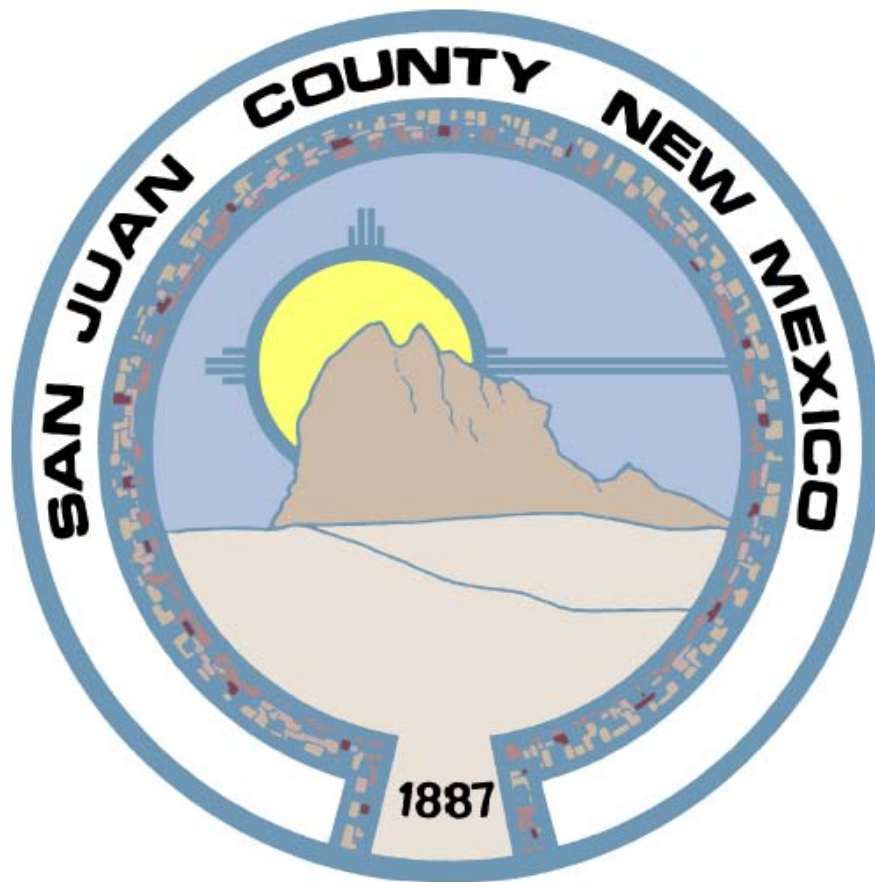


**San Juan County Mitigation Plan  
2010**



**Part II  
Risk Identification and Analysis**

## **Part II**

### **Risk Identification and Analysis**

#### **INTRODUCTION**

In order to understand the problems that exist in San Juan County and each of the participating jurisdictions, it was necessary to determine what types of hazards threaten the area. In order to establish a list of hazards, information was collected from numerous sources in the following manner.

**Risk analysis.** In order to prepare for possible hazardous events within San Juan County, it is first necessary to perform a risk analysis. The possible hazards that exist in San Juan County were identified, the locations that could be affected by each hazard type were determined, the possible effect on human life and property were considered, and the frequency of occurrence was considered. The steps taken in this process are described below.

**Hazard identification.** The identification of possible hazards that exist within San Juan County began with a review of hazards that have been known to occur historically within the county. SARA Title III reports and the New Mexico All-Hazards Emergency Operations Plan were reviewed to consider man-made and possible man-caused hazards. Finally, the area's comprehensive plans were analyzed to determine future building trends and the potential for man-caused events.

**Hazard profile.** Once the hazards had been identified, each was then considered for its possible effect within the county and its jurisdictions. Beginning with the available historical data, the frequency, duration, and locations of occurrence were determined. Although it is impossible to predict every location a hazard can occur, history can provide definite areas to examine.

**Vulnerability.** With the establishment of specific areas to consider, each area was examined for factors such as population density, type of structure, and geographic location to determine how it could be affected by a hazard occurrence. Consideration was given to both the present and predicted 5-year future growth of the area's population and the existing present and future structures.

**Risk assessment.** Examining an area's vulnerability provides information on both the number of lives that will be put in jeopardy by a hazard event and the possible economic damage that can be expected from any given occurrence.

Information concerning the hazards that exist within San Juan County was based on multiple sources. These sources included the State of New Mexico All Hazards Emergency Plan, the San Juan County Emergency Operations Plan, the San Juan County working group, San Juan County public meetings, and questionnaires sent out to the general public. As a result of this effort, the following hazards were identified as placing the county at risk.

<u>Hazard</u>	<u>Level of Risk</u>	<u>Group Identified</u>
Wildfire	Rare	State of New Mexico San Juan County working group San Juan County public meetings Questionnaires
Flood/flash flood	Occasional	State of New Mexico National Flood Insurance Program San Juan County working group San Juan County public meetings Questionnaires
Drought	Presently occurring	State of New Mexico National Oceanic and Atmospheric Administration San Juan County working group San Juan County public meetings Questionnaires
Severe winter storm	Rare	State of New Mexico San Juan County working group San Juan County public meetings Questionnaires
Earthquake	Low	State of New Mexico San Juan County working group San Juan County public meetings Questionnaires
Hazardous material release	Moderate to high	State of New Mexico New Mexico Traffic Safety Bureau San Juan County working group San Juan County public meetings Questionnaires
Terrorism	Rare	San Juan County working group San Juan County public meetings Questionnaires

Table 1.  
Hazards placing San Juan County at risk

Although it is acknowledged that each of these hazards does exist, the San Juan County working group chose to limit the scope of the present project to the four most likely hazards. Therefore, it was determined that the initial San Juan County Mitigation Plan would concentrate on flooding, drought, wildfire, and hazardous material releases. During the 2010 review of the plan, it was determined that the original determination of concentration is still valid.

It is the intent of the San Juan County working group to re-evaluate the hazards within the county on an annual basis (see Part IV, Implementation and Monitoring Plan), and address the additional identified hazards at that time based on the successful mitigation of the initial priorities.

## **EARTHQUAKES**

Earthquakes are seismic events in which the earth's surface moves due to pressures under its surface. Such seismic events occur naturally and are generally located along the plate boundaries deep within the earth's surface. When the ground movement is strong enough, considerable damage can be caused, as seen in the California earthquake of 1995 or the Alaska earthquake of 1964. In addition to the natural occurrence of earthquakes, man-caused seismic events have also been recorded as a result of man-made lakes.

New Mexico is not generally considered to be a very active area for seismic activity. However, there is a significant probability that a strong earthquake could occur here at some point. New Mexico is not located on a plate boundary and the closest major fault is the San Andreas Fault, located in California. Historically San Juan County has not been the center of earthquake activity. Between 1869 and 1992 some 30 seismic events have occurred within New Mexico; the closest one to San Juan County occurred in Gallup, which is located in McKinley County to the south. The seismic event in Gallup occurred on January 5, 1976 and had a magnitude of 4.7 on the Richter scale.

The most significant area of seismic activity in the state is located in the Rio Grande River valley and is centered in Socorro, New Mexico. Eight seismic events have occurred there between 1869 and 1992. The largest recorded seismic event in New Mexico occurred in Socorro in 1906. The effects of this event were felt from El Paso, Texas to Las Vegas, New Mexico; however, little damage was reported and there were no fatalities.

Present structural building code requirements in New Mexico do not consider the possibility of seismic events. In addition, due to the low historic occurrence of seismic events in San Juan County, it has not been considered necessary to take specific mitigation measures to address seismic events at this time.

## SEVERE WINTER STORMS

Severe winter storms are of concern to the citizens of San Juan County as shown in questionnaire results, which indicate that 8% considered it a high priority and 49% considered it a moderate priority. The occurrence of severe winter storms is fairly rare in San Juan County, including Aztec, Bloomfield and Farmington, and they do not cause a major problem throughout the area. Generally when such a storm hits, it may cause some traffic slow-down, but it rarely causes major transportation routes to be closed for more than a day. This situation creates more of an inconvenience than a hazard. During winter storms, heavy/wet snowfall can create a risk to flat-roofed residential structures, but the damage is generally limited. Generally snowfall in the San Juan County area melts off fairly quickly, and the only problem is in the use of unimproved roads outside the major population centers.

**Table 2. Weather Statistics/ San Juan County**

Average Temperatures												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Aztec	29.1	35.2	41.8	49.9	58.8	67.7	74.1	72.1	64.5	53.2	39.6	30.4
Farmington	28.7	35.1	41.3	51.1	60.3	69.3	75.9	73.7	65.7	53.9	39.7	31.3
Bloomfield	28.6	35.5	42.6	51.1	60.6	70.1	75.8	73.4	65.7	53.6	40.1	30.7

Maximum Temperatures												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Aztec	43.3	49.8	58.2	67.8	77.2	86.8	91.3	88.6	81.8	70.5	55.1	44.3
Farmington	40.6	47.8	55.4	66.6	76.5	86.6	91.7	88.8	81.9	69.2	53.2	42.1
Bloomfield	41.0	48.6	57.4	67.2	77.4	88.0	92.0	89.0	81.8	69.4	54.4	43.4

**Table 2, continued**

<b>Minimum Temperatures</b>												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Aztec	15.1	20.6	25.4	32.0	40.4	48.5	57.0	55.6	47.2	36.0	24.2	16.6
Farmington	16.8	22.4	27.2	35.6	44.2	52.0	60.1	58.5	49.5	38.6	26.1	18.5
Bloomfield	16.2	22.4	27.8	35.0	43.8	52.1	59.6	57.7	49.5	37.7	25.7	18.0

<b>Average Snow Fall</b>												
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Aztec	5.3	2.8	1.1	0.1	-	-	-	-	-	0.1	1.0	4.5
Farmington	4.2	2.3	0.9	0.1	-	-	-	-	-	-	0.7	5.2
Bloomfield	3.8	2.2	1.0	0.3	-	-	-	-	-	0.1	0.6	3.4

<b>Overall Precipitation</b>								
	<b>Rain Fall</b>					<b>Snow Fall</b>		
	Mean	Max.	Year	Min.	Year	Mean	Max.	Year
Aztec	9.91	23.74	1941	3.0	1917	15.3	44.9	1949
Farmington	8.21	13.63	1957	3.92	1956	13.7	28.6	1955
Bloomfield	8.61	21.75	1941	3.05	1950	11.4	43.5	1941

*Note: Weather statistics for Aztec, Bloomfield, and Farmington were obtained from NOAA. Weather statistics were not available for the overall county.*

In addition to winter storms, other severe weather such as high winds, tornados, or lightning can also occur. However, the occurrence of such events is extremely rare. Due to the low potential of these events occurring within the county, it was not considered necessary to address specific mitigation measures for them at this time.

## **POWER OUTAGE**

The possibility of a long-term power outage is also of concern to the residents of San Juan County. Based on the questionnaire returns (refer to Attachment B), 38% of those who responded considered this to be a high priority issue, and 41% considered it a moderate issue. Electric power for San Juan County, Aztec, Bloomfield, and Farmington is supplied through the Public Service Company of New Mexico. After the blackout occurred on the East Coast in 2003 the New Mexico PRC met with El Paso Electric, Public Service Company of New Mexico, Texas-New Mexico Power, Tri-State and Xcel, all companies supplying electrical power to the state, and experts from Sandia Labs. The purpose of this meeting was to review New Mexico's electrical grid to determine the potential for a similar blackout, which likelihood was determined to be low. However, it should be noted that a blackout did occur in New Mexico in 1996. Since that incident, progress has been made to increase the system's reliability. In addition, it should be pointed out that electrical grids in the east are much older than those found in New Mexico. Presently the problem associated with electrical blackouts is being discussed on a national level and no complete solution has been established.

San Juan County has installed backup generators at critical infrastructure sites, which can supply limited electrical power in the event of a blackout. In addition, the county has emergency operation plans in place that can provide resources during a blackout.

## **TERRORISM**

Terrorism is identified as resulting from either a foreign or a domestic source. Foreign terrorism is defined as terrorism that is directed and funded by sources outside of the United States, and domestic terrorism is defined as terrorism that is funded, motivated, and directed by citizens of the United States. The possibility of a terrorist event occurring in San Juan County, Aztec, Bloomfield, or Farmington does exist, but the likelihood of such an event occurring is considered slight. The possibility of a foreign terrorist event is considered extremely small, and no practical preventive mitigation of this possibility is presently available. There have been several relatively minor domestic terrorist events in New Mexico and the surrounding region. Earlier in 2003, the Santa Fe area has seen vandalism at area car dealerships, with the Earth Liberation Front (ELF) claiming responsibility. Outside of Los Alamos, ELF has also claimed responsibility for vandalism to Forest Service vehicles. In addition to ELF, the Forest Guardians are also active in New Mexico; however, most of their present activities have been in the form of protests and lawsuits. The New Mexico Department of Public Safety is presently studying the occurrence of domestic terrorism in New Mexico. This agency is in the process of creating an intelligence-gathering arm. Beyond this effort, however, domestic terrorism has not presently risen to a level of activity in New Mexico that requires a specific local mitigation effort.

**Table 3. Major hazards of San Juan County, Aztec, Bloomfield, and Farmington**

<u>Hazard</u>	<u>Why identified</u>	<u>Group Identified</u>
Flood/flash flood	Historically a problem throughout San Juan County. County contains numerous arroyos and irrigation ditches.	State of New Mexico National Flood Insurance Program San Juan County working group County/jurisdiction floodplain managers San Juan County public meetings Questionnaires
Drought	Considered a severe problem throughout the Southwest at this time. Historically a problem in New Mexico and San Juan County.	State of New Mexico National Oceanic and Atmospheric Administration San Juan County working group San Juan County public meetings Questionnaires
Hazardous material release	San Juan County contains a direct route from the Four Corners area into the state en route to Albuquerque and the intersection of I-25 and I-40	State of New Mexico New Mexico Traffic Safety Bureau San Juan County working group San Juan County public meetings Questionnaires
Wildfires	Dense undergrowth and trees are found along the river bottoms of the Animas, La Plata, and San Juan Rivers	San Juan public meetings Farmington Fire Department San Juan Emergency Manager Questionnaires Recent events in Albuquerque

## **FLOODING**

Flooding concerns within San Juan County and its participating jurisdictions have been established through meetings of the San Juan County working group, public meetings, questionnaires, the New Mexico State All-Hazards Emergency Operations Plan, the jurisdiction's floodplain managers, and historical information. Flooding will continue to occur within San Juan County depending on the amount of rainfall and snowmelt occurring during any given year. Two types of flooding appear to be of most concern within San Juan County: flash flooding and riverine flooding.

**Flash flooding.** A flash flood is an extremely dynamic event in which a high volume of water moves through an area at high velocity during a very short time period. This type of flooding can be very difficult to predict and can occur with little or no warning. In many cases, flash floods can move through an area miles from where rain has occurred, thereby increasing the danger to people within the flood's path.

Flash floods are created as a result of rainfall. As rain water runs into small channels, it begins to collect. As these channels merge together, the amount of water increases and picks up speed and force. This collection of water becomes a wall of water that can wash vegetation, structures, and debris along with it. This debris then increases the amount of force available and increases the flood's destructive power.

Other factors that affect the dynamics of this type of flood include slope, width, and vegetation in place along the banks of the water course. The slope that a flash flood traverses has a definite relationship to the overall speed in which the water will travel. The steeper the incline, the faster the water will travel. The incline on which the water moves affects the width of the flooding area. Generally, the faster the water moves, the narrower the channel will be created, since the water digs the channel deeper as it flows. When the water flows on a shallower slope, the water tends to spread out more, which can decrease its potential to cause mass damage. However, it must still be considered dangerous. Finally, the type of vegetation located along the flood's path can prevent further erosion of the channel banks. A structure that lies along a flood channel that has no surrounding vegetation is at risk of having its foundation undercut, which can cause structure damage, or in some cases, the building's complete collapse.

**Riverine flooding.** The Animas and San Juan Rivers both run through San Juan County. Each has the potential of causing flooding along its path. The amount of water flowing through a river at any given time determines the river's depth. When a higher than normal amount of water finds its way into a river or stream, the height of the water relative to its path increases. When this occurs, the river will overflow its normal banks and flood the surrounding area to the water's present height. The height of the river's banks determines how far out a flood will spread. This type of flooding, like flash flooding, will begin at some point above where the flooding occurs.

## **Section 1. San Juan County**

Flooding within San Juan County is an ongoing issue. San Juan County Unincorporated has been a member of the National Flood Insurance Program (NFIP) since 2003 and has held a Community Rating Service (CRS) rating of 9 since 2008. The County Emergency Manager, Don Cooper, CFM, is the Floodplain Administrator and Michele Truby-Tillen, CFM, is the Floodplain Manager and CRS Coordinator. Presently San Juan County Flood Damage Prevention Ordinance Number 58, is ranked as a Class D Ordinance flood regulations in San Juan County, and many structures have been built in the floodplains along the Animas and San Juan Rivers, including areas that are downstream from dams. Flooding along either of these rivers or dam failure will cause destruction or damage to these structures. High flood discharge due to snowmelt has occurred on the San Juan

River in 1909, 1911, 1927, 1929, and 1942. In addition, the National Weather Service (NWS) reports an average of four flash flood warnings per year in San Juan County. However, due to terrain blockage in the area, the NWS estimates that at least eight flash floods will occur in the county annually, with an additional four weather patterns going undetected by their present observation capability, which is blocked from covering the entire area because of the mountains. Flash flooding in San Juan County is generally expected to occur from July through September, which is considered the rainy season in New Mexico.

In addition, some county residents have filled in sections of existing flash flood channels in an effort to maximize the area available for construction. Filling in these sections creates choke points in the flash flood channels, which will cause higher water levels in the channel. As the water rises, it will have the potential of overflowing its banks, thereby flooding any structure in the area. The choke points also create higher pressure on the new channel banks, which increases the possibility of erosion and undercutting foundations.

San Juan County's vulnerability to riverine flooding along the Animas, La Plata, and San Juan Rivers has been determined to threaten approximately 6,250 persons who live along the shoreline of these rivers. It is estimated that some 1,240 homes, 48 small business structures, and 60 other structures have been built within the identified floodplain. Each of these structures is at risk in the event of a flood through the riverine and identified in the presently-known floodplain. With mitigation the number of structures may not decrease, but the exposure of new structures will be limited.

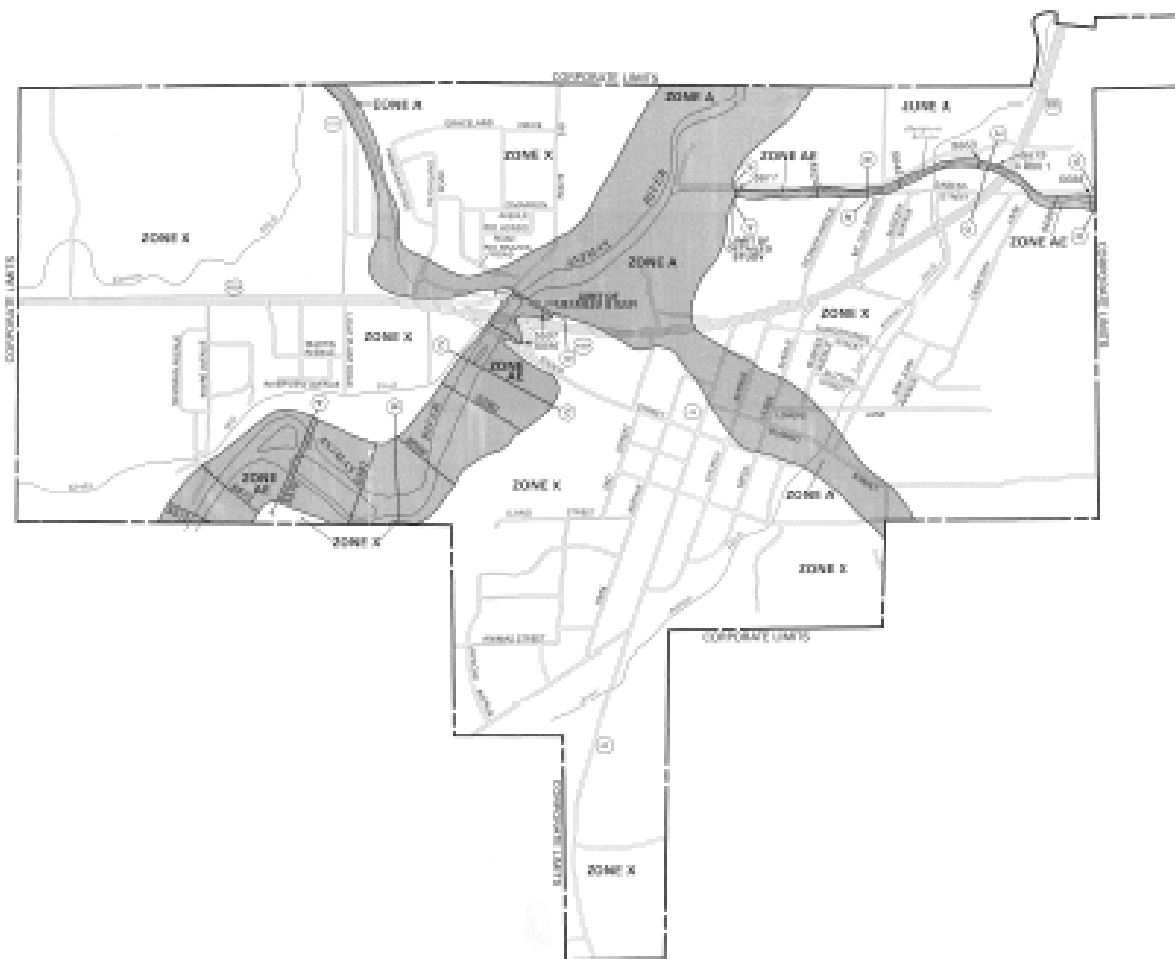
## **Section 2. Aztec**

Flooding in Aztec can be a major issue because the Animas River runs directly through town. During a 100-year flood, the Animas will cause flooding to occur along numerous streets in the city limits, including U.S. 550 and numerous downtown areas. Specific roadways in Aztec that are susceptible to flooding include Blanco Street, Bunker Avenue, Cemetery Lane, Chaco Street, Church Avenue, Highland Road, Lovers Lane, Mesa Verde Avenue, Rio Brazos Road, Route 248, Sebena Street, State Road 173, and State Road 550. These roadways have been identified in the most recent FEMA floodplain maps, which were created in July 1988.

The issue of flooding in Aztec has been addressed by the City Council with the adoption of Section 9-1 of the City Code, Flood Prevention, and the designation of a city floodplain manager. Acknowledging that these codes exist, there are still provisions within this section that allow for use of flood-prone areas for structural use. In addition, it must be noted that the present floodplain maps have not been updated since 1988, and the city limits of Aztec have grown since that time. Flooding can occur in Aztec due to river rise, or more likely due to the encroachment of arroyos created during construction and debris that builds up in waterways. Debris can damage or clog up waterways, acting like a dam and causing water to flood outside the normal waterway.

Aztec's flood vulnerability has been created over a long period of time. Located within Aztec's floodplain are twelve structures that are listed on the National Register of Historic Places and the New Mexico Register of Cultural Properties. These structures and locations are:

- |                               |                               |
|-------------------------------|-------------------------------|
| 309 N. Mesa Verde, built 1905 | 401 Lovers Lane, built 1906   |
| 302 N. Mesa Verde, built 1907 | 405 Lovers Lane, built 1906   |
| 122 N. Mesa Verde, built 1925 | 406 Lovers Lane, built 1906   |
| 116 N. Mesa Verde, built 1906 | 407 Lovers Lane, built 1910   |
| 203 N. Main                   | 314 N. Church, built 1906     |
| 309 Lovers Lane, built 1906   | 216 N. Church, built pre-1907 |



Map 1. Aztec  
FEMA FIRM  
Panel 3500650005B

### **Section 3. Bloomfield**

Flooding in Bloomfield has been addressed by the City Council with the adoption of city ordinances and the designation of a city floodplain manager. Presently there are seven residential structures within the Bloomfield floodplain. However, the present floodplain maps have not been updated since 1978, and these maps do not reflect the city's present incorporated area. As a result, the city's floodplain manager is unable to control construction in areas not covered by the present maps. In addition, certain areas where construction in floodplains has not been previously restricted have been annexed into the city limits.



Illustration 1.  
Bloomfield Canyon Arroyo

The most common type of flooding in Bloomfield is flash flooding, with the last major occurrence occurring in 1997. This event was primarily caused by the encroachment of a waterway and an undersized culvert that caused an increased water level, resulting in flooding outside of the waterway. According to Ray Barnes, Planning/Zoning Administrator and floodplain manager for Bloomfield, this flood caused damage to area residents and structural damage to a roadway bridge. The undersized culvert has since been replaced with a larger one. The dangers of flash flooding are increased due to the encroachment of construction and the presence of debris in waterways.

### **Section 4. Farmington**

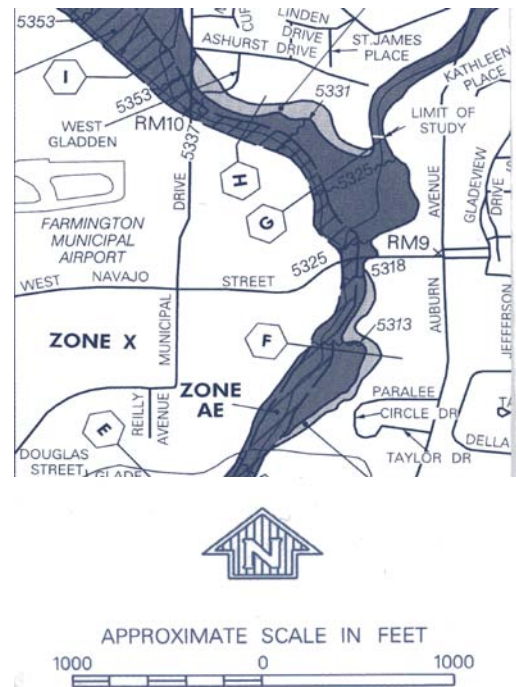
Farmington is situated along the confluence of the La Platte, San Juan, and Animas Rivers, causing flooding to be a major issue. According to the Farmington Comprehensive Plan, strict and consistent adherence to floodplain use restrictions is

strongly recommended. The plan further noted the present lack of floodplain restrictions throughout the unincorporated area of the county. As with the other jurisdictions within San Juan County, certain areas have been annexed into Farmington city limits in which structures are presently located within existing floodplains. However, all new construction within Farmington requires the contractor to verify flood elevations as part of the city's approval system.

Presently there has been little history of flooding along the San Juan and Animas Rivers. However, limited flooding has occurred along the La Platte River. No critical infrastructure for the City of Farmington currently lies within the floodplain. The Farmington Floodplain Manager has identified four specific locations within the city where localized flooding has occurred. This flooding has been due to sudden unpredictable flash flood situations along arroyos and one irrigation ditch. Although it is not possible to warn residents in these areas prior to a flood, redesign of these areas can reduce or eliminate the overall problem. Without mitigation, it is understood that flooding in these areas will occur again.



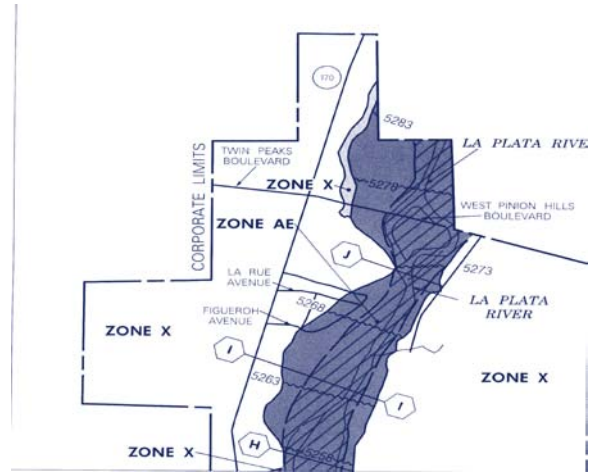
Illustration 2.  
Navajo Crossing  
Glade Arroyo



Map 2. FIRM Map  
Panel 3500670105E



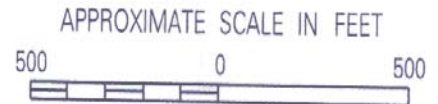
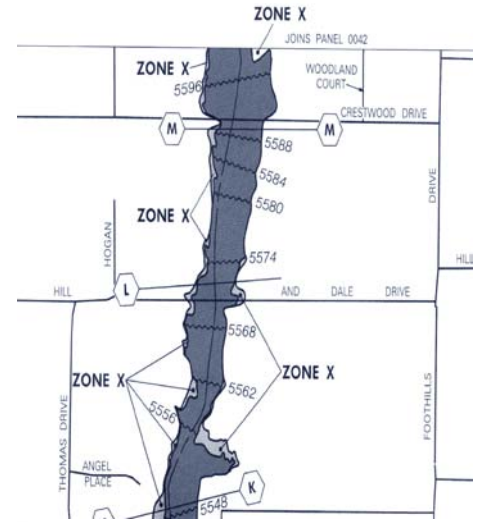
Illustration 3.  
Pinon Hills  
La Plata Crossing



Map 3. FIRM Map  
Panel 3500670040E



Illustration 4.  
Crestwood Dr.  
Hood Arroyo



Map 4. FIRM Map  
Panel 3500670044E

# DROUGHT

The concerns for drought conditions within San Juan County and the participating jurisdictions has been established through meetings of the San Juan County working group, public meetings, questionnaires, the National Oceanic and Atmospheric Administration, the National Weather Service, the U.S. Geological Survey, the New Mexico Drought Task Force, and New Mexico State University. Drought, as defined by the National Oceanic and Atmospheric Administration (NOAA), is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area. Drought status is determined through the use of the Palmer Drought Severity Index, the Standardized Precipitation Index, and the Surface Water Supply Index. In New Mexico, drought is known to occur on an average of every ten years. Drought will always be a concern in San Juan County.

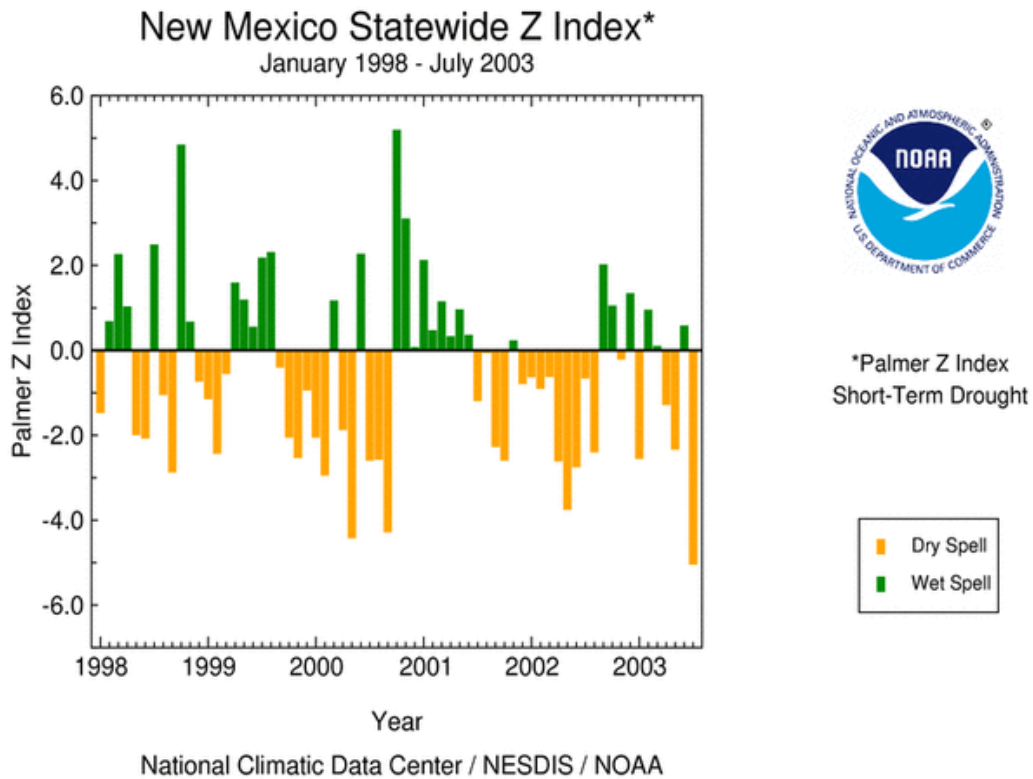


Illustration 5.

## Palmer Drought Index Percentiles by Division

Weekly Value for Period Ending 16 AUG 2003

Records Began in 1895

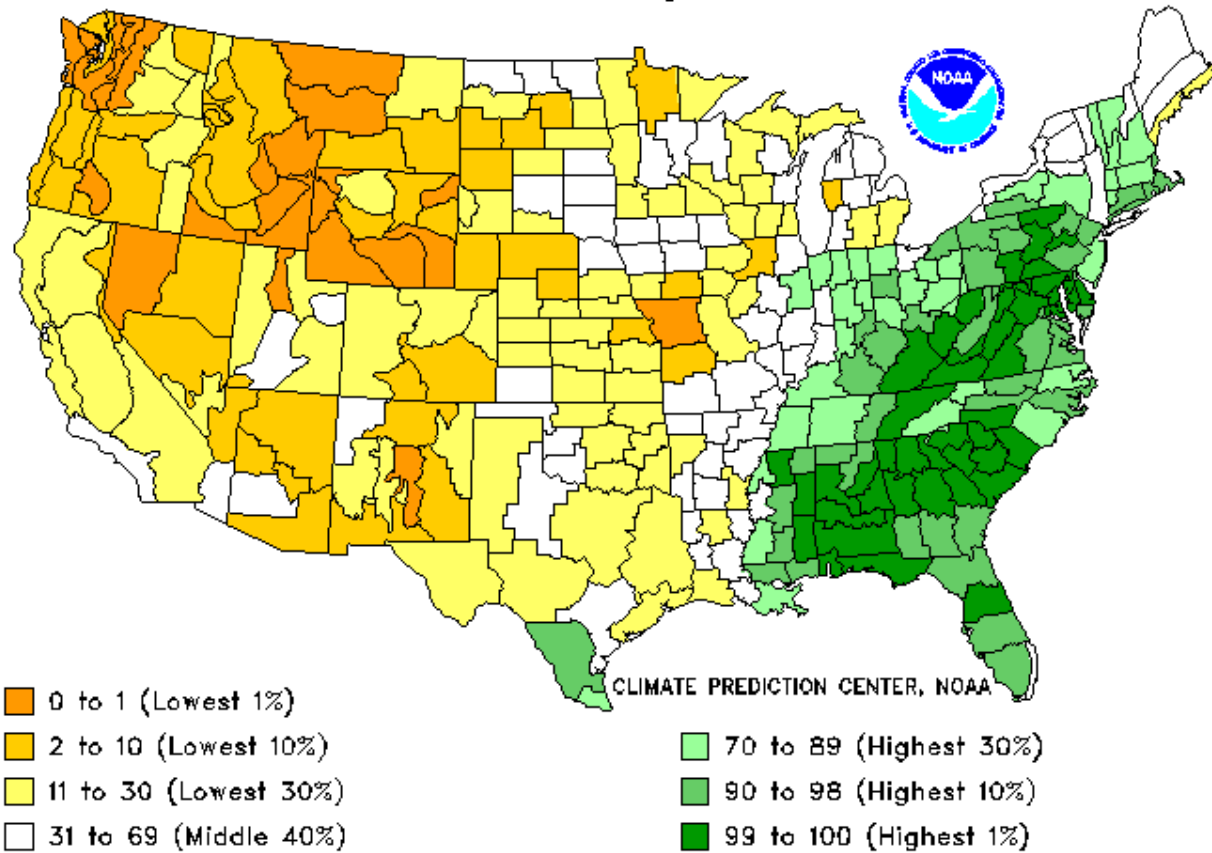
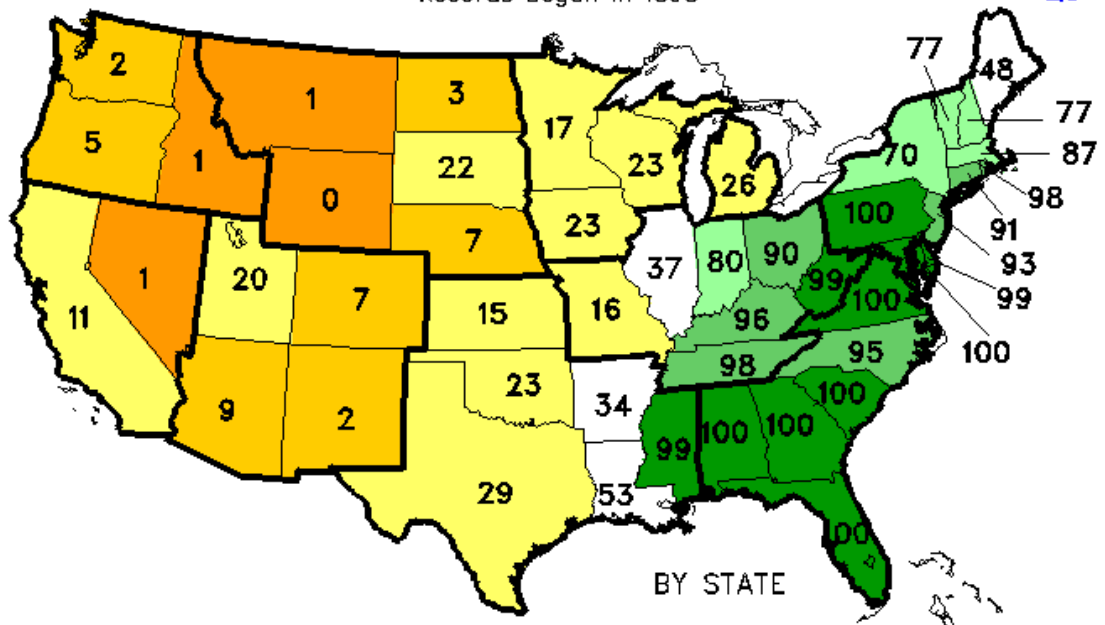


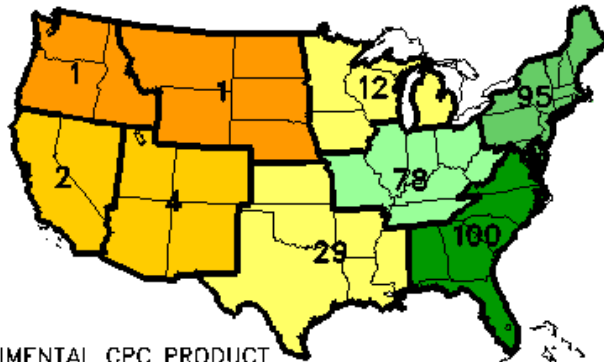
Illustration 6.

PALMER DROUGHT INDEX PERCENTILES  
 Weekly Value for Period Ending 16 AUG 2003  
 Records Began in 1895



BY STATE

BY REGION



BY NATION



EXPERIMENTAL GPC PRODUCT  
 CLIMATE PREDICTION CENTER (GPC), NOAA  
 NATIONAL CLIMATIC DATA CENTER (NGDC), NOAA

Based on preliminary data generated by the CPC. Comparative, final historic PDSI data generated by the NGDC. This chart depicts the percentile of the specific parameter, as measured during the month indicated, with respect to all other such months since 1895.

- 0 to 1 (Lowest 1%)
- 2 to 10 (Lowest 10%)
- 11 to 30 (Lowest 30%)
- 31 to 69 (Middle 40%)
- 70 to 89 (Highest 30%)
- 90 to 98 (Highest 10%)
- 99 to 100 (Highest 1%)

Illustration 7.

## **Section 1. San Juan County**

San Juan County is an agricultural area, and is therefore extremely susceptible to the effects of drought. According to the NOAA, San Juan County is currently experiencing extreme drought conditions. This drought has had agricultural and hydrological impacts throughout the county. At present the Northwest Plateau area of New Mexico was at minus 1.4 inches as of mid-July 2003, and the long-term deficit is estimated to be minus three to four inches.

The impact of drought falls into several danger areas: fire, agricultural, and hydrological. The fire danger in New Mexico's wildland areas remains very high. Although this danger decreases with July and August thunderstorms, the overall precipitation deficit remains. In the area of agriculture, the soil is suffering from multi-year deficits, and according to the United States Department of Agriculture, 61% of New Mexico range and pasture land is in poor to very poor condition. From the hydrological standpoint, all river basins within New Mexico remain in a moderate (warning status) to severe (emergency status) drought condition, and most reservoir storage is well below normal. Although the July and August rains will continue to ease the fire danger and provide some benefit to range and pasture lands, their effect will be minimal on reservoir storage. As the county population continues to grow, demands for water will increase. With the present drought conditions causing water availability to shrink, resource conservation is needed to ensure a sustainable future. The duration of the present drought conditions in San Juan County are very difficult to predict. At present it is reported that weather patterns are similar to those that occurred in the 1950's. The "Great Drought" was considered to be a disastrous time in New Mexico. However, there are indications that the current drought may be even more severe than that. Although it is not possible to predict the long-term severity of this drought, it is safe to say that San Juan County is presently suffering from the effects of extreme drought conditions.

San Juan County's economy is partly based on agriculture. The extent and duration of the current drought will have a large effect on this market. New Mexico Department of Agriculture records indicated that in 1999 there were 39,000 head of cattle in San Juan County, with 18,000 of these being beef cows. In 2003 there were 34,000 head of cattle in San Juan County, of which 14,000 head were beef cows, or a 10% drop in production. In addition, as water resources are reduced or become limited, the extent of sustainable growth within San Juan County will also become limited. The continuation of drought conditions within San Juan County is considered an issue that needs mitigation consideration. Although it is not possible to provide a mitigation plan that can eliminate the causes of drought, actions are available to reduce its effects on the community.

## **Section 2. Aztec**

Aztec, as part of San Juan County, also feels the effects of drought conditions. Presently the city relies on surface water for its water supply. As such the city draws its water from the Aztec Ditch, the Lower Animas River Ditch, and the Animas River. Presently the average daily demand for water in Aztec is approximately three million gallons per day.

However, as the city continues to grow, so does the demand on its water system. Aztec is working on creating a combination of facilities that will be able to provide 6.5 million gallons per day, which will continue to provide for the city's needs. The present system is completely dependent on the presence of surface water, and the effects of prolonged drought can reduce its availability, which will stress the amount of water there is available for use.

### **Section 3. Bloomfield**

Bloomfield, as a part of San Juan County, also feels the effects of the drought conditions. Presently the city relies on surface water drawn from the San Juan River for its water supply. The average service volume supplied to the residents of Bloomfield is 1.4 to 1.6 million gallons of water per day. The maximum amount of water that can presently be supplied is three million gallons of water per day. The present system is completely dependent on the presence of surface water and the effects of prolonged drought can reduce its availability, which will stress the amount of water there is available for use.

### **Section 4. Farmington**

Farmington, as part of San Juan County, also feels the effects of drought conditions. Presently the city relies on surface water drawn from the Animas and San Juan Rivers for its water supply. This water is pumped into Farmington Lake, which is the city's primary raw water storage reservoir. The average daily demand for water in Farmington as of 2000 is approximately 10.6 million gallons per day, with a peak use of approximately 19 million gallons per day. The present water system maintains two water treatment facilities that have a combined delivery capability of 30 million gallons per day. One of the issues facing Farmington at this time is the amount of water rights to which it is entitled. Until this issue is settled, the amount of future water available to Farmington remains in question. In addition, if the drought conditions continue to worsen, the amount of water actually in the Animas or San Juan Rivers may become an issue. The Animas River dried up in 2003 and it may happen again.



Illustration 8.  
Animas River at Farmington  
Courtesy of USGS

<b>Current Flow</b>	<b>Minimum</b>	<b>Mean</b>	<b>Maximum</b>	<b>80 percent exceedance</b>	<b>50 percent exceedance</b>	<b>20 percent exceedance</b>
203	.00	462	3,020	159	324	668
Percent exceedance means that 80, 50, or 20 percent of all daily mean flows for 8/21 have been greater than the value shown.						

Table 4.  
Water flow for the Animas River

The issues of water rights and the continuing effects of the current drought place the future of Farmington in question. No matter how these two issues are resolved, it must be understood that Farmington has a limited available water supply.

## **WILDFIRE**

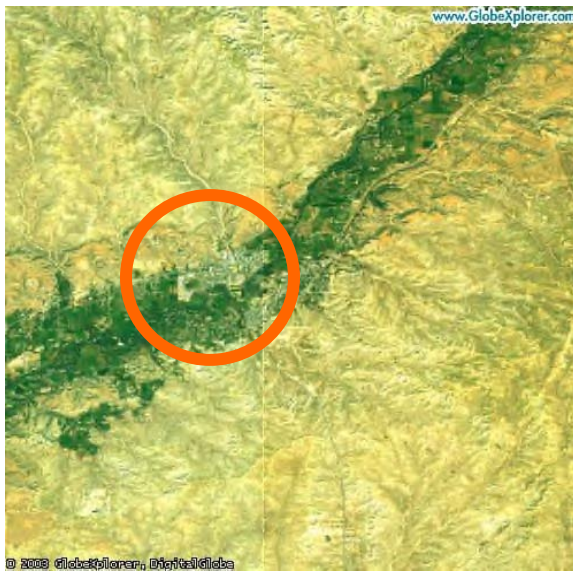
### **Section 1. San Juan County and its Incorporated Jurisdictions**

The densest area of vegetation in San Juan County is generally located along its river bottoms. The concentration of vegetation along river bottoms is a characteristic throughout the southwest. During the 1980's and 1990's, New Mexico had a higher than normal amount of rainfall, which increased the amount of local vegetation, especially along the rivers. Presently the state continues to be in a severe drought, which is drying out the vegetation and creating a major fuel source in these areas. The concern about the dangers of wildfire in the urban/wild land interface was dramatically brought to the forefront by the Bosque fires in Albuquerque during the summer of 2003. During these fires large portions of the city's population had to be evacuated from their homes along the Rio Grande River. These fires were so extensive that they were battled not only by the Albuquerque Fire Department, but also by fire resources brought in from throughout the region and troops from Kirtland Air Force Base.

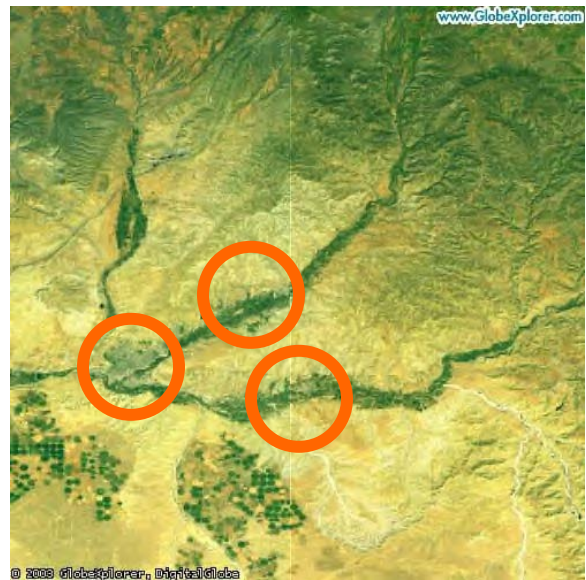
Though the fuel sources in San Juan County are very similar to those existing in the Albuquerque area, there is a difference that creates a more dangerous situation in San Juan County. Much of the area burned in the Albuquerque area is devoted to public recreation and is publicly owned. Though residential structures do exist in the general area, they are not present in the most heavily vegetated parts of the riverbanks. In contrast, the areas along much of the river bottoms in San Juan County are under private ownership, and the local government has no control of vegetation in these areas. In addition, while the Albuquerque area was only dealing with the Rio Grande River bottom, the metropolitan area of Aztec, Bloomfield, and Farmington is coping with three river bottoms along the Animas, La Plata, and San Juan Rivers.

Along with the private ownership of these river bottoms, the area contains a much larger density of residential structures than does Albuquerque. Area fire officials state that a fire in one of these areas could involve up to a seven-mile run of the river bottom area, and it will endanger numerous structures. Although wildfires can occur in other areas of the county, the risk of a rapidly-spreading fire is less likely due to the sparseness of the vegetation.

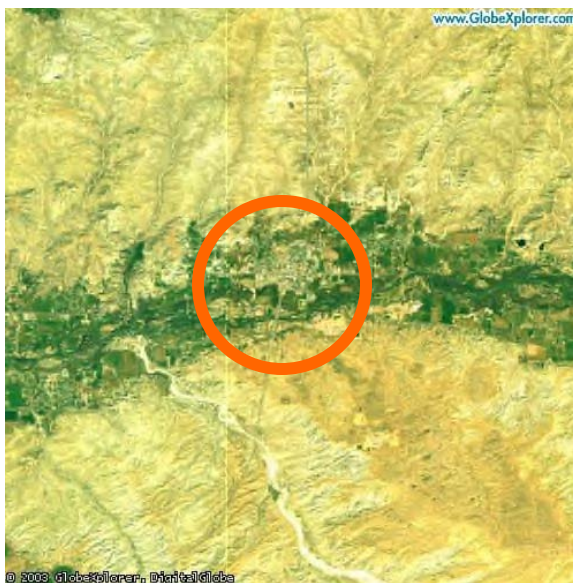
The problem of wildfire for San Juan County and the communities of Aztec, Bloomfield, and Farmington are very similar, since it runs along the river bottoms throughout the region. Separate treatment of this hazard for each community is not necessary.



AZTEC



OVERVIEW OF AREA



BLOOMFIELD



FARMINGTON

Illustration 9.

The wildland fire area depicted in the photographs in Illustration 9 show that the areas threatened by fire are the same as the areas threatened by riverine flooding. 6,250 persons live within these heavily wooded areas, which contain 1,240 residents, 48 small businesses, and 60 other structures. Unlike the threat of flooding, which could affect large portions of this population at one time, the threat of wildland fire would most likely threaten a smaller portion of this population during any given event.

## **HAZMAT**

The concern of hazardous material release has been established through meetings with the San Juan County working group, public meetings, questionnaires, research by the University of New Mexico, the U.S. Department of Transportation, and the New Mexico All-Hazards Emergency Operations Plan. The production and safe transportation of hazardous materials is of great concern in most parts of the United States. Hazardous materials are substances that are harmful to life and the environment. The materials are generally man-made and some are extremely toxic. Hazardous materials and incidents dealing with their release are referred to as HAZMAT incidents. The United States Department of Transportation (USDOT) has identified 308 specific chemicals from 20 chemical categories as HAZMAT under the Emergency Planning and Right to Know Act of 1986. These chemicals cover a wide range of toxicities, and in small doses many have minimal or no effect on humans.

Various U.S. and international organizations, including the United States Environmental Protection Agency (USEPA), the United States Department of Transportation, the National Fire Protection Agency (NFPA), the United States Coast Guard (USCG), and the International Maritime Organization (IMO) have defined, for regulatory purposes, the following list of HAZMAT classes:

- Toxic agents – irritants, asphyxiates, anesthetics and narcotics, sensitizers, hepatotoxic and nephrotoxic agents, carcinogens and mutagens
- Hazardous wastes
- Hazardous substances
- Toxic pollutants
- Extremely hazardous substances

In New Mexico, transportation routes and facilities including pipelines, airports, highways, railroad routes, storage facilities, and other related facilities may become involved in the release of hazardous materials. For transportation purposes, the New Mexico Department of Transportation (NMDOT) classifies HAZMAT in one or more of the following categories:

- Explosive
- Blasting agent
- Flammable liquid
- Flammable solid

- Oxidizer
- Organic peroxide
- Corrosive material
- Compressed gas
- Flammable compressed gas
- Poison – A and B
- Irritating materials
- Inhalation hazard
- Etiological agent
- Radioactive materials
- Other regulated material

The 1986 Act requires that companies report releases of designated hazardous chemicals to the USEPA, even if the release does not result in human exposure. The different types of releases can range from air emissions of gases or particles from a pressure relief valve, smokestack, ruptured reaction vessel, broken pipe, broken, loose-fitting or punctured equipment, containers or cylinders on transportation vehicles and from solid or liquid discharges onto the ground or into water; discharges into bodies of water from damaged ships, barges, underwater pipelines and trucks or railroad cars that fall into the water; outflows from sewer or drain outfalls, runoff from spills on land, runoff of water used to control fires, or contaminated groundwater; discharges onto land; solid waste disposal in onsite landfills; injection of wastes into underground wells; transfers of wastewater to public sewage plants; and transfers of offsite facilities for treatment or storage. Highway transportation of HAZMAT involves tanker trucks or trailers and specialized bulk-cargo vehicles. Railroad releases consist of two main types: (1) collisions and derailments that result in large spills or discharges, and (2) HAZMAT releases from leaks in fittings, seals or relief valves, and improper closures or defective equipment. Natural hazards that increase transportation-related accidents are heavy rain or snowfall, causing slippery road conditions. The potential for a HAZMAT event will continue to remain high within San Juan County.

### **Section 1. San Juan County**

The threat of possible hazardous material releases remains high in San Juan County, partly as a result of the large amount of petroleum production, exploration, and other related operations that take place throughout the county. There are also a large number of pipelines that cross the county. At present the bulk of petroleum operations take place in lightly populated areas, and the greatest occurrence of hazardous material incidents comes from their transport through the county.

Presently the exact amount of hazardous material being transported is unknown, but there are indications that this type of traffic is increasing. This increase is partly due to the recent improvements in the area's transportation system, particularly U.S. 550. Much of the hazardous material transport appears to be traveling through San Juan County en

route to Albuquerque from the Salt Lake City, Utah area. The route used in traversing San Juan County starts at the northern border of New Mexico with U.S. 491 (formerly U.S. 666), south to Shiprock, east on U.S. 64 to Farmington, east from Farmington to either Aztec via State Road 516 or Bloomfield via U.S. 64, south from Aztec to Bloomfield via U.S. 550, and then south from Bloomfield on U.S. 550 and out of the county. Although the largest portion of this route traverses lightly populated areas, there is danger to life and property in the concentrated population areas of Aztec, Bloomfield, and Farmington, which represent the largest economic dynamic within San Juan County.

According to the New Mexico Traffic Safety Bureau, the primary cause of accidents in San Juan County involves the collision of one vehicle with another. (See Table 5.) Of the 1,340 accidents reported in 2001, 60 involved semi tractor-trailers. (See Table 6.)

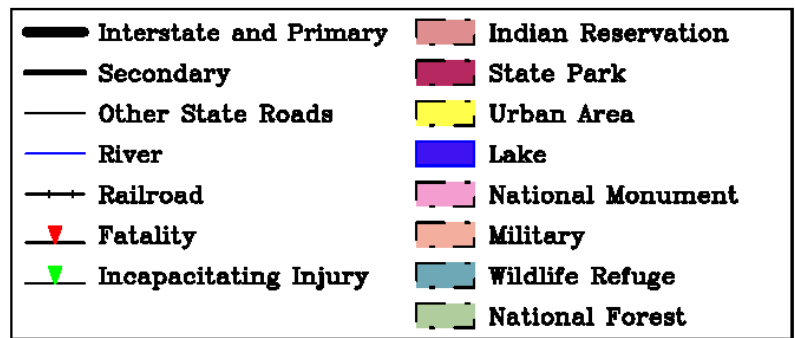
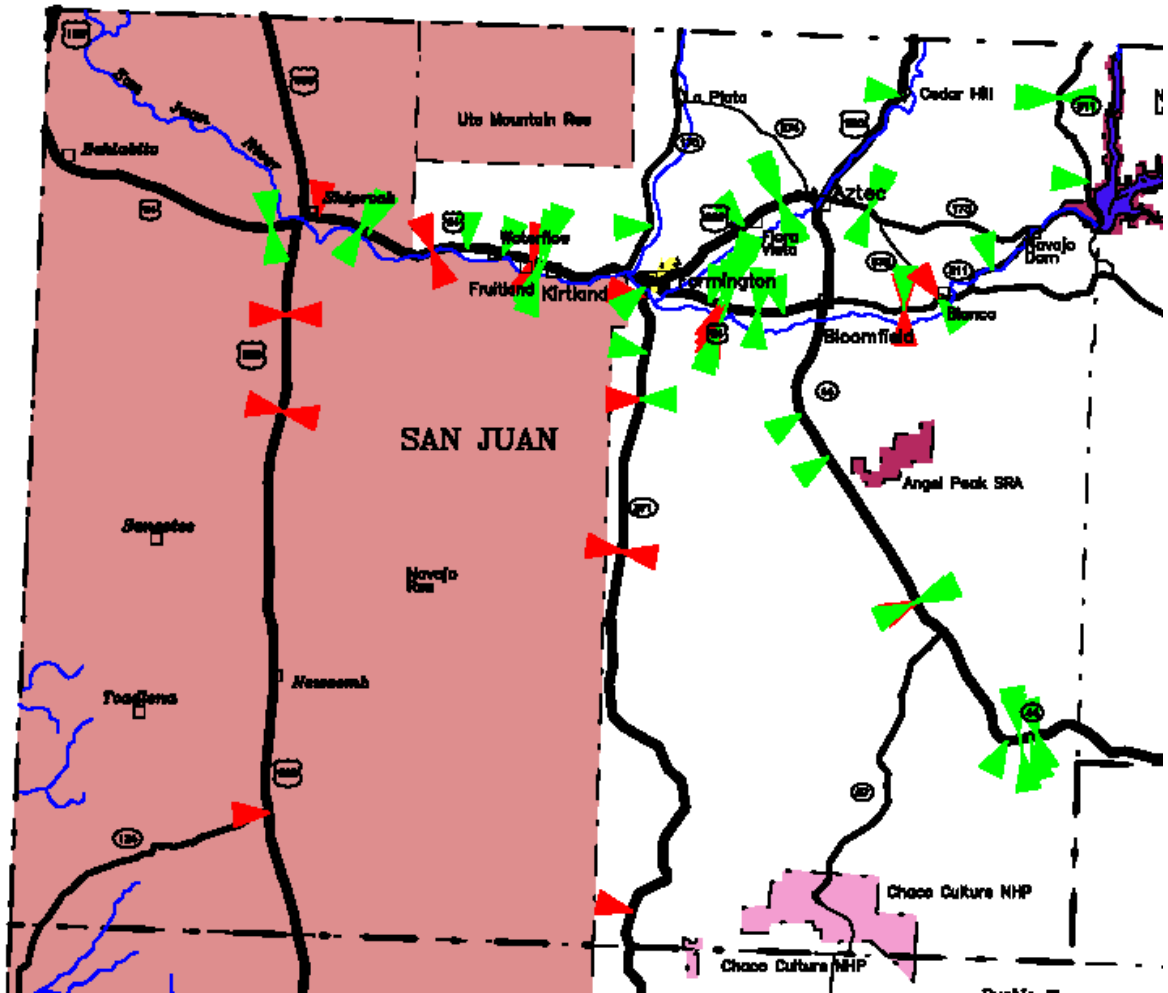


Illustration 10.  
Locations of fatal and injury accidents in San Juan County

**Crashes in San Juan County by Class, 2001**

Class	Crashes				People		
	Total	% of Total	Fatal	% of Fatal	Injury	Killed	Injured
Other vehicle	392	44	5	50	170	8	297
Pedestrian	6	1	0	0	6	0	7
Fixed object	166	19	1	10	40	1	51
Veh. on other roadway	4	0	0	0	0	0	0
Parked vehicle	18	2	0	0	3	0	3
Overturn	162	18	3	30	95	4	127
Other non-collision	26	3	0	0	10	0	13
Pedalcyclist	1	0	0	0	1	0	1
Animal	100	11	1	10	9	1	14
Other object	7	1	0	0	0	0	0
<b>Total</b>	<b>882</b>	<b>100</b>	<b>10</b>	<b>100</b>	<b>334</b>	<b>14</b>	<b>513</b>

Table 5

**Crashes in San Juan County by Vehicle Type, 2001**

Vehicle Type	Vehicles				People		
	Total	% of Total	Fatal	% of Fatal	Injury	Killed	Injured
Passenger car	514	38	6	40	212	9	233
Pickup	516	39	4	27	195	2	149
Semi	60	4	1	7	14	0	7
Bus	5	0	0	0	3	0	0
Motorcycle	18	1	1	7	15	1	18
Pedalcyclist	1	0	0	0	1	0	1
Pedestrian	6	0	0	0	6	0	6
Van/4 WD	186	14	3	20	82	2	95
Other	14	1	0	0	4	0	4
Unknown	20	1	0	0	4	0	0
<b>Total</b>	<b>1,340</b>	<b>100</b>	<b>15</b>	<b>100</b>	<b>536</b>	<b>14</b>	<b>513</b>

Table 6

## Section 2. Aztec

Truck traffic moving along State Road 516 travels directly through Aztec. This traffic is required to make a 90-degree turn in Aztec in order to proceed south on U.S. 550. Each of these routes contains numerous intersections, which increases the risk of an accident. U.S. 550 moves traffic through downtown Aztec, which is congested with local traffic during the day. This area's congestion increases the possibility of accidents that can involve hazardous material transport. Based on the Hazardous Material Emergency Response Guidelines, a hazardous material release at or near the intersection of State Road 516 and U.S. 550 could potentially shut down the entire city of Aztec for the duration of the response and recovery from the incident. The economic effect of such a shutdown could cause some businesses to fail.

According to the New Mexico Traffic Safety Bureau report, the most likely type of motor vehicle accident to occur in Aztec involves the collision of one vehicle with another. (See Table 7.) This report further indicates that of the seven most dangerous intersections in Aztec, six of them involve U.S. 550. (See Table 8.)

One of the hazardous materials currently being transported through Aztec is liquid nitrogen. According to the 2000 Emergency Response Guide, the evacuation distance for a large spill is initially 100 meters. If this spill involves a fire, the evacuation distance increases to a half mile in all directions. The effects of just one such spill would cause a considerable portion of Aztec to be shut down. If a more hazardous material cargo was involved, a much larger area could be affected.

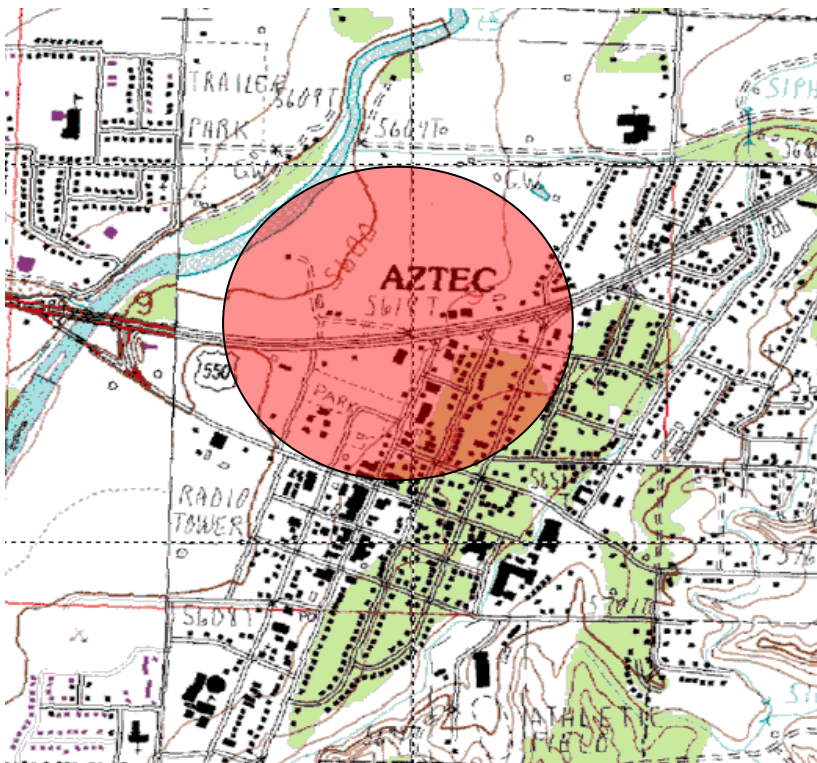


Illustration 11. Map depicting the potential evacuation area due to a liquid nitrogen spill at the junction of State Road 516 and US 550. Circle is a half mile in diameter.

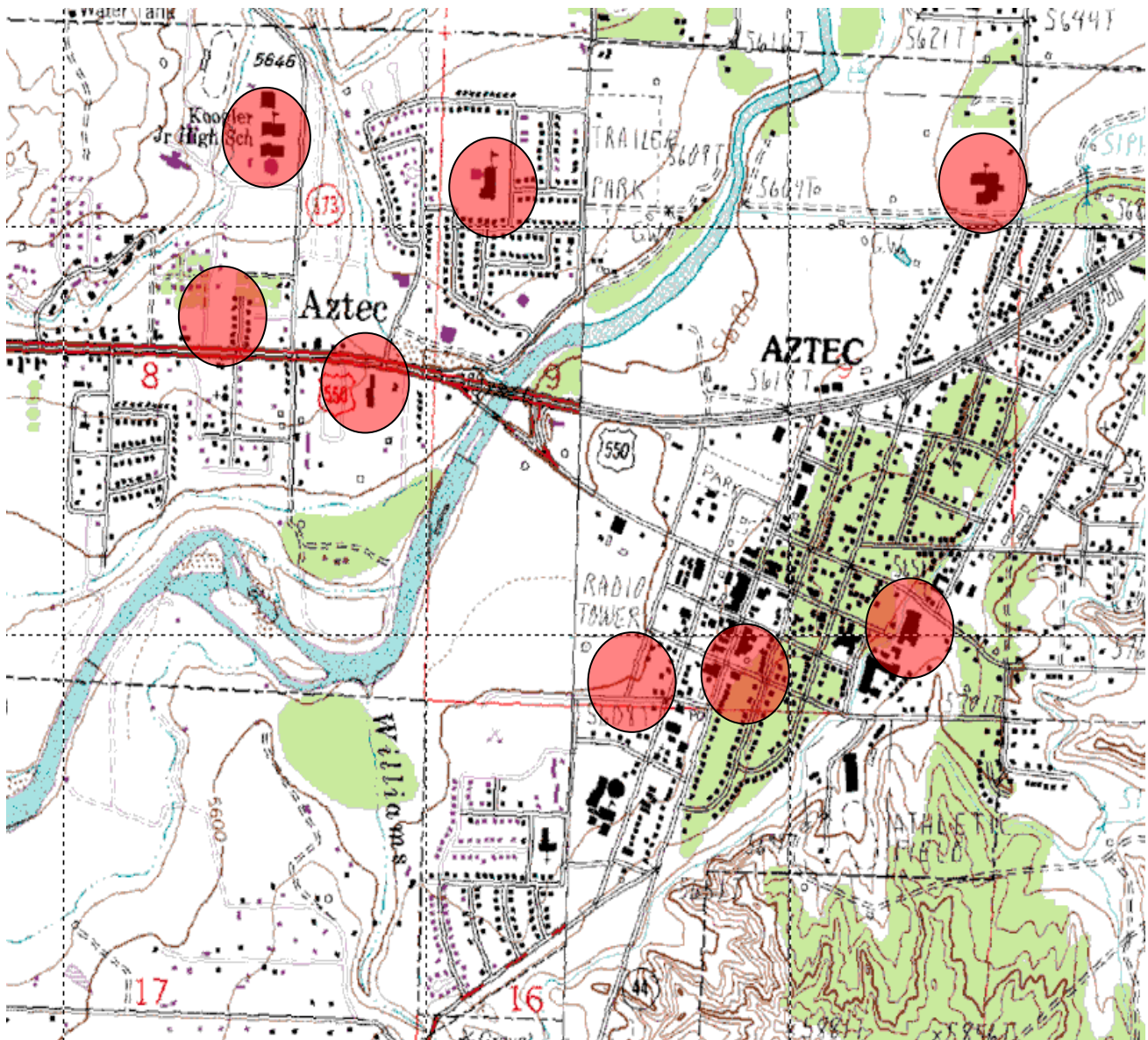


Illustration 12.  
Location of schools in Aztec

Depending on the location and type of a HAZMAT incident in Aztec, any or all of the city's eight schools could be affected. This can become a problem with not only the evacuation of students, but also due to the fact that schools are generally used as temporary shelters during evacuations. If the schools are evacuated, they will not be available for use as shelters.

The Seven Intersections in Aztec with the Most Crashes, 2001

Intersection	Crashes			People	
	Total	Fatal	Injury	Killed	Injured
Aztec Blvd US 550 @ Chaco St	6	0	1	0	1
Aztec Blvd US 550 @ Church Ave	6	0	3	0	3
Aztec Blvd US 550 @ Heiland Rd	5	0	1	0	1
Aztec Blvd US 550 @ Light Plant Rd	18	0	5	0	5
Aztec Blvd US 550 @ Main Ave NM 544	6	0	1	0	3
Aztec Blvd US 550 @ Ruins Rd NM 248	11	0	5	0	8
Chaco St @ Main Ave NM 544	4	0	0	0	0

Table 7

Crashes in Aztec by Class, 2001

Class	Crashes					People	
	Total	% of Total	Fatal	% of Fatal	Injury	Killed	Injured
Other vehicle	114	73	0	0	27	0	34
Fixed object	20	13	0	0	3	0	3
Parked vehicle	12	8	0	0	0	0	0
Overturn	3	2	0	0	0	0	0
Other non-collision	1	1	0	0	1	0	1
Pedalcyclist	2	1	0	0	2	0	2
Animal	4	3	0	0	0	0	0
Total	156	100	0	0	33	0	40

Table 8

If a hazardous material accident occurred in Aztec, the danger to life would be high and evacuation could be difficult, depending on the incident's location. The economic impact of shutting down commercial businesses for the period of evacuation and possible decontamination of the area could be costly.

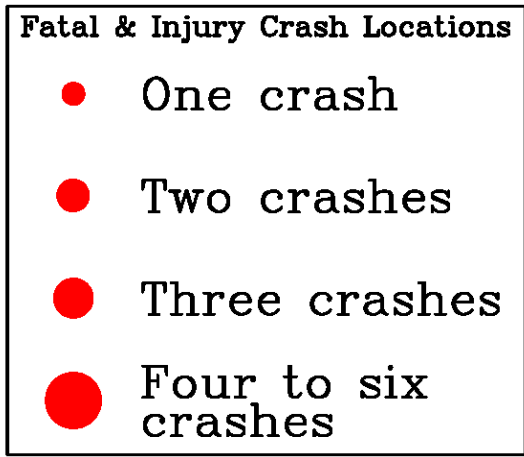
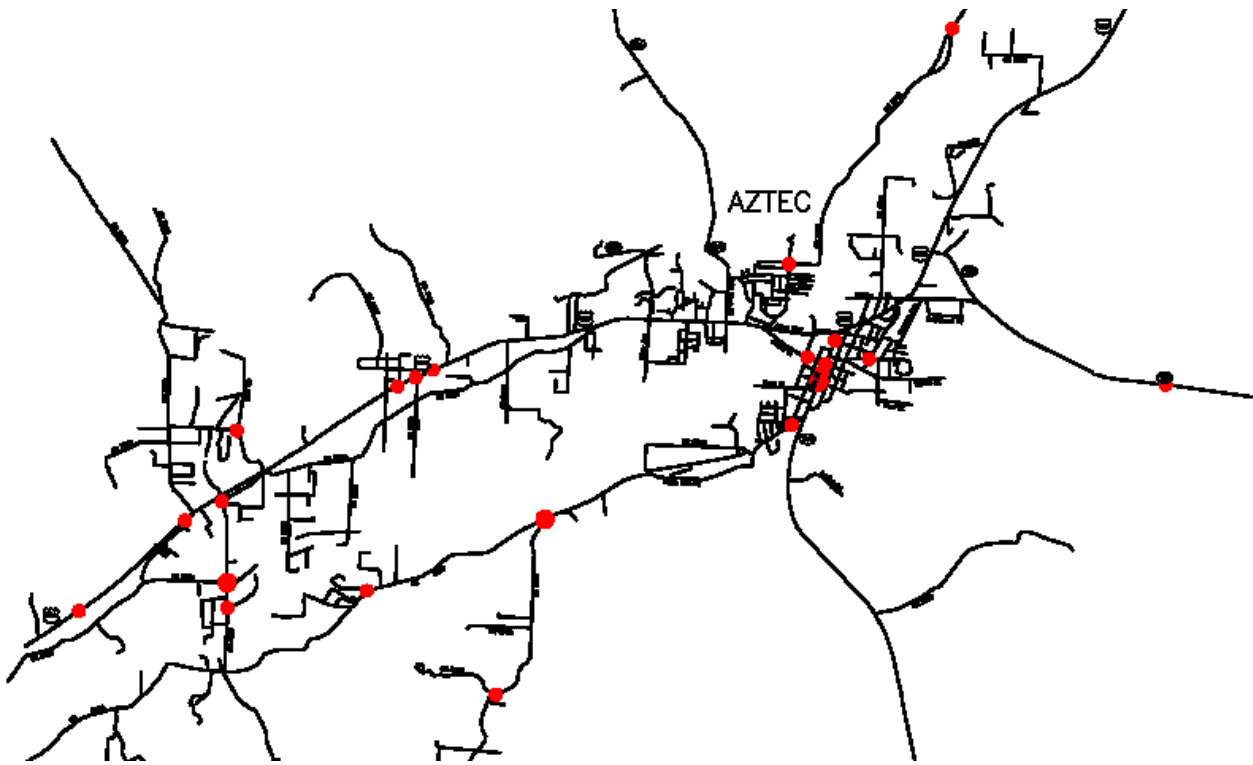


Illustration 13.  
Locations of fatal and injury accidents in Aztec

### Section 3. Bloomfield

Hazardous material is transported through Bloomfield from two directions, north via U.S. 550 from Aztec, and east via U.S. 64 from Farmington. In each case, traffic leaves Bloomfield south on U.S. 550. The traffic moving south from Aztec on U.S. 550 comes downhill into the Bloomfield area and passes Bloomfield High School before reaching U.S. 64. Traffic then makes a 90-degree turn onto U.S. 64 to the west for approximately one block before making a second 90-degree turn back to the south onto U.S. 550, which then leads out of the city limits. Traffic through this area can become extremely congested due to the high school and normal traffic moving along U.S. 64. A hazardous material release anywhere along this route could cause the shutdown and evacuation of a considerable area of Bloomfield.

During the time traffic moves through Bloomfield it is routed through a series of intersections, including three that are controlled by red light signals. According to the New Mexico Traffic Safety Bureau, the most likely motor vehicle accidents involve the collision of one vehicle with another. (See Table 9.) This report indicates that of the seven most dangerous intersections in Bloomfield, four of them involve either U.S. 550 or U.S. 64. (See Table 10.)

One of the hazardous materials currently being transported through Bloomfield is liquid nitrogen. According to the 2000 Emergency Response Guide, the evacuation distance for a large spill is initially 100 meters. If the spill involves a fire, the evacuation distance increases to a half mile in all directions. The effects of just one such spill would cause a considerable evacuation of the schools and businesses in the affected area. Such an incident could also close down major traffic routes in the area.

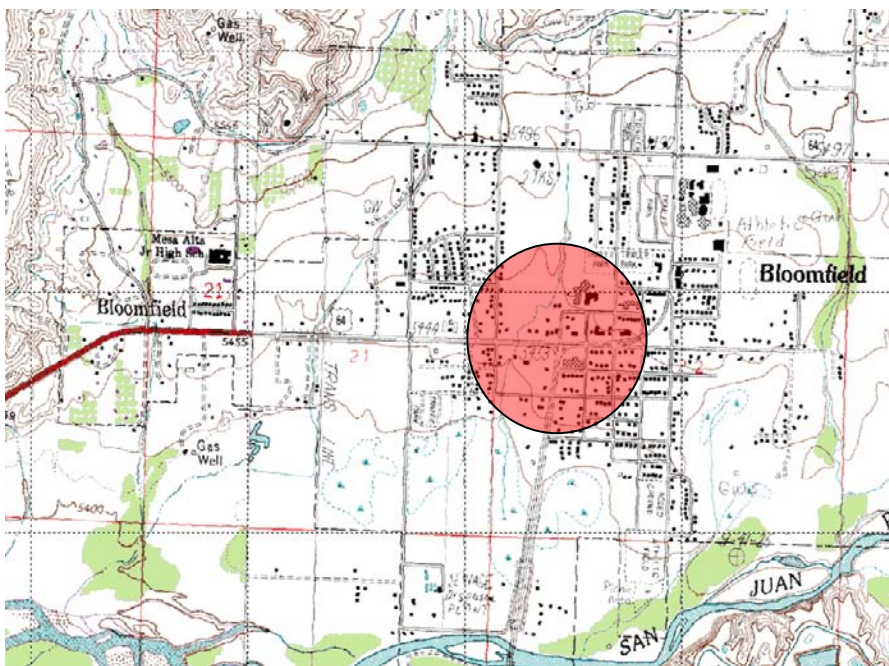


Illustration 14. Map depicting the potential evacuation area due to a liquid nitrogen spill at the intersection of U.S. 64 and U.S. 550. Circle is a half mile in diameter.

**Crashes in Bloomfield by Class, 2001**

Class	Crashes					People	
	Total	% of Total	Fatal	% of Fatal	Injury	Killed	Injured
Other vehicle	105	67	0	0	35	0	53
Pedestrian	2	1	1	50	1	1	1
Fixed object	23	15	0	0	5	0	6
Parked vehicle	12	8	0	0	1	0	1
Overturn	8	5	1	50	4	1	7
Other non-collision	1	1	0	0	0	0	0
Pedalcyclist	1	1	0	0	0	0	0
Animal	4	3	0	0	0	0	0
<b>Total</b>	<b>156</b>	<b>100</b>	<b>2</b>	<b>100</b>	<b>46</b>	<b>2</b>	<b>68</b>

Table 9

**The Seven Intersections in Bloomfield with the Most Crashes, 2001**

Intersection	Crashes			People	
	Total	Fatal	Injury	Killed	Injured
1st St @ Blanco Blvd	3	0	0	0	0
1st St @ Broadway	19	0	6	0	6
1st St - US 64 @ Blanco Blvd	4	0	1	0	3
3rd St @ Broadway - US 64	3	0	3	0	7
4th St @ Broadway - US 64	4	0	0	0	0
5th St @ Broadway - US 64	3	0	1	0	1
Bloomfield Blvd - NM 44 @ Broadway - US 64	7	0	3	0	3

Table 10

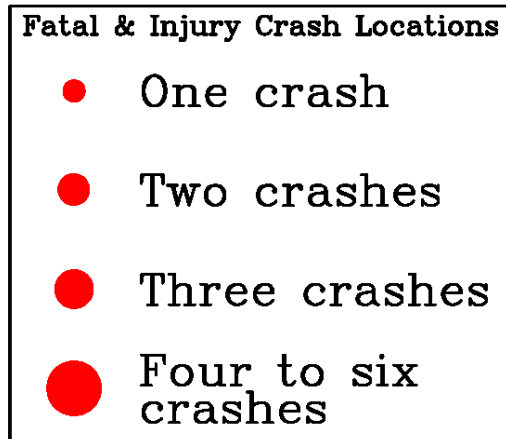
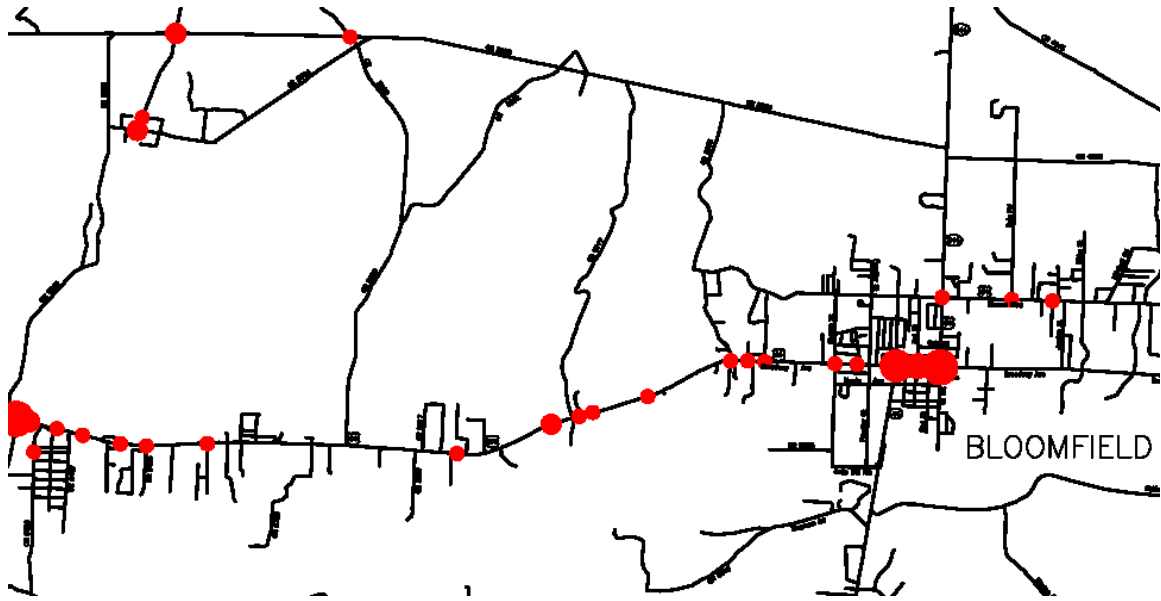


Illustration 15.  
Location of fatal and injury accidents in Bloomfield

## Section 4. Farmington

Traffic moving into Farmington from the east can take one of several routes in order to proceed to Albuquerque. As traffic moves into Farmington it can take an existing truck route via U.S. 64, which proceeds to Bloomfield and south onto U.S. 550. Although this is considered a truck route, there are numerous intersections along this route, as well as a hospital and other commercial enterprises. The second route currently in use through Farmington runs along either Broadway or Main, both of which run through the center of downtown. Traffic along both Broadway and Main involves numerous intersections and a high degree of traffic congestion. Based on the 2000 Emergency Response Guidelines, a hazardous material release along any of these three routes would cause a large-scale evacuation and a major disruption to the area's economic vitality.

Although none of these routes involves the level of maneuvering that occurs in Aztec or Bloomfield, the routes still present the clear danger of an accident involving the transport of hazardous materials. According to the New Mexico Traffic Safety Bureau, the main cause of accidents within Farmington is the collision of one vehicle with another. (See Table 11.) This report further indicates that of the seven most dangerous intersections in Farmington, three involve Main Street and one involves U.S. 550. (See Table 12.)

One of the hazardous materials known to travel through the Farmington area is liquid nitrogen. According to the 2000 Emergency Response Guide, the evacuation distance for a large spill is initially 100 meters. If this spill involves a fire, the evacuation distance increases to a half mile in all directions.

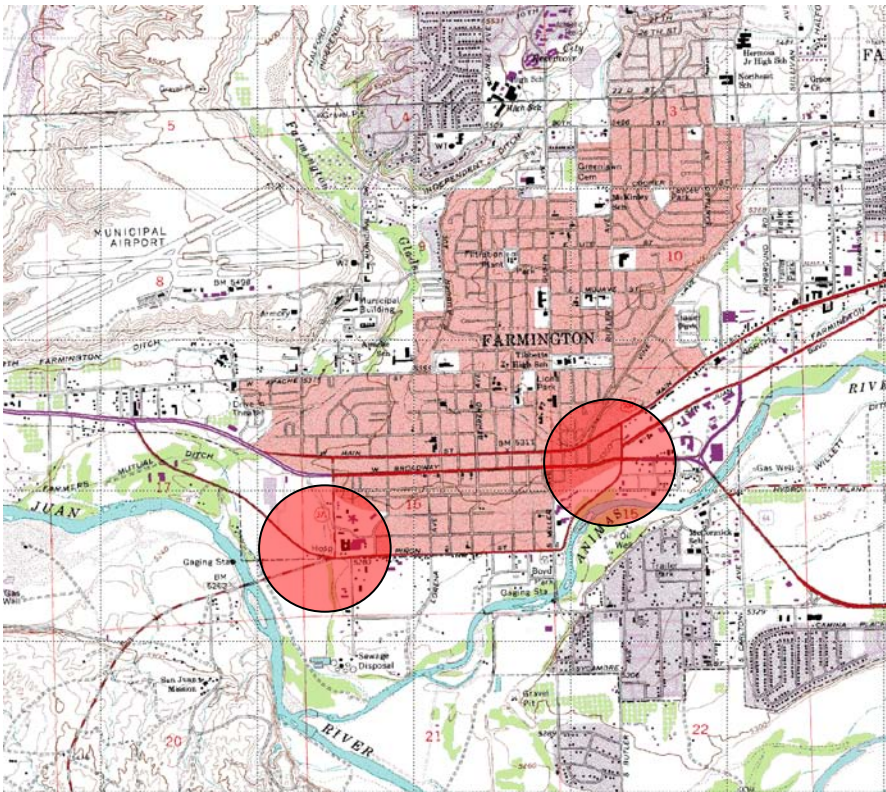


Illustration 16. Map depicting the potential evacuation area due to a liquid nitrogen incident along U.S. 64 or the Main/Broadway areas of town. Circles are a half mile in diameter.

**Crashes in Farmington by Class, 2001**

Class	Crashes					People	
	Total	% of Total	Fatal	% of Fatal	Injury	Killed	Injured
Other vehicle	1,334	82	0	0	562	0	930
Pedestrian	12	1	1	33	11	1	12
Fixed object	148	9	0	0	38	0	45
Parked vehicle	90	6	0	0	12	0	13
Overturn	19	1	0	0	13	0	19
Other non-collision	16	1	1	33	9	1	9
Pedalcyclist	12	1	1	33	11	1	11
Animal	3	0	0	0	1	0	1
Other object	2	0	0	0	1	0	2
<b>Total</b>	<b>1,636</b>	<b>100</b>	<b>3</b>	<b>100</b>	<b>658</b>	<b>3</b>	<b>1,042</b>

Table 11

**The Seven Intersections in Farmington with the Most Crashes, 2001**

Intersection	Crashes			People	
	Total	Fatal	Injury	Killed	Injured
20th St @ Clayton Ave	25	0	10	0	17
20th St @ Hutton Rd	31	0	15	0	24
20th St @ Sullivan Ave	29	0	9	0	12
30th St @ Main St	41	0	16	0	29
Browning Pkwy @ Main St	28	0	11	0	18
Cliffside Dr @ Main St	41	0	18	0	40
San Juan Blvd @ Scott Ave US 550	27	0	15	0	17

Table 12

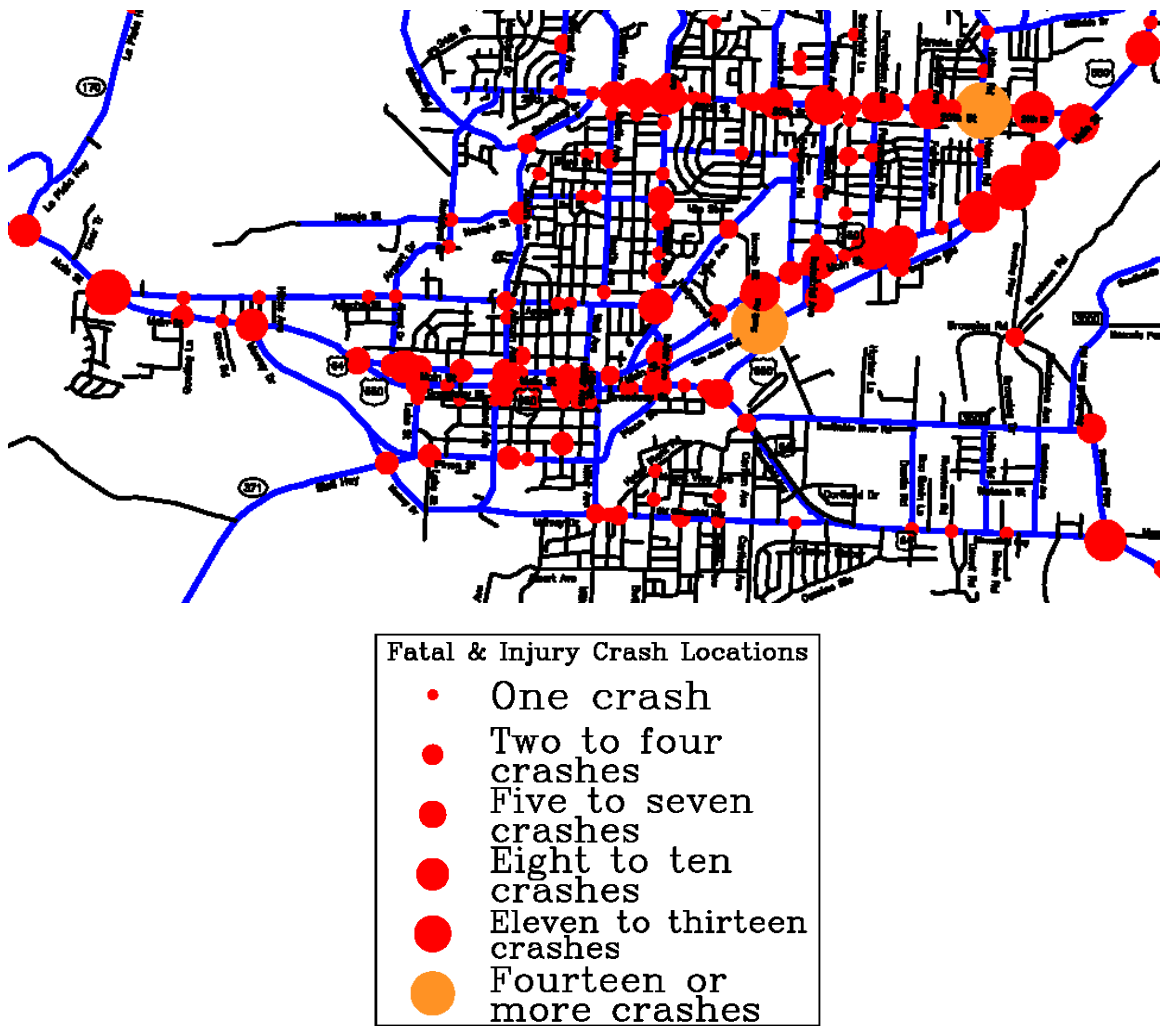


Illustration 17.  
Location of fatal and injury accidents in Farmington

# VULNERABILITY OF SAN JUAN COUNTY AND ITS INCORPORATED JURISDICTIONS

## Section 1. Introduction

Along with identifying the hazards that exist within San Juan County, Aztec, Bloomfield, and Farmington, it is also necessary to consider these hazards and their relationship to the area's existing infrastructure.

**Infrastructure.** According to the Encarta World English Dictionary, infrastructure, with regard to public services or systems, consists of the large-scale public systems, services, and facilities of a country or region that are necessary for economic activity, including power and water supplies, public transportation, telecommunications, roads, and schools.

The most vital factor in identifying any area's infrastructure is consideration of what facilities and functions create an improvement in public health, both physically and mentally. Power and water supplies, public transportation, telecommunications, roads, and schools are all important to the community's welfare. However, other critical services include hospitals, medical centers, public safety organizations, and other government divisions that assist in the community's response and recovery during a hazardous event.

**Vulnerability.** Any location's or structure's vulnerability to a hazard must be evaluated for exposure to the hazard, frequency of occurrence, and damaging effects. Any area's existing hazards will expose population and structures to their effects. However, if the frequency of occurrence is low, mitigation of any particular hazard may not be necessary. Another factor in determining whether mitigation strategies are appropriate is cost-effectiveness: if the cost of mitigation is higher than the cost of repairing potential damages, mitigation may not be worthwhile.

San Juan County's identified infrastructure, locations, and hazard or risk exposure are noted in the following table. The hazard/risk exposure notations have the following meanings: "No specific vulnerability" indicates that the structure is not located in a potential hazard area; "Potential HAZMAT area" indicates that the structure is located within 800 meters of a HAZMAT route; "Potential flooding" indicates that the structure is located in the floodplain; and "Potential dam failure" indicates that a structure is located below Navajo Dam.

## Hazard Occurrence Future Probability

It is difficult to determine the number of times any particular type of event will occur. A 100-year flood, which indicates the largest amount of rainfall predicted to fall in any one storm in a 100-year cycle, can be determined by historical records. However, this does not mean it will occur at least once every 100 years or that it won't occur more frequently than once every 100 years. The following information is based solely on historical records and the general chance of these events occurring under present conditions.

<b>Hazard</b>	<b>Location</b>	<b>Probability of Occurrence</b>
<b>Drought</b>	<b>County Wide</b>	<b>Very Likely</b>
<b>Earthquake</b>	<b>County Wide</b>	<b>Rare</b>
<b>Riverine Flooding</b>	<b>Water Course Areas</b>	<b>Unlikely</b>
<b>Flash Flooding</b>	<b>Arroyos</b>	<b>Very Likely</b>
<b>HAZMAT Small Spill</b>	<b>County Wide</b>	<b>Very Likely</b>
<b>HAZMAT Large Spill</b>	<b>Transportation Routes</b>	<b>Likely</b>
<b>Terrorism</b>	<b>Critical Infrastructure Targets Based on Terrorist's Agenda</b>	<b>Rare</b>
<b>Wildfire</b>	<b>River Areas</b>	<b>Occasional</b>
<b>Winter Storm</b>	<b>County Wide</b>	<b>Unlikely</b>

Table 13

**Table 14. Probability of Occurrence Definitions**

<p><b>Rare</b></p>	<p><b>Definition: Although it is acknowledged that this type of event may occur, it is not expected to happen within the next 50 years or under present conditions.</b></p> <p><b>Earthquakes</b> have occurred in the past in San Juan County; however, there has been no recorded history of earthquakes in this area during the last several centuries. Although it is possible that such an event could occur, it is an extremely low probability.</p> <p><b>Terrorism</b> can occur anywhere in the United States; however, the present political environment in San Juan County is not volatile. The probability of an act of international terrorism occurring here is extremely low since there are far more attractive targets to be found elsewhere. The probability of an act of domestic terrorism is also very low. However, it can not be ruled out considering the unpredictability of groups such as ELF and ALF.</p>
<p><b>Unlikely</b></p>	<p><b>Definition: The probability of occurrence is low and will depend on environmental conditions that are not present at this time. These events are not anticipated within the next 10 years.</b></p> <p><b>Riverine Flooding</b> has previously occurred in San Juan County, with the last major event occurring approximately 50 years ago. Given the present overall drought conditions that exist in the region, the risk of riverine flooding is not anticipated in the near future.</p> <p><b>Winter Storms</b> have occurred in the past and will occur again in the future. However, the probability of a severe storm that would paralyze the area is very low. The winter of 2004 has brought large amounts of snow to the region without causing more than temporary road closures.</p>
<p><b>Occasional</b></p>	<p><b>Definition: There is some likelihood of an event of this type occurring within the next 5 years. The number of occurrences is difficult to predict and depends on weather conditions during this time frame.</b></p> <p><b>Wildfires</b> can occur in San Juan County; they are mainly restricted to the densely forested areas along rivers. The possibility of wildfires in this area is generally limited to the driest months of the year, and the number and size of such wildfires is usually minor.</p>
<p><b>Likely</b></p>	<p><b>Definition: This event may occur within any given year, but is difficult to predict. The severity of the incident will depend on many factors.</b></p> <p><b>A large HAZMAT spill</b> will occur in San Juan County at some time. The impact of such a spill will depend greatly on the type of hazardous material involved, the location of the incident, and the prevailing weather conditions. Hazardous materials are constantly being shipped along the numerous transportation routes existing in the county; sooner or later there will be an incident.</p>
<p><b>Highly Likely</b></p>	<p><b>Definition: These events are currently ongoing or occur on a regular basis. Multiple occurrences of these events can be expected annually.</b></p> <p><b>Drought</b> conditions presently exist in the southwestern United States, including San Juan County. The winter of 2004 has brought record moisture, which has provided some relief from the existing drought conditions, but it is too early to tell if this situation will continue. The current drought has been in place for many years, and one wet winter will not be enough to reverse the present conditions. In addition, drought is cyclical, with the last major drought in New Mexico occurring in the 1950's. Drought can be anticipated to be an ever present concern in San Juan County.</p> <p><b>Flash Flooding</b> occurs on a regular basis in San Juan County and can be expected to continue. The impact of these events will depend on their location and the specific circumstances existing at the time.</p> <p><b>Small HAZMAT spills</b> will continue to occur in San Juan County, and there is no indication that any reduction in the number of occurrences can be anticipated. The impact of these small spills is generally localized and impacts only small areas at a time.</p>





There are occasionally exceptions to the need to mitigate parts of the infrastructure. For example, the location of several fire stations along HAZMAT routes may actually prove to be beneficial, since fire department personnel will be the first responders to any HAZMAT incidents, and their location along hazardous material routes will actually provide first responders with rapid access to the main transportation routes.

The most important infrastructure exposure is that of the schools in Aztec and Bloomfield. In these two areas, most of the schools are located along hazardous material transport routes and would likely need to be evacuated if a HAZMAT incident occurred. Two major factors to consider in such an evacuation would be (a) the evacuation of a large number of school-age children and others in the area, and (b) where to shelter them. Since the schools in Aztec and Bloomfield are considered to be primary shelter locations, there would be a major problem in identifying and moving the evacuees to a safer location.

It is not possible to predict a specific cost that a HAZMAT incident would create due to the many existing variables. Cost factors that must be considered in the event of a HAZMAT incident include the type of material and the amount spilled; the time of day and climate conditions; and where the event occurs.

Aside from possible HAZMAT incidents, there are several locations that are at risk from possible flooding due to their location in the floodplain or, in the case of the Navajo Dam Volunteer Fire Department, if Navajo Dam were to fail. One structure at risk from flooding is the Farmington waste water treatment facility. This situation is presently being mitigated by relocating this facility outside of the current floodplain.

### **Section 3. Vulnerability of Non-Governmental Areas**

The exposure of San Juan County's non-governmental areas to HAZMAT events exists along main transportation routes, but is much less critical due to more sparse population and location of fewer local businesses. San Juan County's larger hazard exposure comes from flooding and wildfire, which are located within the same general area. According to the county's application for participation in the National Flood Insurance Program, there are 6,250 persons located within the county's floodplains. There are 1,240 family structures, 48 small business structures, and 60 other structures located within this area. Although the values of these structures vary, the median value of a residential structure in San Juan County is approximately \$91,300 (2000 U.S. Census). Using this figure, the potential aggregate loss of all the family structures, not including their contents, in the county's flood and wildfire prone areas is \$113,212,000. This figure also does not take into account the 48 small business structures, the 60 other structures, or their contents.

San Juan County's hazard exposure due to drought is very difficult to predict, aside from the loss of revenue from the area's existing agricultural industry. The amount of revenue generated by the county's agricultural industry was not available from the New Mexico Economic Development Department. Also, as discussed earlier, the amount of water

available within San Juan County is a limiting factor to its continued growth, even under the best of circumstances.

#### **Section 4. Developing Trends**

The vulnerability existing in San Juan County is further influenced by expected future growth. The 2000 U.S. Census predicts that the county's population will increase from 113,801 to an estimated 122,564 by 2010. As of the 2000 Census, approximately 44.5% of the population of San Juan County resided within the incorporated jurisdictions. By 2010, the population within the incorporated areas is forecast to increase to approximately 50% of the county's overall population.

The incorporated areas of San Juan County are expected to continue to grow toward each other as they have done in the past. This expansion historically has occurred along the main roadways of U.S. 64, N.M. 550, N.M. 516, and N.M. 170. As this growth occurs, the population's exposure to the effects of potential HAZMAT incidents will increase.

Along with the population increase along these major routes there are other specific threats that can result from a HAZMAT event. As U.S. 64 traverses Farmington, it passes very close to the San Juan Regional Medical Center, the county's largest hospital. A HAZMAT event in this area could require the evacuation of this hospital and the relocation of its patients. Additionally, the Farmington Comprehensive Plan indicates that some 13,566 vehicles utilize this portion of U.S. 64 daily. These vehicles would require rerouting during a HAZMAT event.

N.M. 516, the primary route from Farmington to Aztec, exits Farmington and accounts for 31,384 vehicles daily. Although it is acknowledged that not all vehicles exiting Farmington arrive in Aztec, it can be assumed that most of them do. In addition to the economic damage done to Aztec if its downtown area were to be evacuated due to a HAZMAT event, the daily traffic through this area would require an alternate route.

N.M. 550 in Bloomfield abuts the campus of Bloomfield High School, as depicted in Attachment C, Illustration 8. A HAZMAT event at this location could potentially require the evacuation of the entire campus as well as closing a major transportation route through the area. Additionally, the city government of Bloomfield is located near the high school and could also require evacuation.

HAZMAT events in San Juan County are generally handled by the Farmington Fire Department. The cost in handling a HAZMAT event is extremely dependant on the materials involved and location of the event. According to the Farmington Fire Department, most HAZMAT calls are small and cost between \$300 and \$500 per hour. Additionally, a large event, requiring the full team and backup personnel, will cost a minimum of \$3,000 per hour. Along with the cost for fire personnel and equipment, additional costs will be incurred depending on the number of law enforcement and emergency medical personnel that will also be required during a given response. Further

costs can be expected when a HAZMAT event occurs in an area of high population or business district.

In addition, the Farmington Comprehensive Plan indicates that several other areas are being considered for annexation. One such area is the “South Farmington” section south of Pinon Street, including all areas north of the San Juan River, a large part of the Bisti Highway, and the area south of the San Juan River. This annexation will increase the number of people and structures falling within Farmington’s floodplain planning. However, if Farmington’s presently established floodplain regulations are enforced, there should be no additional structural exposure in the annexed section. Another factor to be considered in this annexation would be an increase in need for present infrastructure, or a higher demand on existing services. Aztec and Bloomfield have similar floodplain regulations, and even if areas within the floodplain are annexed, there would not be an expected increase in structures in these areas.

San Juan County presently does not have any floodplain regulations, and based on the forecasted population increase of 7%, the population exposed to flooding and wildfire could be expected to increase by 500, to 6,750. Therefore, for an average family of four, there would be an additional potential aggregate loss for 125 new family structures of over \$1,300,000.

As the floodplain areas of San Juan County correspond to the areas subject to wildland fire danger, any increase in the population or structures in this area also increase the potential loss due to wildland fires. Of the 125 new family structures projected to be built in this area, only a small number would be at risk during any single event. However, the threat still exists.

Higher than normal rainfall and snowfall during early 2004 have helped provide badly-needed moisture to much of New Mexico, but they have not significantly reduced the existing drought conditions. In March 2004, several fires have already occurred along the bosque in Albuquerque. Drought is a regional fact of life and such conditions will continue to occur cyclically.

Drought conditions have affected the county’s agricultural economy and are a factor in the reduction of the area’s cash receipts. Although the income from crops in the county has rebounded, the cattle industry has continued to decline.

Table 16.

Livestock cash receipts		
2000	2001	2002
\$35,591,000	\$32,320,000	\$23,898,000

Crop cash receipts		
2000	2001	2002
\$36,272,000	\$35,117,000	\$50,437,000

*Data collected from the New Mexico Department of Agriculture*

The effects of drought on Aztec, Bloomfield, and Farmington have to date remained fairly minor and sufficient water rights are presently available to meet the community's needs. However, the continuation of drought conditions in the county will eventually limit its long-term population growth. Additionally, a long-term drought can result in the prolonged drying-up of the Animas River, which would stress Farmington's available water supply.

Drought will also prolong and increase the threat of wildfire along the floodplains of San Juan County, and as new construction takes place, an increase in the potential loss due to fire can be anticipated.

## **Section 5. San Juan County History**

**Flooding.** Flooding has historically occurred in San Juan County, with the last major flood occurring in 1940 along the San Juan River. In 1998, the accumulation of water behind Navajo Dam became so great that a maximum outflow was necessary to prevent flooding. Local emergency management resources were prepared for this potential but did not have to be called into action. More flooding occurred in 1999 when rapidly developing storms resulted in runoff that damaged roads in the county. A declaration of emergency was made as a result of the 1999 flooding, and funding for repairs was provided through the Federal Emergency Management Agency (FEMA).

Flooding has also occurred in Bloomfield when storm waters backed up in the Bloomfield Canyon Arroyo due to a poorly-designed culvert which did not provide sufficient water flow. This flooding resulted in damage to several residences in the area.

**Drought.** Drought is a common problem that has occurred in San Juan County for centuries. A mega-drought occurred in the 1600's, causing a migration of the Native American population out of the area. Severe drought conditions also existed in the county during the 1950's. This drought caused economic problems, although its duration and intensity were not as great as the 1600's mega-drought. The discovery of oil and the subsequent drilling boom that began then most likely minimized the resulting economic damage at that time.

Presently San Juan County is in severe drought conditions similar to those that occurred in the 1950's. It is unknown how long this drought will last, and most water reservoirs in

New Mexico are at 14% capacity or lower. There is currently no end in sight for this drought.

**Wildfire.** Drought conditions throughout the southwest continue to create the possibility of wild land fires. In addition, as the urban/wild land interface increases, the exposure to wildfires increases. Although the potential for a wild land fire exists, there has not been an incident of this kind to date in San Juan County. According to area fire officials, a fire in the river bottom could, under the right conditions, cause damage along an expanse of as much as seven miles on both sides of the river. This danger is the same throughout the county and includes the incorporated areas of Aztec, Bloomfield, and Farmington.

New Mexico experienced major fires during 2000, including the Cerro Grande fire in Los Alamos, which destroyed numerous homes and forced the evacuation of Los Alamos and White Rock. The Cerro Grande fire required an emergency declaration and was in the national news. Additional fires caused damages and grave danger to the Ruidoso area, resulting in ordinances requiring property owners to provide defensible space around structures on their property.

Albuquerque experienced major fires along the Rio Grande River in 2003, causing local evacuation of several areas of town and the complete closure of I-40. Regional fire-fighting efforts were assisted by assets from Kirtland Air Force Base.

The recent fires in California demonstrate the danger that exists when fire occurs in a densely populated urban/wild land interface. Dry weather, coupled with dead trees and high winds, created a deadly combination. Similar dry conditions presently exist in the river bottoms of San Juan County, and the potential for an urban/wild land interface fire is high.

**HAZMAT.** Fortunately no major hazardous material spills have yet occurred in a major population area of San Juan County. However, there appear to be a great number of vehicles traveling through the county carrying hazardous material. The amount of oil production occurring in San Juan County alone creates great concern as to the effects of a hazardous material release.