agencies of KDEM, the KDHE and the KCC.

Reports from the U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration provides detail and incident history for the pipeline systems in south Kansas between 2001 and 2012. Significant incidents are those incidents reported by pipeline operators with any of the following conditions met:

- Fatality or injury requiring in-patient hospitalization
- $50,000 or more in total costs, measured in 1984 dollars
- Highly volatile liquid releases of five or more barrels or other liquid releases of 50 or more barrels
- Liquid releases resulting in an unintentional fire or explosion

According to these reports there were seven incidents that caused no deaths or injuries and $836,436 in damages over the 12 year period (2001-2012). The following table gives the incident details.

Regional Pipeline Incidents, 2001 - 2012

County	Total Natural Gas Transmission Incidents	Total Natural Gas Distribution Incidents	Total Hazardous Liquid Incidents	Total Fatalities	Total Injuries	Total Damage	Gross Barrels Lost	Total Barrels Recovered
Barber	0	0	0	0	0	0	0	0
Barton	0	0	0	0	0	0	0	0
Comanche	0	0	2	0	0	$483,046	11	11
Edwards	-	-	-	-	-	-	-	-
Kiowa	0	1	1	0	0	$327,274	3,415	3,415
Pawnee	0	0	0	0	0	0	0	0
Pratt	0	0	0	0	0	0	0	0
Stafford	0	0	3	0	0	$26,116	473	351
Regional Total	0	1	6	0	0	$836,436	3,899	3,777

Source: U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration
-: Data unavailable

In general, it is difficult to quantify potential losses of hazardous materials events due to the many variables and human elements. For example, a spill of a toxic airborne chemical in a populated area could have great potential for loss of life while a spill of a very small amount of a chemical in a rural agricultural area would be much less costly and possible limited to remediation of soil. Therefore, for the purposes of this plan, the loss estimates will take into account a hypothetical scenario. Please note that the hypothetical scenario is included for illustrative purposes only.

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people and then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work close with local responders, KDHE, KCC, KDEM, and EPA to ensure that cleanup is done safely and in accordance with federal and state laws.

For discussion purposes, the materials needed for a spill at a fixed facility at an easily remediated area are listed in the following table. The costs for the cleanup are estimated from the current State of Kansas Unified HazMat Response Program statewide contract # 35167.

Hypothetical Cost Estimate For Hazardous Materials Spill Remediation

Classification	Rates Per Hour/Unit	Number of Hours/Units	Total Cost
Project Manager	$90.00	24	$2,160
Health & Safety Supervisor	$86.00	24	$2,064
Environmental Tech	$50.00	12	$600
Foreman	$55.00	24	$1,320
Equipment Operator	$56.50	24	$1,356
Laborer	$45.00	24	$1,080
Truck, 4 wheel drive	$680/wk	1	$680
Backhoe, Case 416B	$320.00/day	2	$640
Forklift, 3 ton all terrain	$160.00/day	2	$320
Skimmer	$250.00/day	2	$500
Pump, 4”	$80.00/day	3	$240
Drums, chemical, 17H or E	$90.00	25	$2,250
Drums, 95 gallon	$295.00	25	$7,375
Vermiculite per bag	$15.00	6	$90
Acid Suits	$70.00/each	6	$420
Gloves	$4.00/pair	30	$120
Total			$21,215

Source: State of Kansas Unified HazMat Response Program statewide contract # 35167

	Magnitude/Severity
Hazardous Materials	2.13

Future Development

People, livestock and vegetation in close proximity to facilities fabricating, processing and storing as well as those where hazardous waste is treated, stored and disposed of are most at risk for hazardous materials incidents. Additionally, localities along transportation corridors that carry these materials to their final destinations are at risk. Populations downstream, downwind and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. As the infrastructure and population of urban centers of south Kansas increases, along with the number and type of hazardous chemicals stored and transported through the region, the amount of potential losses could increase. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on the limited historical occurrence future major events is unlikely. However, if the infrastructure and population of south Kansas reverses trends and begins to increase, or there is

an increase in the number and type of hazardous chemicals stored and transported through the region, the amount of potential losses could increase.

	Probability
Hazardous Materials	1.25

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Hazardous Material Event Consequence Analysis

Subject	Ranking	Impacts of Hazardous Material Event
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas.
Responders	Severe	Impact to responders is expected to be severe.
Continuity of Operations	Minimal to Moderate	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe in the incident area. Streams, open bodies of water, aquifers, roads, residential and business properties will be most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities.
Environment	Severe	Impact could be severe for the immediate area. Impact will lessen with distance.
Economic Conditions	Minimal to Severe	Local economy and finances may be adversely affected, depending on damages.
Public Confidence in Governance	Minimal to Moderate	Response and recovery will be in question if not timely and effective. Warning systems and the timeliness of those warnings could be questioned.

3.7.11 LAND SUBSIDENCE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Land Subsidence	1.38	1.00	1.75	3.63	1.54

Description

Land subsidence is caused when the ground above manmade or natural voids collapses. Subsidence can be related to mine collapse, water and oil withdrawal, or natural causes such as shrinking of expansive soils, salt dissolution (which may also be related to mining activities), and cave collapses. The surface depression is known as a sinkhole. If sinkholes appear beneath developed areas, damage or destruction of buildings, roads and rails, or other infrastructure can result. The rate of subsidence, which ranges from gradual to catastrophic, correlates to its risk to public safety and property damage.

The development of sinkhole and subsidence areas can be grouped into three major categories:

- Natural dissolution of soluble minerals
- Extraction of minerals by either solution mining or shaft mining
- Downward drainage of fresh water, via a drill hole or unplugged oil or gas well which penetrates a soluble mineral formation and has an outlet for the solution cavity water to be disposed.

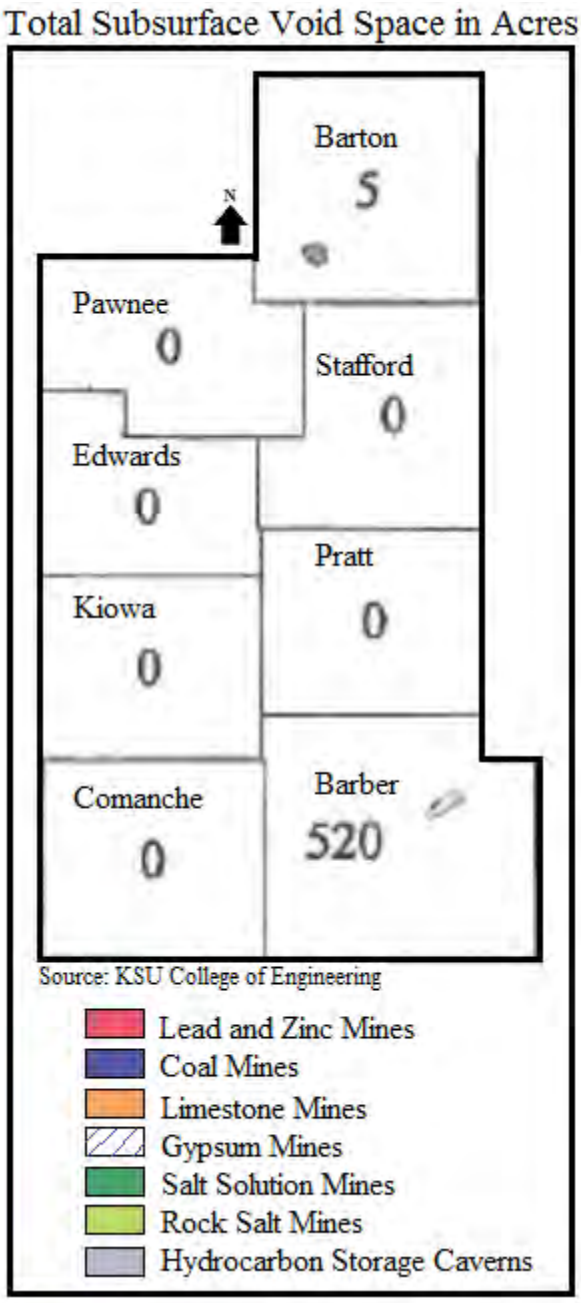
Major materials or minerals present in south Kansas that are associated with subsidence and sinkhole development include salt, limestone and dolomite, gypsum, coal, lead and zinc. Some isolated incidents of subsidence have been associated with high volume pumping of water wells.

	Warning Time
Land Subsidence	1.75

	Duration
Land Subsidence	3.63

Hazard Location

The Kansas Department of Health and Environment in 2006 prepared a report on "Subsurface Void Space and Sinkhole/Subsidence Area Inventory for the State of Kansas." The report inventoried subsurface void space from oil and gas exploration and production, natural sources, shaft mining, and solution mining. The total void space inventory for all sources in the state is 119,136 acres. The distribution of total acres and major cause of void spaces are shown for each county in the following map.



Areas of karst, a terrain or type of topography generally underlain by soluble rocks, such as limestone, gypsum, and dolomite, in which the topography is chiefly formed by dissolving the rock, are also particularly prone to sinkholes.

The following map illustrates the location of karst features and features analogous to karst in south Kansas. The green areas shown in the map show fissures, tubes, and caves generally less than 1,000 feet long with 50 feet or less vertical extent in gently dipping to flat-lying carbonate rock. Brown areas have similar features in gently dipping to flat lying gypsum beds. Light pink colored areas are features analogous to karst with fissures and voids present to a depth of 250

feet or more in areas of subsidence from piping in thick unconsolidated material. Darker pink areas contain fissures and voids (analogous to karst) to a depth of 50 feet. There are limited documented problems associated with natural limestone subsidence and sinkholes in south Kansas.

Previous Occurrences and Extent

No notable incidents of land subsidence have been recorded for the region.

Hazard Vulnerability and Impact

Data was obtained from KDHE for the following:

- Lead and Zinc Mines that required filling
- Coal Subsidence Projects
- Coal Emergency Program Projects

This emergency program provides for the remediation of sites which are an immediate threat to the health and safety of the general public. There are no identified projects for regional counties.

With the known number of acres in each risk category for each county with documented subsurface void spaces, a weighted vulnerability calculation was completed. Acreage in risk Category I (High Risk) received a multiplier of three, acreage in risk Category II (Moderate Risk) received a multiplier of two and acreage in risk Category III (Low Risk) received a multiplier of one.

A high risk classification indicates one or more of the following: the source material very soluble, source material thickness may leave large voids, depth of source material less than 100 feet, mining operations have left a large vertical void space (4 - 300 feet), mining operations have large vertical shafts or bore holes associated with the mining techniques, mined area has a large void space to pillar ratio, void space in the mine has filled with water, mine floor susceptible to collapse or loading failure, cap rock not competent for long term support, mine pillars susceptible to deterioration and future collapse, mine roof less than 60 feet in thickness, bedrock material comprising the mine roof is not competent material for long-term stability, horizontal or inclined mine shafts with shallow or thin overburden, and areas in the subsurface where support pillars in columns have been mined or removed.

A moderate risk classification indicates one or more of the following: depth of mine floor greater than 125 feet, void space to pillar ration (80 to 90%), vertical opening 4 feet or greater, water filled void increases subsidence risk, overlying bedrock material very competent, numerous mine shafts or boreholes associated with mining technique, and support columns or pillars susceptible to serious deterioration when void space is filled with water.

A low risk classification indicates one or more of the following: small vertical void space, void space to pillar ratio good (75 to 80%), vertical shafts and bore holes are in good condition, depth of mined material relatively deep, +/- 150 feet, competent cap rock over void space, long wall mining method allows slow subsidence with minimal vertical opening; surface subsidence is minimal to undetected, mine opening is dry, no pillar deterioration, and mine area has little risk of sudden subsidence.

Subsurface Void Space Vulnerability Analysis

County	Gypsum Category II	Salt Solution Category II	Weighted Calculation
Barber	500	0	1,040
Barton	0	5	10
Regional Total	500	5	1,050

Source: KDHE, "Subsurface Void Space and Sinkhole/Subsidence Area Inventory for the State of Kansas" 2006. Data tabulated and assigned weighted scores in individual categories.

	Magnitude/Severity
Land Subsidence	1.00

Future Development

Future development would tend to increase the risk of this hazard, especially on areas of known subsidence or with subsidence potential. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on historical records, land subsidence events occur in south Kansas on a very sporadic basis and result in minimal impact. However, due to underlying surface conditions and activities a small probability of future events exists.

	Probability
Land Subsidence	1.38

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Land Subsidence Consequence Analysis

Subject	Ranking	Impacts of Land Subsidence
Health and Safety of Persons in the Area of the Incident	Moderate to Severe	Local impact expected to be moderate to severe for the incident area.
Responders	Minimal	Impact to responders would be minimal.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP, unless a facility is impacted.
Property, Facilities, and Infrastructure	Severe	Localized impact to facilities and infrastructure in the incident area has the potential to do severe damage.
Delivery of Services	Minimal	Impacts to the delivery of services could be severe if roads/utilities are affected. Otherwise impact would be non-existent to minimal.
Environment	Minimal	Impact to the area would be minimal.
Economic Conditions	Minimal	Impacts to the economy will depend on the severity of the damage.
Public Confidence in Governance	Minimal to Severe	Local development policies will be questioned.