

1 CITY OF SANTA FE, NEW MEXICO

2 RESOLUTION NO. 2008-85

3 INTRODUCED BY:

4 *Daniel Coss*  
5  
6  
7  
8  
9

10 A RESOLUTION

11 ADOPTING THE SANTA FE COUNTY HAZARD MITIGATION PLAN.  
12

13 WHEREAS, the City of Santa Fe, located in Santa Fe County, is vulnerable to natural  
14 hazards such as flash floods, wildfire and drought as well as human-caused hazards that can result  
15 in loss of life and property, economic hardship and threats to the public's health and safety; and

16 WHEREAS, a Hazard Mitigation Plan for Santa Fe County, New Mexico (the "Plan")  
17 was developed by City of Santa Fe staff, Santa Fe County staff and key members of the public;  
18 and

19 WHEREAS, the Plan recommends mitigation activities that will reduce losses to people  
20 and property affected by the natural and human-caused hazards that face the County; and

21 WHEREAS, the Federal Emergency Management Agency (FEMA) requires adoption of  
22 the plan and updating every five years in order to ensure the City's continued eligibility for  
23 certain categories of federal disaster relief and mitigation funding both before and after disaster  
24 events.

25 NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE

1 **CITY OF SANTA FE that:**

2 1. The Santa Fe County Hazard Mitigation Plan, dated February 2006, is hereby  
3 adopted as an official plan of the City of Santa Fe. A copy is attached to this resolution.

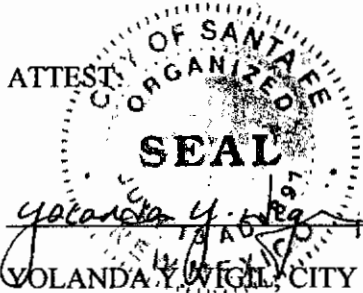
4 2. The City Emergency Manager shall be responsible for coordinating hazard  
5 mitigation planning and related actions and programs of the City of Santa Fe.

6 3. The City Emergency Manager is directed to bring appropriate revisions to the  
7 Governing Body to reflect city issues and then on an annual basis, prepare a report to the  
8 Governing Body including an assessment of progress made toward meeting the goals and  
9 objectives and implementing specific actions identified in the Plan. The report shall include  
10 targets for the following year including recommendations for any appropriate revisions to the  
11 Plan.

12 PASSED, APPROVED, and ADOPTED this 6<sup>th</sup> day of October, 2008.

13  
14 David Coss

15 DAVID COSS, MAYOR



27 APPROVED AS TO FORM:

28  
29 Frank D. Katz  
30 FRANK D. KATZ, CITY ATTORNEY

31 Jp/ca/jpmb/2008 res/hazard mitigation plan

# Santa Fe County Hazard Mitigation Plan

February 2006



prepared for:  
**Santa Fe County**  
**Office of Emergency Management**  
200 Lincoln Avenue  
Santa Fe, New Mexico 87504



under contract with:  
**Office of Emergency Management**  
4491 Cerrillos Road  
Santa Fe, New Mexico 87507

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**URS**

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Suite 900  
Albuquerque, New Mexico 87110

**Final Report**  
**Hazard Mitigation Plan**  
**Santa Fe County, New Mexico**

*Prepared for*



Santa Fe County Emergency Services  
Santa Fe County, New Mexico  
35 Camino Justicia  
Santa Fe, NM 87508

*Under contract with*



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**February 2006**

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**SANTA FE COUNTY, NEW MEXICO  
PLAN ADOPTION RESOLUTION**

**Note to Santa Fe County Reviewers:** Adoption renders validity and authority to the Plan and is required by the Federal Emergency Management Agency (FEMA). Approval by FEMA is required to ensure continued eligibility for certain categories of federal disaster relief and mitigation funding both before and after disaster events. Two model resolutions for adopting the plan are included here, one for Santa Fe County and one for each of the participating municipalities.

**RESOLUTION NO. \_\_\_\_\_**

WHEREAS Santa Fe County is vulnerable to natural hazards such as flash floods, wildfire, and drought as well as human-caused hazards that can result in loss of life, property loss, economic hardship and threats to public health and safety; and

WHEREAS a Hazard Mitigation Plan for Santa Fe County, New Mexico (hereinafter referred to as the "Plan") has been developed by Santa Fe County Emergency Services and the people of the County; and

WHEREAS the Plan recommends mitigation activities that will reduce losses to people and property affected by the natural and human-caused hazards that face the County; and

WHEREAS a series of public meetings were held to develop and review the Plan,

NOW THEREFORE BE IT RESOLVED by the Santa Fe County Commissioners that:

The Hazard Mitigation Plan for Santa Fe County, New Mexico is hereby adopted as an official plan.

The Santa Fe County Mitigation Planning Team or its successor is hereby recognized as the official advisory body for hazard mitigation planning and related activities in the County. The Team members and its Chair shall be appointed by the Chairman of the Santa Fe County Commissioners, subject to the approval of the Santa Fe County Commissioners.

The Santa Fe County Mitigation Planning Team shall meet as often as necessary, but at least quarterly, to ensure all appropriate activities are targeted toward implementing the Plan. The schedule of meetings shall be posted in appropriate places. All meetings of the Mitigation Planning Team shall be open to the public.

The respective Santa Fe County officials and agencies identified in Section Three of the Plan (i.e., Mitigation Plan and Implementation Strategy) are hereby directed to implement the recommended activities assigned to them. By August 31 of each year, the respective Santa Fe County officials and agencies shall report to the Mitigation Planning Team on the progress of their activities.

By September 30<sup>th</sup> of each year, the Mitigation Planning Team shall prepare an annual evaluation report to the Santa Fe County Commissioners and the governing board of each of the communities within the County that have adopted the plan and participated in its implementation. The report shall include an assessment of progress made toward meeting the goals and objectives and implementing specific actions identified in the Plan. The report shall also include targets for the following year including any appropriate revisions to the Plan.

**SANTA FE COUNTY, NEW MEXICO  
PLAN ADOPTION RESOLUTION**

ADOPTED this the \_\_\_\_\_ day of \_\_\_\_\_, 2006

ATTEST:

**BOARD OF COUNTY COMMISSIONERS  
OF SANTA FE COUNTY**

---

Insert name, Chair of County Commission

---

Insert name, County Clerk

APPROVED AS TO FORM:

---

Insert name, County Attorney



**[INSERT COMMUNITY NAME], SANTA FE COUNTY, NEW MEXICO  
PLAN ADOPTION RESOLUTION**

**Note to Santa Fe County Reviewers:** The following draft resolution is recommended for each participating jurisdiction to adopt the Plan.

RESOLUTION NO. \_\_\_\_\_

WHEREAS [insert community name], Santa Fe County, is vulnerable to natural hazards such as flash floods, wildfire, and drought as well as human-caused hazards that can result in loss of life, property loss, economic hardship and threats to public health and safety; and

WHEREAS a Hazard Mitigation Plan for Santa Fe County, New Mexico (hereinafter referred to as the "Plan") has been developed by Santa Fe County Emergency Services and the people of the County; and

WHEREAS the Plan recommends mitigation activities that will reduce losses to people and property affected by the natural and human-caused hazards that face the County; and

WHEREAS a series of public meetings were held to develop and review the Plan,

NOW THEREFORE BE IT RESOLVED by the [insert elected official and/or governing body] of the [insert community name] that:

The Hazard Mitigation Plan for Santa Fe County, New Mexico is hereby adopted as an official plan of the [insert community name].

The Santa Fe County Mitigation Planning Team or its successor is hereby recognized as the official advisory body for hazard mitigation planning and related activities in the County.

The [insert appropriate community official and/or agency] is hereby recognized as the official representative for [insert community name] to the Mitigation Planning Team and shall be responsible for coordinating the related actions and programs of [insert community name] accordingly.

By August 31 of each year, the [insert above named community official and/or agency] shall prepare an annual evaluation report first to the [insert elected official and/or governing body] and subsequently to the Mitigation Planning Team including an assessment of progress made toward meeting the goals and objectives and implementing specific actions identified in the Plan. The report shall include targets for the following year including recommendations for any appropriate revisions to the Plan.

ADOPTED this the \_\_\_\_ day of \_\_\_\_\_, 2006

ATTESTED and FILED this the \_\_\_\_ day of \_\_\_\_\_, 2006

\_\_\_\_\_  
[insert appropriate title] of  
[insert community name],  
Santa Fe County, New Mexico

\_\_\_\_\_  
[insert appropriate title] of  
[insert community name],  
Santa Fe County, New Mexico

Santa Fe County, New Mexico, is threatened by a number of different natural and human-caused hazards. These hazards endanger the health, safety, and welfare of the County's population, jeopardize its economic vitality, and imperil the quality of its environment. To avoid or minimize vulnerability to these hazards, the New Mexico Office of Emergency Management (NMOEM) and the Federal Emergency Management Agency (FEMA) provided support to Santa Fe County to undertake a hazard mitigation planning process. The resulting "*Hazard Mitigation Plan for Santa Fe County, New Mexico*" (hereinafter referred to as the "Plan") identifies and profiles the hazards that can affect Santa Fe County, assesses the County's vulnerability to these hazards, and identifies alternative mitigation actions. The Plan also includes an implementation strategy for preferred mitigation actions as selected and prioritized by a multi-jurisdictional community-based planning team.

Santa Fe County Emergency Services provided the lead in soliciting the participation of both incorporated municipalities and unincorporated communities within the County to form the "*Santa Fe County Mitigation Planning Team*" to undertake a comprehensive planning process that has culminated in the publication of this document. In addition, because of the diversity of interests in the County and municipalities, the Mitigation Planning Team encouraged citizens to add their voices to the planning process and the decisions that will affect their future. As a result, this document represents the work of citizens, elected and appointed government officials, business leaders, and volunteers of non-profit organizations to develop a plan that will help save lives, protect assets, and preserve the economic viability of the community.

The following summarizes the results of this effort and is organized according to the major sections of the Plan:

**Hazard Identification and Risk Assessment (Section One)** - identifies and profiles the natural and human-caused hazards that can affect Santa Fe County as follows:

- Wildfires;
- Drought;
- Floods, including flash floods;
- Severe weather, including winter storms;
- Human-caused hazards, including hazardous materials releases, nuclear facility accidents, and terrorism;
- Earthquakes; and other hazards, including landslides/land subsidence, dam failure, and volcanoes.

These hazards are listed in order of priority as determined by the Mitigation Planning Team. However, wildfire, drought, and flash floods are considered to pose significantly higher risk to the residents of Santa Fe County than the others on this list. A brief summary of the relevant issues is provided for these three hazards with more detail regarding the entire list within the Plan.

- ✓ **Wildfire** – Forestland in Santa Fe County is extremely susceptible to wildfires due to dense timber stands and recent drought conditions. The higher than normal tree densities and accumulation of fuels present a significant, continued threat of wildfire to structures located in the wildland-urban interface area. An estimated 40% of the County's water comes from the Santa Fe Watershed located within the forest. In addition, Santa Fe County has identified that more than 156 square miles of structures with an aggregate value of billions of dollars are located in areas identified as wildfire hazard areas.
- ✓ **Droughts** - New Mexico experiences drought approximately every ten years, so droughts have been a common occurrence in Santa Fe County. Droughts in Santa Fe County

significantly affect human activities, wildfire suppression, natural resources, and water-dependent activities.

- ✓ **Flash Floods** - Flash floods are aptly named: inundation can occur suddenly with high velocity stormwater flows. Although the duration of these events is usually brief, the damages can be quite severe. In the past, flash floods have affected many low-lying areas throughout Santa Fe County and this is expected to continue. However, specific impacts depend on the location, duration, and quantity of rainfall and are therefore difficult to predict. Flash floods are more likely to occur in drainage ways that receive runoff from watersheds with steep slopes and narrow stream valleys. In urban areas, parking lots and other impervious surfaces that shed water rapidly can also contribute to flash floods. In addition, the County experiences flash flooding from heavy rain on dense snow pack in winters and excessive rain in spring and summer.

**Goals, Objectives and Alternative Mitigation Actions (Section Two)** - presents a series of goals and objectives to guide hazard mitigation actions. In addition, this section of the Plan identifies a series of alternative mitigation actions to address these goals and objectives on a community-by community-basis.

**Mitigation Plan and Implementation Strategy (Section Three)** – identifies the preferred and prioritized mitigation actions as determined by the Mitigation Planning Team as an overall approach to reducing the County's vulnerability to natural and human-caused hazards. This section of the Plan recommends specific actions and an implementation strategy including details about the organizations responsible for carrying out the action, their estimated cost, possible funding sources, and timelines for implementation.

The following table includes a description of the mitigation actions that are recommended in this Plan, listed in the order of priority as determined by the Mitigation Planning Committee.

Reduce fuel loads and create defensible spaces in the wildland-urban interface	1
□ Expand Chipping Program	
Update floodplain and floodway maps in Santa Fe County.	2
Install snow fences along County roads in southern Santa Fe County.	3
Update equipment used to respond to hazardous materials incidents.	4
Continue efforts to encourage residents to use water-saving landscaping techniques.	
□ Fund program to meter domestic wells	
□ Enforce existing zoning and building regulations on water use	5
□ Expand City of Santa Fe incentive program	
□ Implement pilot projects to use treated effluent for non potable uses	
Develop dependable sources of water for fire suppression in all residential areas of the County.	*
Following policies in the SF Emergency Operation Plan and the Homeland Security Response Plan, assess need and means to harden critical facilities against the effects of human-made hazards.	*
Develop a plan to install an emergency communication system that is not dependent on local telephone and electrical services for rural communities within the County.	*
Improve and expand structure data records in the Santa Fe County GIS	
□ Improve information sharing between County assessors, appraisers and building inspectors	*
□ Maintain rural addressing in all unincorporated parts of the County	
Work with the State, County and municipal building inspectors to consistently enforce the building code from jurisdiction to jurisdiction.	*
Ensure compliance with the recently adopted wildland-urban interface ordinance by hiring additional staff to do on-site inspections and enforcement.	*

## EXECUTIVE SUMMARY

Mitigation Actions	Priority
Develop a CERT training program for all areas of the City and County.	*
Convene regular meetings with the Mitigation Planning Team to discuss issues and progress related to the implementation of the plan.	*
Conduct non-technical assessment to determine relative vulnerability/risk for earthquakes.	*
Develop a public relations and information program.	*
<input type="checkbox"/> Identify and publicize success stories as part of an overall consistent public relations program.	
<input type="checkbox"/> Renew and expand commitments to business partner organizations.	
<input type="checkbox"/> Include vulnerability analysis information as part of periodic plan review and revisions at the county and municipal level.	
<input type="checkbox"/> Incorporate hazard mitigation concepts into regular County and Municipal operations.	

\*Note: The first five mitigation actions are ranked according to their priority. The remaining actions are not assigned a numerical ranking, they all have merit as mitigation actions and should be pursued as funds and resources allow.

The plan was formally adopted by the Santa Fe County Commissioners on [Note: date of actual approval will be inserted here in the final document] and subsequently by the incorporated communities of [Note: list of communities that adopt the document will be inserted here in the final document.]

The following individuals and organizations served as members of the Santa Fe County Mitigation Planning Team or made significant contributions to the planning effort and therefore were instrumental to the development of this plan:

## **Santa Fe County Mitigation Planning Team Members**

Terry Delgado, Captain-Santa Fe County Sheriff	Leonard Quintana, Utilities Department, Santa Fe County
Bill Ewing, NM-DPS-OESS	Chris Rivera, Assistant Chief, City of Santa Fe Fire Department
Jim Gallegos, GIS Analyst-County of Santa Fe	Gary Thompson, St. Vincent Hospital
Evonne Gantz, NM-DPS-OESS	Jeff Saunders, Assistant Chief, County of Santa Fe Fire Department
Tom Griego, St. Vincent Hospital	Doug Sayre, Santa Fe County Utilities Department
Steve Handback, PNM Gas	Jerry Lowance, City of Santa Fe Water District
Paul Kavanaugh, Land Use-Santa Fe County	Lance Tyson, GIS Manager-City of Santa Fe
James Leach, SFOEM	Erle Wright, GIS Coordinator-Santa Fe County
Andrew Leyba, Captain-Santa Fe Police Department	
Rich Guffey, PNM NC Region	
Robert Martinez, Deputy Public Works Director, Santa Fe County	

## **Other Contributors**

Frank Diluzio, Federal Emergency Management Agency, Office of Cerro Grande Fire Claims  
Dwayne Merritt, Emergency Manager-Rio Arriba County

In addition, the Federal Emergency Management Agency (FEMA) provided funding for the Hazard Mitigation Plan for Santa Fe County, New Mexico, through its Region VI offices in Denton, Texas, via a grant to the NMOEM.

This section of the *Hazard Mitigation Plan for Santa Fe County, New Mexico* includes:

- ✓ *Overview* – identifying general background issues for this mitigation planning effort
- ✓ *Mitigation Planning in New Mexico* – providing the specific context for this Plan
- ✓ *Purpose of the Plan* – outlining the benefits to the community
- ✓ *Planning Process* – describing the basic steps in the process
- ✓ *Community Profile* – identifying relevant characteristics of Santa Fe County

Across the United States, natural and human-caused<sup>1</sup> disasters have led to increasing levels of death, injury, property damage, and interruption of business and government services. The toll on individuals, families and businesses can be immense. The time, money, and effort spent to respond to and recover from these disasters divert public resources and attention from other important programs and problems. Santa Fe County recognizes the consequences of disasters and the need to reduce the impacts of natural and human-caused hazards. The elected and appointed officials of the County also know that with careful selection, mitigation actions in the form of projects and programs can become long-term, cost-effective means for reducing the impact of natural and human-caused hazards.

Therefore, the Santa Fe County Mitigation Planning Team, composed of County residents and responsible officials, with the support of the New Mexico Office of Emergency Management (NMOEM) and FEMA, has prepared this *Hazard Mitigation Plan for Santa Fe County, New Mexico*. The Plan is the result of nearly a year's work to develop a multi-jurisdictional, multi-hazard mitigation plan that will guide the County toward greater disaster resistance in full harmony with the character and needs of the community.

The Cerro Grande Fire started on Thursday, May 4, 2000, when National Park Service personnel ignited a prescribed burn with the intent of reducing the future risk of fire by reducing the fuel load. Sporadic and changing winds carried embers across the fire line. Control was lost and the prescribed burn was declared a wildfire on May 5.

The fire triggered increasing levels of federal assistance, beginning with activation of a Federal-State Fire Suppression Assistance Agreement, followed by a Presidential Disaster Declaration, and culminating in an Act of Congress: the Cerro Grande Fire Assistance Act (CGFAA). The CGFAA was established to compensate victims of the Cerro Grande Fire for property, business, and financial losses, and other expenses directly related to the fire. The CGFAA also provides funding for mitigation efforts to reduce the risk of secondary hazards, such as the increased flooding that results when rainfall rushes down denuded hillsides.

Following the Cerro Grande Fire in 2000, concerned government officials and citizens, led by Santa Fe City/County Emergency Manager, requested funding through the Cerro Grande Fire Assistance Act to complete a countywide hazard mitigation plan.

The *Hazard Mitigation Plan for Santa Fe County, New Mexico* is intended to serve many purposes. These include the following:

<sup>1</sup> Human-caused hazards include technological (hazardous materials, nuclear, aviation accidents, etc.) and terrorism incidents.



- ✓ *Enhance Public Awareness and Understanding* — to help residents of the County better understand the natural and human-caused hazards that threaten public health, safety, and welfare; economic vitality; and the operational capability of important institutions;
- ✓ *Create a Decision Tool for Management* — to provide information that managers and leaders of local government, business and industry, community associations, and other key institutions and organizations need to take action to address vulnerabilities to future disasters;
- ✓ *Promote Compliance with State and Federal Program Requirements* — to ensure that Santa Fe County and its incorporated communities can take full advantage of state and Federal grant programs, policies, and regulations that encourage or mandate that local governments develop comprehensive hazard mitigation plans;
- ✓ *Enhance Local Policies for Hazard Mitigation Capability* — to provide the policy basis for mitigation actions that should be promulgated by participating jurisdictions to create a more disaster-resistant future; and
- ✓ *Inter-Jurisdictional Coordination of Mitigation-Related Programming* — to ensure that proposals for mitigation initiatives are reviewed and coordinated among the participating jurisdictions within the County.

The approach taken by Santa Fe County relied on sound planning concepts and a methodical process to identify County vulnerabilities and to propose the mitigation actions necessary to avoid or reduce those vulnerabilities. Each step in the planning process built upon the previous, providing a high level of assurance that the mitigation actions proposed by the participants and the priorities of implementation are valid. Specific steps in the process included:

- ✓ *Project Initiation* - URS, a consulting firm, was selected by NMOEM to assist Santa Fe County in creating a hazard mitigation plan. URS worked with the County Mitigation Planning Team and NMOEM to solicit public input and draft this mitigation plan. Representatives of the NMOEM and FEMA conducted a kick-off meeting on June 14, 2002, to educate the public about pre-disaster mitigation, identify needs, and generate interest in the mitigation planning process. James Leach, the Santa Fe City/County Emergency Manager, assembled the Santa Fe County Mitigation Planning Team as an advisory body to undertake the planning process. Mr. Leach called each municipality, including Indian tribes and invited them to join the Mitigation Planning Team. The Pueblos of San Ildefonso, Nambe, Pojoaque, Tesuque, and Santa Clara whose governing bodies reside within the County have been contacted by the Santa Fe County Emergency Manager. None of the Pueblos expressed interest in participating on the planning team. San Ildefonso and Pojoaque have completed or are completing their own plans. Due to limited resources and personnel, the Town of Edgewood requested that the Santa Fe County Manager represent them on the planning team. The City of Santa Fe was the only municipality to join the planning team.
- ✓ *Hazard Identification and Risk Assessment* — The Mitigation Planning Team identified natural and human-caused hazards that potentially threaten all or portions of the County. Where possible, specific geographic areas subject to the impacts of the identified hazards were mapped using a Geographic Information System (GIS). The Mitigation Planning Team considered the probability of a hazard occurring in an area and its impact on public health and safety, property, the economy, and the environment.



The Mitigation Planning Team had access to information and resources regarding hazard identification and risk estimation, although the level of detail varied among the participating jurisdictions. Planning team members representing individual jurisdictions provided hazard-specific maps, such as floodplain delineation maps, whenever possible and performed GIS-based analyses of hazard areas and the location of infrastructure, critical facilities, and other properties located within their jurisdictions.

The Mitigation Planning Team also conducted a methodical, qualitative examination of the vulnerability of important facilities, systems, and neighborhoods to the impacts of future disasters. GIS data were used to identify specific vulnerabilities that could be addressed by specific mitigation actions. The Mitigation Planning Team also reviewed the history of disasters in the County and assessed the need for specific mitigation actions based on the type and location of damage caused by past events.

- ✓ *Goals, Objectives, and Mitigation Actions* -- Based on this understanding of the problems faced by the County, a series of goals and objectives were identified by the Mitigation Planning Team to guide subsequent planning activities. At the April meeting the Planning Team adopted the State Hazard Mitigation Goals. These Goals are defined in Section Two of this document. In addition, a series of alternative mitigation actions were identified to address these goals and objectives on a community-by-community basis. The Mitigation Planning Team met in July and August of 2002, and April and May 2003 to accomplish these tasks.
- ✓ *Mitigation Plan and Implementation Strategy* -- Finally, the Mitigation Planning Team met in March and April of 2003 to determine the priorities for actions from among the alternatives and develop a specific implementation strategy including details about the organizations responsible for carrying out the action, their estimated cost, possible funding sources, and timelines for implementation.

Three additional areas are important to note regarding the planning process: Community Participation, Public Involvement, and Regulatory Compliance.

*Community Participation* -- As noted, all incorporated municipalities and sovereign governments were contacted to solicit participation in the process. Opportunities were also provided for interested parties and communities to review and comment on the work-in-progress for the Plan. The incorporated municipalities all identified representatives to serve on the Mitigation Planning Team and provided prioritized lists of mitigation actions for their communities. In some cases, these recommendations were incorporated into countywide efforts. The Emergency Manager will contact the tribes and municipalities when the draft of the Plan is available for review. Communities and governments that did not choose to participate in the development of the Plan were still provided the opportunity to adopt the Plan and provide any suggestions for additional mitigation actions that would meet their needs. The Plan will be presented to Santa Fe County, the City of Santa Fe and the town of Edgewood for adoption. The Emergency Manager will also contact tribes located in Santa Fe County and present the opportunity of adoption by each individual tribe.

- ✓ *Public Involvement* -- The Santa Fe County Mitigation Planning Team hosted a series of public meetings to educate stakeholders about their risks, involve them in identifying issues, and educate them about mitigation options available to them. The meetings included:
  - Public Information Meetings to educate citizens, public officials, and business leaders about the hazard mitigation planning process. Topics included hazard mitigation planning and its benefits, steps in the hazard mitigation planning process, and the importance of community input and participation.

- The public information meetings were held in Santa Fe on September 18, 2002 and on January 8, 2003 as part of the Local Emergency Planning Committee meeting (see Appendix C for copies of meeting agendas, attendance lists, and meeting minutes).
  - Public Response Questionnaires to develop lists of potential mitigation actions by soliciting community input regarding vulnerabilities and potential solutions. Citizens participated by prioritizing the hazards and suggesting possible solutions, which formed the basis for researching alternatives and developing evaluation criteria for selecting mitigation actions. Questionnaires were distributed at the public meetings (see Appendix D for a copy of the questionnaire).
  - Press Releases were prepared to announce the availability of the Draft Hazard Mitigation Plan for public review and comment (see Appendix E for copies of press releases and public notices).
  - Presentations to the Santa Fe County Commissioners for the Draft and Final versions of the Plan informing them of proposed mitigation actions and their implementation schedule, and seeking support for adopting the Plan.
  - Presentations to the individual jurisdictions to seek approval and adoption of the Plan.
- ✓ *Regulatory Compliance* — To qualify for certain forms of federal aid for pre- and post-disaster funding, local jurisdictions must comply with the federal Disaster Mitigation Act of 2000 (DMA 2000) and its implementing regulations (44 CFR Section 201.6, published February 26, 2002). DMA 2000 intends for hazard mitigation plans to remain relevant and current. Therefore, it requires that State hazard mitigation plans are updated every three years and local plans, including Santa Fe County's, every five years. This means that the Hazard Mitigation Plan for Santa Fe County uses a "five -year planning horizon": it is designed to carry the County through the next five years, after which its assumptions, goals, objectives, etc. will be revisited and the plan resubmitted for approval.

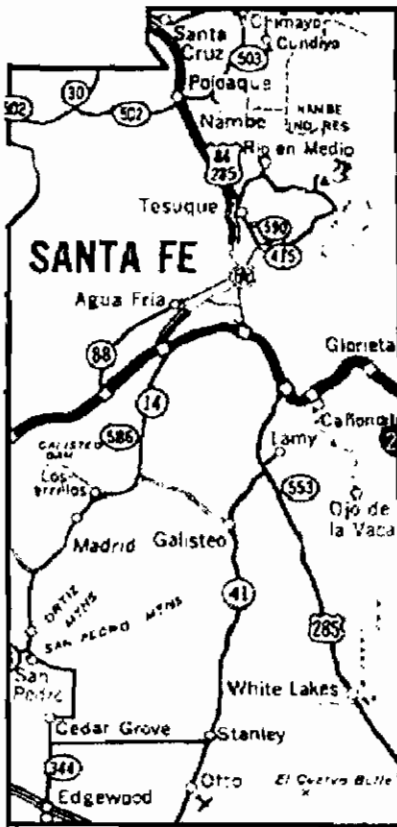
The *Hazard Mitigation Plan for Santa Fe County, New Mexico* has been prepared to meet FEMA and NMOEM requirements for making the County eligible for funding and technical assistance from State and federal hazard mitigation programs. Appendix A identifies sections of the Plan that address specific requirements in the Interim Final Rule, the regulation implementing DMA 2000.

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Santa Fe County is a culturally, geographically, and economically diverse County located in northern New Mexico approximately 55 miles north of Albuquerque. The City of Santa Fe, the County's largest metropolitan area, was established in the early 1600s and is one of the nation's oldest communities. Since 1610, Santa Fe has been the capital city under four different flags: Spain, Mexico, the U.S. Confederacy, and the U.S. The historic City of Santa Fe includes centuries-old adobe and eastern-style structures and is a historic and artistic tourism mecca. Santa Fe County has a diverse population of wealthy transplants as well as Indian and Hispanic populations whose heritages reach back through the centuries. The County includes the seven pueblos of San Ildefonso, Nambe, Pojoaque, Tesuque, and small sections of Santo Domingo, Santa Clara, and Cochiti Pueblos.

The following briefly discusses relevant characteristics of Santa Fe County under the categories of *Demographics*, *Physical Features* and *Infrastructure*.

## Demographics



**Figure 1: Santa Fe County**  
 (Source: <http://www.nmiland.com/Images/counties/santafe.gif>)

- ✓ **Population** - According to the 2000 US Census, the population of Santa Fe County is 129,292, and the City of Santa Fe population is 62,203, which accounts for 48% of the County's population.
- ✓ **Growth Projections** - Population growth in Santa Fe County within the last decade was 31% (2000 U.S. Census). Over 22% of the increase is due to migration rather than natural increase (number of births minus deaths). Santa Fe County had an estimated increase in population of 4,000 between the US Census 2000 and 2002 (Santa Fe Trends 2003). During the same period the population of the City of Santa Fe increased by an estimated 1,300. Therefore, while the population of the City of Santa Fe grew by an estimated 33% the remainder of the County, particularly in the nearby areas accounts for the remaining 67%.
- ✓ **Employment and Income** - The largest industries in Santa Fe County are the tourism-associated service industry, at 34.1% of the County's employment earnings. State and local government earnings are 22%, retail trade 13.7% (BEARFACTS, [www.unm.edu/~bber](http://www.unm.edu/~bber)). The unemployment rate for Santa Fe County is 2.7%—the second lowest in the state (4.9%) and below the US average of 4.0% (2000 Census). Per capita income in Santa Fe County (\$28,488 per year) is 34.4% above the State average of \$21,283 per year.
- ✓ **Housing** - The total number of housing units in Santa Fe County is 57,701, with 30,533 units located within the City of Santa Fe (U.S. Census 2000 for New Mexico). However, the largest increase in housing units is anticipated outside of the current boundaries for the City in the proposed urban area and nearby communities. The Santa Fe County Growth Management Plan dated October 1996 anticipates the need for 25,000 new homes in Santa Fe County by 2020. Some of the housing units can be provided within the City of Santa Fe, but additional lots for development will still be needed in the outlying County areas.

## Physical Features

- ✓ **Land Area** - Santa Fe County covers approximately 1,910 square miles. Public and Indian managed lands account for 41% of Santa Fe County. The largest metropolitan area in the County is the City of Santa Fe, with a population of 62,203 (2000 U.S. Census).
- ✓ **Topographic Features** - Santa Fe County is located in north central New Mexico and is situated within the Southern Rocky Mountain and the Basin and Range Provinces (Hawley, 1986). Landform and vegetation in the County are roughly split into northeastern, central, and southwestern areas.

- ✓ *Hydrology* - Three major watersheds are present in the County. The Rio Grande/Santa Fe River Watershed covers most of the County, including the Rio Grande and Espanola Basins, as well as the west flank of the Sangre de Cristo Mountains and the Sandia Mountains. The Rio Pecos watershed is located in the eastern portion of the County on the southern and eastern flanks of the Sangre de Cristo Mountains. The Estancia Basin Watershed is a "closed basin," having no surface water drainage outlet; this watershed is located in the southern portion of the County.
- ✓ *Natural Resources* - The City of Santa Fe and the surrounding area is located within areas of forests, grasslands, and rivers of northern New Mexico. The watersheds and surrounding mountains contain conifer forests including species of Douglas fir (*Pseudotsuga menziesii*), Englemann Spruce (*Picea engelmannii*) and White Fir (*Abies concolor*) at the highest elevations. As elevation decreases, mixed conifer forests (including aspen (*Populus tremuloides*) forests) become prominent. Ponderosa Pine (*Pinus ponderosa*) and Gambel Oak (*Quercus gambelii*) forests become predominant at elevations of approximately 8500 to 7500 feet. As the elevation continues to decrease, Pinyon (*Pinus edulis*) and juniper (*Juniperus monosperma*) woodlands and juniper grasslands blend into high elevation deserts at elevations ranging from 7500 to 6500 feet.
- ✓ *Climate* - Santa Fe County climate is arid; annual precipitation ranges from 8 inches in the Rio Grande Valley areas to 34 inches in the higher elevations. Elevation is the greatest determining factor for temperature in New Mexico. Mean average temperatures are from 64°F (approximately 5,000 feet) in the Rio Grande Valley to 40°F in the higher mountain elevations. Temperatures can exceed 100° F at elevations below 5,000 feet. Average daytime January temperatures range from the mid-50s in the lower elevations to mid-30s in the higher elevations. There are more than 200 freeze-free days in the lower elevations of the County and more than 300 days of sunshine each year.

### Infrastructure

- ✓ *Vehicular Transportation Routes* – Interstate 25 bisects the County at Santa Fe on its northern route from Albuquerque to Denver, Colorado. US 285/84 connects Santa Fe to the northern communities of Tesuque, Nambe, and Pojoaque. US 285/84 also provides access to Los Alamos via NM 501.
- ✓ *Air/Rail Transportation Routes* - the Albuquerque International Sunport provides most air service to Santa Fe. However, the Santa Fe municipal airport, located in the southwest corner of the city, is serviced by commuter airline connections, and private aircraft provides air access to the community. Passenger trains and freight trains pass through the middle portion of the County. Amtrak's Southwest Chief trains eastbound from Los Angeles and westbound from Chicago meet daily in Lamy, New Mexico (20 miles south of Santa Fe).
- ✓ *Utilities* – Primary communities, including Santa Fe, Edgewood, Cerrillos, Pojoaque, Santa Cruz, and Tesuque, as well as the San Ildefonso and Tesuque Pueblos, have community water systems (Dinwiddie & Mourant, 1966). These communities obtain water from publicly owned water systems or from water cooperatives. Santa Fe and Pojoaque have public wastewater treatment and disposal facilities. Numerous other areas have publicly-owned package wastewater treatment and disposal facilities (NMED, 2002). Many residents in the County, including some in Santa Fe, obtain water from on-site domestic wells and dispose of wastewater through individual septic systems.

**Section One: Hazard Identification/Risk Assessment** summarizes the results of the first fundamental task in the planning process wherein hazards that may affect Santa Fe County are identified, profiled and the potential effects quantified. Section One describes previous occurrences, physical characteristics, likelihood of future occurrence, and the potential severity of an occurrence. The steps in the process include:

- ✓ *Hazard Identification* - investigating the existence of certain types of natural and human-caused conditions in and around the County. Hazards that have harmed the County in the past are likely to happen in the future; consequently, the hazard identification process first included determining whether or not the hazard has occurred previously. In addition, a variety of sources were used to determine the possibility of other hazards within Santa Fe County that may not have occurred in recent history.
- ✓ *Hazard Profiles* - determining the frequency or probability of future events, their severity, and factors that may exacerbate their severity. The Mitigation Planning Team and hazard mitigation planners used national maps available online from sources such as the U.S. Geological Survey (USGS), ESRI (a GIS software development firm), and the University of New Mexico to further investigate the possible implications of a range of hazards. The data sets used to generate the assessment were sometimes out of date or lacked county-specific detail. In those cases, hazard probabilities and severities identified in this document are discussed in broad terms reflecting the lack of available detailed information. These data limitations are discussed in the appropriate sections.
- ✓ *Vulnerability Assessment* - uses the information generated in the hazard identification and profiles to identify locations in which Santa Fe County residents could suffer the greatest injury or property damage in the event of a disaster. The vulnerability assessment process identified the effects of natural and human-caused hazard events by estimating the relative exposure of people, buildings, and infrastructure to hazardous conditions. The assessment helped the County and its municipalities set mitigation priorities by allowing them to focus attention on areas most likely to be damaged or most likely to require early emergency response during a hazard event. The vulnerabilities identified in this section consist of an inventory of affected structures completed primarily using GIS to overlay the hazard areas with the locations of individual structures, using population data from the 2000 Census.
- ✓ *Risk Assessment* - in hazard events, requires a full range of information and accurate data. Several site-specific characteristics—first-floor elevations for flooding, the number of stories, construction type, foundation type, and the age and condition of the structure for multiple hazards—determine a structure's ability to withstand hazards. In Santa Fe County, much of this type of detailed information is not yet available. Projected loss estimates used in this document are based on 2000 U.S. Census data average structure values of \$237,000. The percentage of potential damage to structures varies depending upon the specific hazard. For example drought will have no impact on residential structures while wildfires typically destroy the entire structure.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Table 1 includes a ranking by the Mitigation Planning Team for the City of Santa Fe and unincorporated Santa Fe County's hazard vulnerability. The hazards were prioritized during the April 29, 2003 Santa Fe County Mitigation Committee Meeting. The hazards were prioritized based on number of occurrences and potential for reoccurrence. Both the city and county rank wildfire and drought as high threats, and floods/flash floods and severe weather as medium threats. Human caused hazards have been ranked as medium in Santa Fe County, low in the City of Santa Fe, and all other potential hazards have been categorized as low for both jurisdictions.

**Table 1: Summary of Jurisdiction's Vulnerability to Hazards**

Wildfire	High	High
Drought	High	High
Floods/ Flash Floods	Medium	Medium
Severe Weather, including Wind, Winter Storms, and Thunderstorms	Medium	Medium
Human-Caused Hazards, including Hazardous Materials Releases, Nuclear Facility Accidents, and Terrorism	Medium	Low
Earthquakes, and Other Hazards, including Landslides/Land Subsidence, Dam Failure, and Volcanoes	Low	Low

Table 2 presents a description of the hazards that were identified, how they were identified, and why they were identified. In 2000, the New Mexico Office of Emergency Management (NMOEM) completed an All Hazards Mitigation Plan for the State. The NMOEM Plan identified a list of 21 hazards that could be encountered in New Mexico. Using the list as a guide, the Planning Team identified hazards likely to occur in Santa Fe County. A questionnaire for residents was also developed using the hazards identified by the Planning Team. As noted, hazard identification involved a combination of input from concerned residents and preliminary research from several New Mexico State resources.

**Table 2: Summary of Hazard Investigations**

<b>Wildfire</b>	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> <li>Residents</li> <li>Consultation with New Mexico Forestry Division</li> </ul>	<ul style="list-style-type: none"> <li>Santa Fe County has experienced several past wildfires, including the Cerro Grande Fire.</li> <li>The New Mexico Forestry Division indicated that there are several yearly forest fires.</li> </ul>
<b>Drought</b>	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> <li>Residents</li> <li>New Mexico Department of Natural Resources</li> </ul>	<ul style="list-style-type: none"> <li>The County has had droughts in the past.</li> <li>Residents indicated that droughts have been a recurring problem.</li> <li>New Mexico, including Santa Fe County, is currently undergoing a dry weather phase.</li> </ul>
<b>Floods, including Flash Floods</b>	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> <li>Identification of previous disaster declarations</li> <li>National Climatic Data Center (NCDC)</li> </ul>	<ul style="list-style-type: none"> <li>There have been several previous flood disaster declarations.</li> <li>Several flash flood events have been recorded in Santa Fe County</li> </ul>
<b>Severe Weather,</b>	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> </ul>	<ul style="list-style-type: none"> <li>Santa Fe County has experienced destructive localized wind events in the recent past.</li> </ul>



## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Hazard	How Identified	Why Identified
Winter Storms	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> </ul>	<ul style="list-style-type: none"> <li>Santa Fe County has experienced severe winters most years. Some storm events have overwhelmed County operations and individual resources</li> </ul>
Human-caused Hazards, including Hazardous Materials Releases, Nuclear Facility Accidents, and Terrorism	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List</li> <li>Review of U.S. Environmental Protection Agency (U.S. EPA) website</li> </ul>	<ul style="list-style-type: none"> <li>Santa Fe County has several facilities that handle or process hazardous materials.</li> <li>There have been previous transportation accidents and hazardous materials spills.</li> <li>Localized terrorist events, including school violence, have occurred in Santa Fe County.</li> <li>The federal and state governments have advised every jurisdiction to consider the terrorism hazard.</li> </ul>
Earthquake	<ul style="list-style-type: none"> <li>NMOEM 2000 All Hazard Plan List USGS seismologic information</li> </ul>	<ul style="list-style-type: none"> <li>Earthquakes have occurred in the State of New Mexico.</li> </ul>
Other Hazards (i.e., landslides/land subsidence, dam failure, and volcanoes)	<ul style="list-style-type: none"> <li>NMOEM All Hazard Plan List</li> </ul>	<ul style="list-style-type: none"> <li>Mudslides/landslides are associated with flash flooding</li> <li>Disaster was included on the State Hazard List</li> </ul>

### HAZARD PROFILES AND VULNERABILITY ASSESSMENT

The remainder of this section presents profiles and vulnerability assessment information for these hazards. The order that these hazards are discussed in the remainder of this report is the order of priority as determined by the Mitigation Planning Team.

#### WILDFIRES



#### OVERVIEW—WILDFIRES IN SANTA FE COUNTY, NEW MEXICO

A wildfire is an uncontrolled fire spreading through vegetative fuels, threatening and possibly consuming structures and other community assets. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. A *wildland* fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. A *wildland-urban interface* fire is a wildfire in an area where structures and other human development meet or intermingle with wildland or vegetative fuels.



## PREVIOUS OCCURRENCES—WILDFIRES

The State of New Mexico Energy, Minerals and Natural Resources Department, Forestry Division lists over 250<sup>1</sup> reports of fires requiring emergency response from 1997 to 2003 in Santa Fe County. Table 3, *Recent Wildfires in Santa Fe County*, shows that approximately 14,000-acres were affected at a direct cost of over \$1 million to the State of New Mexico for firefighting efforts.

**Table 3: Recent Wildfires in Santa Fe County (cumulative totals for each year\*)**

1997	118	Not reported
1998	882	Not reported
1999	126	10,340
2001	29	16,400
2002	13,424	1,132,420
2003	28	15,800
<b>Total*</b>	<b>14,607</b>	<b>\$1,174,960</b>
*Total does not include federal and local funds expended. Source: State of New Mexico Energy, Minerals and Natural Resources Department, Forestry Division.		

In May 2000, one of the worst wildfires in the State of New Mexico occurred when a prescribed burn went out of control in Santa Fe County. The fire, which is now known as the Cerro Grande Fire of 2000, spread quickly to neighboring Los Alamos County. More than 48,000 acres were burned, with 350 families losing their homes. The fire was declared a presidential disaster and a subsequent act of Congress created the Cerro Grande Fire Assistance Program that has paid out more than \$243 million in fire related claims as of November 13, 2001 (FEMA, 2001). The damage to the community continued after the fire ended as increased stormwater runoff from rainfall events rushed down fire-scoured mountains and hillsides, producing mudslides, erosion, and silting that wiped out roads and utilities.

More recently, unhealthy forest conditions, recent drought conditions, and a bark beetle infestation prompted the Santa Fe County Commission to declare a State of Emergency on February 25, 2003. The dead and dying trees combined with years of drought created an extreme fire hazard for the community.

## HAZARD PROFILE—WILDFIRES

### Hazard Characteristics

Wildfires can occur at any time of the year, but they mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can spread out of control. Human carelessness, negligence, and ignorance cause most wildfires. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion.

There are three burn types: surface, ground, and crown fires. Any fire may be a combination of the three. A surface burn consumes the ground cover and is limited to the surface, a ground fire will burn roots and plants beneath the surface in the soil and the crown fire will burn the tops of trees and vegetation (Cohen, 2003).

<sup>1</sup>According to the Santa Fe County Fire Marshall, this number is underrepresented by approximately 50%.

Potential aftermath of wildfires includes severe erosion, and the silting of streambeds and reservoirs, resulting in damage to the watershed, and flooding due to a loss of ground cover.

### **Severity and Probability of Occurrence**

Forestland in Santa Fe County is extremely susceptible to wildfire due to the arid climate, recent drought, and degraded timber stands. In addition, much of the heavily forested areas in Santa Fe County are located on steep slopes, which aid in the spread of fires and add to the difficulty of fighting a wildfire. Several factors contribute to the degradation of forests in the Southwest:

- ✓ Increased tree density and decreased grass and forb (broad-leaved herbs that grow in fields, prairies, or meadows) cover.
- ✓ Past forest fire suppression practices and livestock overgrazing that resulted in the unnaturally heavy accumulation of live and dead vegetation and led to "doghair" thickets of ponderosa pine trees.
- ✓ Early logging activity in different regions that creates artificial fuel breaks, alters the local microclimate, and modifies forest composition and age structure (Gilmore, 1998).

As a result, wildland-urban interface areas of Santa Fe County contain tree densities that are several times greater than what is considered to be a healthy forest, with thick stands of stunted trees and large accumulations of fuels. The higher-than-normal tree densities and accumulation of fuels present a significant continued threat of wildfire to structures located in the wildland-urban interface area.

## **VULNERABILITY ASSESSMENT—WILDFIRES**

### **Existing Community Assets**

In February 2001, the Santa Fe County Fire Department and the New Mexico State Forestry Division completed a Wildland-Urban Interface Area Inventory Assessment for Santa Fe County. The inventory did not include the incorporated area of City of Santa Fe. The inventory identified 43 areas of wildland-urban interface within the County. Each of the areas was assessed and rated based on the following conditions:

- ✓ Observed condition of vegetative fuel,
- ✓ Access,
- ✓ Building materials,
- ✓ Quality of defensible space,
- ✓ Water availability,
- ✓ Terrain,
- ✓ Proximity to the nearest fire department,
- ✓ Extent of the area,
- ✓ Housing density, and
- ✓ Potential for increase and special hazards

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

A map from the Santa Fe County Wildland-Urban Interface Area Inventory Assessment showing locations of the interface areas is included at the end of this section (see Plate 3). Copies of the full report are available from the Santa Fe County Fire Department.

This analysis shows that future wildfires could cause substantial loss of property, along with direct and indirect economic effects for residents and community businesses. Table 4 shows that currently, over 21,000 structures are located in areas defined as high fire danger.

**Table 4: Potential Fire Damage**

Fire	High Fire
Population affected	83,664
Fire area square miles	156
% of County population	64
# of housing units	21,114
Critical facilities	42
Assets at Risk <sup>1</sup>	\$5,533,682,649

<sup>1</sup> Assumes mean structure values per 2000 US Census.

Three communities in Santa Fe County have been identified by the New Mexico State Forestry Division as part of the 20 most vulnerable wildland-urban interface communities in the State. The Santa Fe Watershed, the Pecos area and the East Mountain area are shown on Figure 2. Risk factors used to identify the communities include: fire behavior potential; risk to social, cultural, and community resources; and fire protection capabilities of the communities.



Source: (State Forestry Division, New Mexico Energy, Minerals and Natural Resources Department).

**Figure 2. The 20 Most Vulnerable Wildland-Urban Interface Communities in New Mexico**

### **Critical Facilities**

Forty-two critical facilities within Santa Fe County have been identified as vulnerable to wildfire. The total includes 13 fire stations, three hospitals or medical clinics, two nursing homes, four police stations, and 20 schools. In addition, 15 historical places are in the high-risk category. Due to security issues, the names of specific facilities vulnerable to wildfire are not included in this document. However, Santa Fe County maintains the list at its Emergency Operations Office. The Santa Fe watershed that supplies approximately 40% of the City of Santa Fe's water is located in one of the most vulnerable areas of the State. A wildfire in the watershed would threaten the water supply for the City.

### **Future Development Trends**

In recent years, New Mexico, and Santa Fe County in particular have experienced an increase in population, especially in areas located in or near forest/range lands. Increasing residential development into wildland-urban interface areas will likely increase the occurrence of human-caused fires and the number of people and property at risk due to wildfire. As picturesque forested lands are transformed into residential areas, the wildland-urban interface area increases, creating more risk for both the forest and the population residing there.

There are currently 2,717 undeveloped acres in the County identified as high wildfire vulnerability. Assuming 1-acre lot sizes, this translates into between 2,000-3,000 developable lots in the County. In the absence of data regarding the amount of developable, vacant land, the aforementioned numbers are a rough estimate of the maximum potential for future development, although it is unlikely that the entire area is developable.

Recent enactment of a wildland-urban interface fire code in the County will help to mitigate the impact of wildfires on vulnerable residential areas and make new subdivisions more fire resistant. Traditional tactics for preventing wildfires have focused on fire suppression. Rather than trying to stop all wildfires, mitigation measures included in the new code focus on reducing fuel loads and creating defensible spaces to reduce structural damage caused by wildfires. More specific mitigation goals and actions are detailed in Sections 2 and 3 of this document.

## **CONCLUSIONS—WILDFIRE**

### **Summary of Hazard Identification and Vulnerability Assessment**

Past experience has proven that wildfires can be a significant threat to the citizens, structures, infrastructure, and natural resources within Santa Fe County. Per Table 3, wildfires in Santa Fe County can affect more than 21,000 units, with an aggregate value of over \$5 billion. Furthermore, there are 42 critical facilities as well as the Santa Fe water supply within the high-risk wildfire areas. As a result, the Mitigation Planning Team has identified the wildfire hazard as the first priority in the Plan.

### **What Can Be Mitigated?**

Mitigation options for wildland fire need to address not only the management of fuels, but also the potential for growing population in wildfire threat areas.

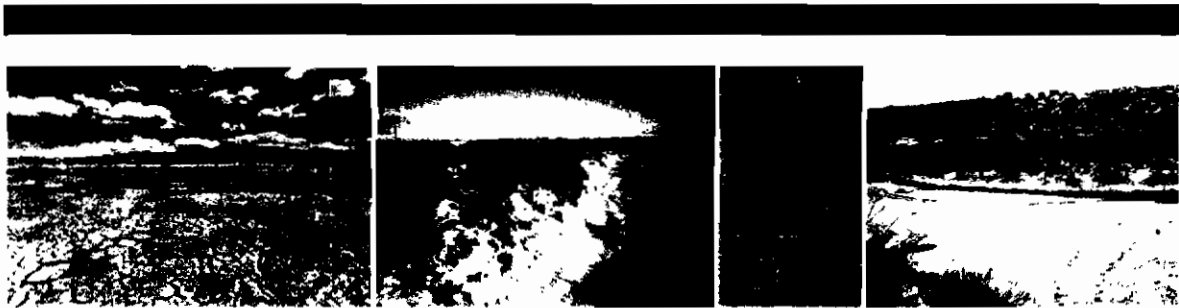
Traditional tactics for preventing wildfires have focused on fire suppression. Rather than trying to stop all wildfires, mitigation measures such as reducing fuel loads and creating defensible

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

spaces aim to reduce the damage caused by wildfires. More specific mitigation goals and actions are detailed in Sections two and three of this document.

### Data Limitations

Existing data sources did not allow the Mitigation Planning Team to determine the number or location of properties in the wildland-urban interface within the City of Santa Fe. Additional types of information that would be most useful would include a more detailed assessment of the vegetation adjacent to specific structures, the amount of fuel in the immediate vicinity and details regarding the construction of the structures.

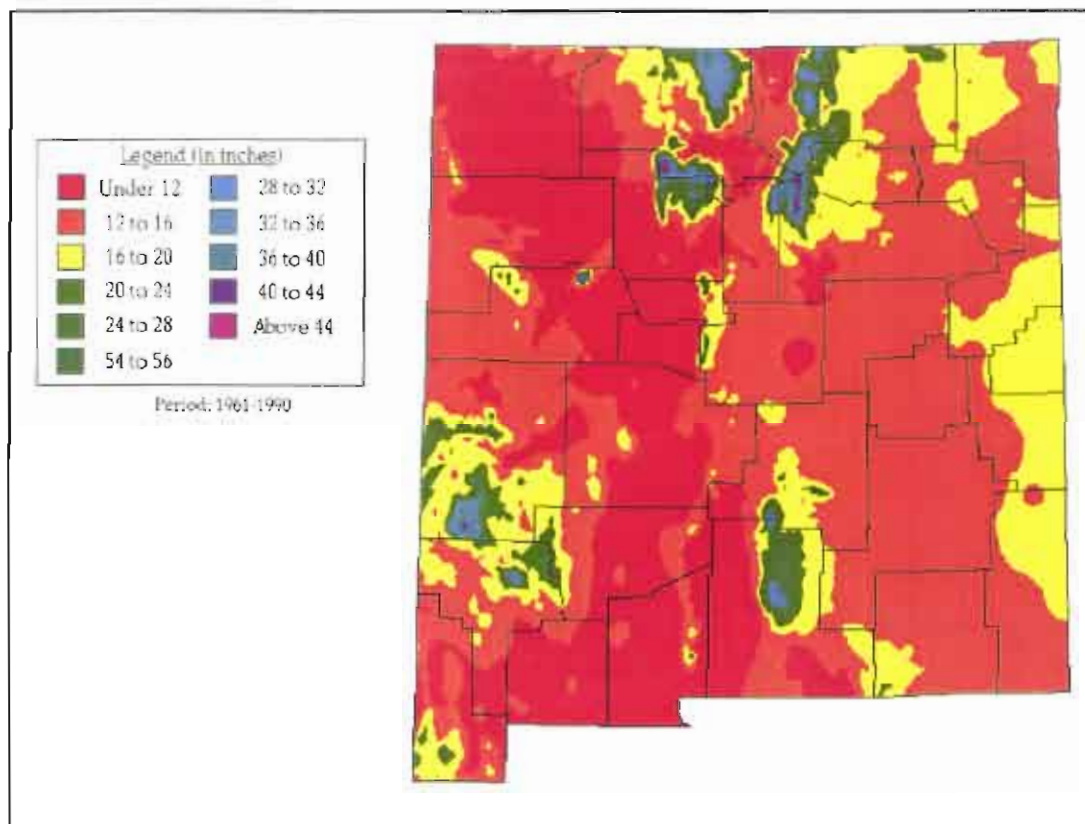


### OVERVIEW—DROUGHT IN SANTA FE COUNTY, NEW MEXICO

A drought is a period of prolonged dryness that depletes both ground and surface water. Droughts are common in New Mexico and Santa Fe County. The climate in Santa Fe County is arid with average annual precipitation ranges from less than 12 inches for the majority of the County up to 40 inches in the mountainous areas in the eastern part of the County, as seen on Figure 3. This normally meager annual precipitation causes extended periods of scant flow in the State's rivers, and any measurable decrease in precipitation rates can create drought conditions in a relatively short period of time.

### PREVIOUS OCCURRENCES—DROUGHT

New Mexico has always known drought. Archeological records indicate that drought has led to the collapse of early civilizations in New Mexico, most notably the abandonment of Chaco Canyon by the Anasazi around 1300 A.D. (Annenberg/CPB Learner.Org). In the last 100 years, New Mexico has suffered from four devastating periods of drought; 1900-1910, 1931-1941, 1942-1956, and 1974-1979. The last short duration drought was in 1996 (New Mexico Drought Task Force, May 2002). Due to the cyclical nature of droughts in New Mexico the county may be entering another period of drought. The City of Santa Fe is currently in Stage two Water Shortage Emergency (New Mexico Natural Resources, 2003). This stage contains restrictions on landscape watering, fines for water use violations and drought emergency surcharges. Other communities in Santa Fe County are experiencing the effects of drought conditions, particularly the Edgewood and El Dorado areas, with some of the water systems experiencing pronounced drops in groundwater levels (*Albuquerque Journal*, 2003).



Source: [www.wrcc.dri.edu/pcpm/nm](http://www.wrcc.dri.edu/pcpm/nm).

**Figure 3: New Mexico Average Annual Precipitation**

The U.S. Geological Survey (USGS) has established gauging at many waterway locations to gather data on annual stream flows. Three locations around Santa Fe County were examined for times of low stream flows, indicating a drought period. The gauging station data vary between the locations but generally show drought periods during the approximate periods of 1930–1936, 1946–1956, and 1969–1977. One station along the Rio Grande contained data back to 1896 and a low stream flow period is indicated at the station from approximately 1898–1902. See gauging station data at <http://waterdata.usgs.gov/nm/nwis/annual>.

## HAZARD PROFILE—DROUGHT

### Hazard Characteristics

A drought is a period of prolonged dryness that depletes groundwater and surface-water yields. Given that drought is a slow-moving hazard without an event to mark its arrival, a one-time drought can be difficult to define.

### Severity and Probability of Occurrence

When drought begins, agriculture is usually first to be affected because of its heavy dependence on stored moisture in the soil. Soil moisture can be rapidly depleted during extended dry periods. Dry land farming and ranching are most at risk from drought. Impact on these activities can be seen during a short-term drought. The drought during the 1950s greatly affected non-irrigated agricultural areas in New Mexico. Up to that time, many farmers still practiced dry land

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

farming for crops such as wheat and beans. Wheat production in the 1950s was the smallest since 1909 (Cockril, 1959). By the end of the 1950s, approximately 2000 wells had been drilled to supplement surface-water irrigation allotments that had decreased due to the drought ([www.nm.water.usgs/drought](http://www.nm.water.usgs/drought)). Since the 1950s, most agricultural production in New Mexico has been irrigated with surface water or groundwater, thus alleviating the severity of short-term drought conditions (see Table 5).

**Table 5: Drought Severity Classification**

<b>Alert</b>	<b>Mild Drought</b>	Abnormally Dry—Begins with short-term dryness causing slow-growing pastures or crops and above average fire risk. This period ends with lingering water deficits with pastures and crops not fully recovered. Could indicate less than 75% of normal precipitation for three months.
<b>Warning</b>	<b>Moderate Drought</b>	Some damage to pastures and crops; high fire risk; streams, reservoirs, or wells low; and water shortages developing or imminent with voluntary water use restrictions requested. Could indicate less than 70% of normal precipitation for three months.
<b>Emergency</b>	<b>Severe Drought</b>	Apparent crop or pasture losses; fire risk very high; water shortages common; and water restrictions imposed. Could indicate less than 65% of normal precipitation for six months.

Water uses depending on in-stream flows, such as irrigated farms; aquatic, wetland, and riparian environmental communities and recreational uses, are at high risk, but less exposed. Urban and agricultural water uses that rely on reservoirs and wells that are not dependent on high rates of aquifer recharge are the last to feel the effects (New Mexico Drought Task Force, 2002).

Drought severity is a function of the types of resources dependent upon precipitation, the duration of dry conditions, and the quantity of precipitation received as the drought ends. For example, dry conditions that persist for three to six months may have little impact on stored surface or subsurface water supplies, but can rapidly deplete soil moisture.

Figure 4 shows, as of February 2003, Santa Fe County is designated as emergency: severe drought (New Mexico Department of Natural Resources, 2003).





Source: NM Natural Conservation & Resources (<http://www.nm.nrcs.usda.gov>) and U.S. Drought Monitor (<http://drought.unl.edu>) websites

**Figure 4: New Mexico Drought Map**  
(see Table 5 for description of Drought Severity Classifications)

## VULNERABILITY ASSESSMENT—DROUGHT

### Existing Community Assets

When droughts occur, they can have significant consequences for public and rural water supplies, human and livestock consumption, water quality, natural soil water or irrigation water for agriculture, forests, wild land fire fighting, and navigation and recreation. Those who rely on surface water (reservoirs and lakes) and subsurface water (ground water), for example, are usually the last to be affected. A short-term drought that persists for three to six months may have little impact on these sectors, depending on the characteristics of the hydrologic system and water use requirements. For droughts of longer duration, impacts may disappear quickly in the agricultural sector, because rain quickly replenishes soil moisture, but linger for months or even years in other sectors dependent on stored surface or subsurface supplies. Ground water users, often the last to be affected by drought during its onset, may also be last to experience a return to normal water levels. The length of the recovery period is a function of the intensity of the drought, its length, and the quantity of precipitation received as the drought ends.

There are 127 farms in Santa Fe County, with a total of 651,977 acres in agricultural use. The top five farm commodities of Santa Fe County are cattle and calves, hay silage, nursery crops, horses and ponies, and vegetables. The market value of agricultural products sold in Santa Fe County for 2000 was over \$12,000,000 (New Mexico Economic Development Department, 2003). Major portions of the population in Santa Fe County rely on on-site wells and private water systems. These smaller systems are more vulnerable to water shortages as they generally have limited resources to monitor groundwater levels and maintain effective systems.

### **Critical Facilities**

Critical facilities, in particular fire-fighting facilities, must have reliable access to water for fire suppression. Droughts can impact their access to sufficient quantities of surface water and ground water. Other critical facilities such as schools and hospitals may experience restrictions on potable water consumption during periods of severe drought.

### **Future Development Trends**

As business and population growth continues in Santa Fe County, the potential impacts of prolonged drought grow significantly. Continued residential housing and commercial development in Santa Fe and the surrounding areas will be difficult to sustain with the limited water resources currently available to the County and will require additional water rights and drilling new production wells. A continuation of the current drought and lower water tables will require deeper wells for existing production. Deeper groundwater also requires more intensive treatment to filter out arsenic and minerals. With or without a prolonged drought, agricultural users of water in the County will come under increasing pressure to sell or lease water rights to developing urban areas.

Santa Fe County has been proactive in addressing the limited water sources of the County. Beginning in 1980, the County completed the first Santa Fe County Growth Management Plan that emphasizes carefully controlled growth with a special respect for water availability. New residential subdivisions in the County must be able to demonstrate a 75-year supply of water for projected water demand as a condition of approval. As detailed below, the County has taken several measures in recent years to reduce overall water consumption and to mandate water conservation during periods of drought.

## **CONCLUSIONS—DROUGHT**

### **Summary of Hazard Identification and Vulnerability Assessment**

All of Santa Fe County is currently in an emergency drought situation. The consequences of a drought on the arid climate of Santa Fe County are quickly felt. Agriculture and ranching dependent on rainfall are affected within weeks of reduced precipitation. A moderate to severe drought threatens groundwater supplies that most of the County's residents rely upon for potable water.

A prolonged drought also increases the probability of other hazards. Forests become more susceptible to wildfires and native vegetation dies, leaving exposed soils susceptible to erosion, flash flooding, and dust storms. The Mitigation Planning Team has identified drought as a priority hazard in Santa Fe County.

### **What Can Be Mitigated?**

The best practices include early assessment, public education and water conservation programs. Identifying the first phases of the drought and reacting with water conservation at the earliest time will help to mitigate drought later in the disaster. In the future, there is also the potential for limiting population growth and development dependent on groundwater. Mitigation management for drought is a proactive process. However, most of the process has been at the state level since there is no U.S. water conservation or drought policy.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Santa Fe County has taken steps to address water conservation and reduce the severity of drought by implementing a Water Conservation Ordinance (No. 2002-13). This ordinance mandates water conservation measures for residents and businesses within Santa Fe County. Outdoor conservation as well as indoor conservation measures are addressed in the ordinance. Water waste is defined in the ordinance and enforcement and penalties are provided to ensure adherence to the ordinance. In addition to the water conservation ordinance, Santa Fe County adopted resolution number 2000-91 implementing water conservation measures in stages to correspond with the severity of drought conditions. The first stage of conservation is the actual resolution implementing a voluntary water conservation plan. Stage two and three list increasingly mandatory water use restrictions, which are listed in Table 6. Stage four has been drafted but has not yet been adopted by the County. As recently as April 2003, the County was in Stage three of the mandatory water use restrictions.

**Table 6: Santa Fe County Mandatory Water Use Restrictions, Stages 2 and 3**

	<ul style="list-style-type: none"><li>• Three days per week outdoor watering restrictions:<ul style="list-style-type: none"><li>- Odd addresses: Tuesday, Thursday, and Saturday</li><li>- Even addresses: Wednesday, Friday and Sunday</li></ul></li><li>• No new turf seed or sod may be planted</li><li>• Water is not allowed to leave intended irrigated area or property</li><li>• Washing hard surfaces (e.g. patios, driveways, etc.) is prohibited</li><li>• Vehicle washing at residences is prohibited</li></ul>
Stage 2	<ul style="list-style-type: none"><li>• Only recirculating ornamental fountains, pools and spas allowed</li><li>• Water use violation fees<ul style="list-style-type: none"><li>- Violating the restrictions described above and other restrictions result in citations:<ul style="list-style-type: none"><li>- First citation: \$20 Second citation: \$50 Third and subsequent citations: \$100</li><li>- Water service may be disconnected for repeat violators</li></ul></li></ul></li><li>• Drought emergency surcharge:<ul style="list-style-type: none"><li>- Residential: \$15 per 1000 gallons for all usage above 10,000 gallons a month \$25 per 1000 gallons for all usage above 20,000 gallons a month</li><li>- Commercial: \$2 per 1000 gallons on all usage</li></ul></li><li>• Vehicle washing at residences is prohibited. Vehicle washing at commercial car washes is limited to once per month.</li><li>• One day per week outdoor watering restriction:<ul style="list-style-type: none"><li>• Odd addresses: Tuesday</li><li>• Even addresses: Friday</li></ul></li><li>• No new turf seed or sod may be planted</li><li>• All swimming pools must be covered when not in use</li><li>• The use of ornamental fountains is prohibited</li></ul>
Stage 3	<ul style="list-style-type: none"><li>• Lodging facilities shall not change the sheets and towels more than once every four days for guests staying more than one night</li><li>• Water use violation fees<ul style="list-style-type: none"><li>- Violating the restrictions described above and other restrictions results in fees being placed on the customer's water bill:<ul style="list-style-type: none"><li>- First violation: \$20, Second violation: \$50, Third violation: \$100, Fourth and subsequent violations: \$200</li></ul></li><li>- Water service may be suspended for repeat violators</li></ul></li><li>• Drought emergency surcharge:<ul style="list-style-type: none"><li>- Residential: \$15 per 1000 gallons for all usage above 10,000 gallons a month \$25 per 1000 gallons for all usage above 20,000 gallons a month</li><li>- Commercial: \$2 per 1000 gallons on all usage</li></ul></li></ul>

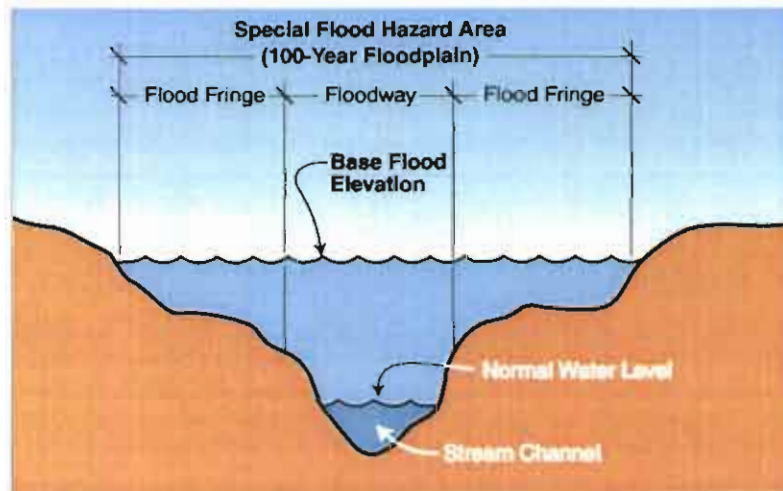
### Data Limitations

It is difficult to determine when a drought hazard event starts. In most cases, the dry weather conditions that cause droughts will need to persist for a while before it becomes clear that drought conditions exist. There are also data limitations in determining the available quantity and quality of groundwater.



### OVERVIEW—FLASH FLOODS IN SANTA FE COUNTY, NEW MEXICO

Nationwide, hundreds of floods occur each year, making flooding one of the most common hazards in all 50 states and U.S. territories. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. The majority of flood events in the U.S. involve inundation of floodplains (see Figure 5) associated with rivers and streams and shoreline inundation along lakes and coastlines.



Source: *Understanding Your Risks* – FEMA Publication 386-2, page 2-12.

**Figure 5: Definition Sketch for Floodplains**

This type of flooding typically results from large-scale weather systems generating prolonged rainfall or from locally intense storms or from snowmelt. For the purposes of this report, this type of flooding is referred to as "riverine flooding" and is characterized by a gradual and predictable rise in a river or stream due to persistent precipitation. After the stream or river overflows its banks, the land nearby remains under water for an extended period of time.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Although the State of New Mexico and Santa Fe County experience riverine flooding, flash flooding is a more common and more damaging type of flooding. Flash floods are aptly named: they occur suddenly after a brief but intense downpour; they move quickly and end abruptly. Although the duration of these events is usually brief, the damages can be quite severe. People are often surprised at how quickly a normally dry arroyo can become a raging torrent. Flash floods are the primary weather-related killer with around 140 deaths recorded in the U.S. each year. Flash floods are common and frequent in New Mexico, and, as a result, New Mexico has the tenth highest flash flood fatality rate in the nation.

Flash flooding also produces erosion and mud and debris flows that damage homes and infrastructure. Flash floods result as a secondary effect from other types of disasters, including large wildfires and dam breaks. Wildfires remove vegetative cover and alter soil characteristics, increasing the quantity and velocity of stormwater runoff. Banks and soils previously stabilized by vegetation are quickly eroded by rainwater on unprotected soils. Dam breaks can quickly release large quantities of water into receiving drainage ways.

### PREVIOUS OCCURRENCES—FLASH FLOODS

New Mexico has a long history of flash flooding problems. Many minor flash flood events occur each year during New Mexico's summer monsoon season. Due to the small scale and localized nature of these events, no consistent records are available.

Table 7 lists some of the significant flash flood events in Santa Fe County in the last 10 years. Table 7 is compiled from a list of local newspaper articles and the National Oceanic and Atmospheric Administration's web site; [www.ncdc.noaa.cgi-win](http://www.ncdc.noaa.cgi-win).

**Table 7: Significant Flash Flood Events in Santa Fe County**

Month/Year	Location	Damage/Impact	Notes
August 1995	Santa Fe River south of Santa Fe	Unknown	Flooding trapped three men in a flooded arroyo- debris and mud on road
July 1996	2.5 miles west of SR 599 and CR 56	\$33,935	Erosion and loss of embankment and pavement
July 1996	3.3 miles west of SR 599 and CR 56	\$33,744	Erosion with loss of embankment and pavement, damaged culverts
July 1996	3.7 miles west of SR 599 and CR 56	\$103,337	Bridge
July 1996	1.5 miles north of SR 599 and CR 56	\$95,328	Culvert s
July 1996	02 miles north of Camino Carlos Rael and Agua Fria Rd at the Santa Fe River	\$34,135	Damage to grade control structure, sewer manhole, and embankment
August 1996	4 miles southwest of Santa Fe along Hwy 14	\$90,000	Homes
June 1997	Santa Fe River south of the Santa Fe airport	Unknown	Roads
July 1997	Throughout Santa Fe along the Santa Fe River	Unknown	Homes and businesses
July 1997	5 miles southwest of the Santa Fe airport	Unknown	Roads
August 1997	Village of Arroyo Seco	\$250,000	Roads and bridges
July 1998	City of Santa Fe	Unknown	Man injured
August 1999	5 miles west of Edgewood/Tijeras	Unknown	Roads
July 2000	San Ildefonso Pueblo	Unknown	Road and infrastructure

The Planning Team identified several areas of recent and historical flooding:

- ✓ Along the Santa Fe River within the City of Santa Fe
- ✓ The La Cienega area south of Santa Fe



## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

- ✓ Nambe River/Santa Cruz River on SR 76
- ✓ Chimayo and Española areas

FEMA's 1988 Flood Insurance Study identifies historical flooding around the Santa Fe River, Arroyo Hondo and Arroyo de Los Chamisos. The anticipated 100-year discharges are confined to the main channel of the Santa Fe River in the County where most of the development is on high ground.

The Cerro Grande Fire in 2000 and additional wildfires in the 2001 and 2002 fire seasons created an especially dangerous risk of flash flooding from summer thunderstorms and heavy rains. Catastrophic wildfires like these events remove large amounts of vegetative cover, exposing hydrophobic soils (soils unable to absorb moisture) that allow high runoff and increased flooding. These conditions will persist for several years until vegetation and soil are re-established to pre-fire conditions.

### HAZARD PROFILE—FLASH FLOODS

#### Hazard Characteristics

Flash floods occur in developed areas from intense rainfall flowing into overburdened dry riverbeds, arroyos and man-made stormwater structures. Flash flooding in undeveloped areas is likely to occur when heavy rains fall on impervious desert soils or previously saturated soils. Summer thunderstorms that deposited large quantities of rainfall over a short period of time have also produced flash flooding. Flash floods peak during the Southwest monsoon season of July and August.

Flash floods are more likely to occur in places with steep slopes and narrow stream valleys, and along small tributary streams. In urban areas, parking lots and other impervious surfaces that shed water rapidly contribute to flash floods. In rugged, hilly, and steep terrain, the high-velocity flows and short warning time make flash floods hazardous and very destructive.

#### Severity and Probability of Occurrence

Santa Fe County has several conditions that may contribute to flash floods and exacerbate their effects:

- ✓ Steep Slopes: Santa Fe County has a moderate to steeply sloping terrain that can contribute to flash flooding since runoff reaches the receiving arroyos and rivers more rapidly over steeper terrain. Flood studies conducted by FEMA indicate that flood velocities along the Santa Fe River can reach 22 feet/second. Flows of 5 feet/second are considered high velocity.
- ✓ Obstructions: During floods, obstructions can block flood flow and trap debris, damming floodwaters and potentially causing increased flooding up hill from the obstructions.
- ✓ Soils: Soils throughout much of Santa Fe County are derived from unconsolidated sands, silts and clay of the underlying Tesuque Formation. As a result, soils are typically fine-grained, and have low infiltration rates and high runoff potential. Sparse vegetative cover combines with high runoff soil potential to result in significant flooding hazards in ephemeral washes (not continuously containing water) and adjacent areas. Accelerated soil erosion has created problems ranging from loss of productive agricultural soil to displacement of human structures to sediment buildup in water reservoirs. Water erosion is one of the most

common geologic phenomena. The detachment and transportation of soil particles by water can cause sheet erosion, rill erosion or gully erosion. Sheet erosion occurs with soil being removed in a uniform manner across the surface but is often accompanied by tiny channels cut into the surface creating rill erosion. Where the volume of runoff water is further concentrated the formation of larger channels or gullies may occur within the landscape creating gully erosion. Rill and gully erosion can cause serious land use problems. Storm events in New Mexico can result in flashfloods and can create serious rill and gully erosion. Erosion damage from flashflooding includes access disruption, road closures, driving hazards, drainage facility damage and blockage, sedimentation, etc. Erosion can occur rapidly during a storm event or can occur over time due to minor storms or breaks in water lines.

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed as the percentage chance that a flood of a specific extent will occur in any given year.

Table 8 shows a range of flood recurrence intervals and their probabilities of occurrence. Every year, a 10-year flood has a greater likelihood of occurring (10% chance) than a 100-year flood (one-percent chance). The extent of flooding associated with a one percent annual probability of occurrence—the base flood—is used as the regulatory boundary by a number of federal, state, and local agencies. Also referred to as the Special Flood Hazard Area (see Figure 5), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities since many communities have maps that show the extent of the base flood and the likely depths that will be experienced. The base flood is often referred to as the 100-year flood. Since its one-percent probability of occurring in any one year implies a recurrence interval of 100 years, this is often mistaken to have a literal meaning of “once every 100 years.” Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather, it reflects the probability that over a long period of time, a flood of that magnitude should occur in only one-percent of all years. Smaller floods occur more often than larger (deeper and more widespread) floods.

**Table 8: Flood Probability Terms**

10 year	10%
50 year	2%
100 year	1%
500 year	0.2%

The determination of the extent of the base flood for Santa Fe County is assumed to account for flash flooding events as well. Therefore, the base flood extent is used for this study as an approximation of the area that may be affected by a significant flash flood of that recurrence interval. The location of the flood hazard areas in the County is shown on the accompanying floodplain maps (see Plates 4 and 5).



**VULNERABILITY ASSESSMENT—FLASH FLOODS****Existing Community Assets**

Flood vulnerability is described in terms of the community assets that lie in the path of floods. There are 345 structures within the floodplain in Santa Fe County and 1321 structures within the City of Santa Fe. The Town of Edgewood had no structures located within the 100-year floodplain (see Table 9). The flood hazard vulnerability assessment for Santa Fe County focused on the base flood elevation, though floods of both greater and lesser flood depths are possible. Vulnerability to flash floods is difficult to determine because local terrain, soil conditions, and construction play a role in how much storm water is able to run off, percolate into the soil, or cause flash flooding.

**Table 9: Structures Identified in 100-year Floodplain Santa Fe County**

Santa Fe County	4171	345
City of Santa Fe	2677	1321*
Edgewood	N/A	N/A
*Estimated using 2000 U.S. Census data		

**Critical Facilities**

Two historical places are listed within the 100-year floodplain. No other critical facilities are located in the Santa Fe County floodplain.

**Future Development Trends**

There are 12 vacant lots within the 100-year floodplain. Santa Fe County's Comprehensive Growth Plan and Land Use Ordinances prohibit construction in the floodways, arroyos and other natural drainage ways. However, lots that were platted prior to the adoption of the Comprehensive Plan may be developed with the requirement that the building be either elevated above the floodplain level or dry-flood proofed.

**CONCLUSIONS—FLASH FLOODS**

Flash floods have been and will continue to be a significant threat to the economic and social well being of selected areas of the County. The municipalities, in particular, the City of Santa Fe, have relatively more population and economic assets that are vulnerable to flood damages. Exacerbating the effects of flooding in the County are steep slopes, unstable desert soils, and obstructions in the floodplain.

Due to the vulnerability of the County to flood/flash flood events, the Santa Fe County Hazard Mitigation Team has identified flash flood hazard mitigation as one of its priorities.

**What Can Be Mitigated?**

Determining the aspects of Santa Fe County flood vulnerability that can be mitigated requires a review of the causal factors for floods and the assets that can be affected. In Santa Fe County, most flash flood events result in direct damage to structures, infrastructure and erosion in developed areas. As a result, available alternatives for mitigation actions should focus on

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

property protection, corrective measures for drainage and erosion in developed areas and future development in the municipalities.

### Data Limitations

The flood vulnerability analysis has the following limitations:

Flash Floods Predictability: The location and occurrence of flash floods are difficult to predict and dependent on local conditions of terrain, land use, and percent of impervious cover, etc.

Data for Structures—Attributes: The Santa Fe County Tax Assessor's office has not developed a detailed property database with the information necessary to determine the losses possible to flood-vulnerable structures. Replacement value (the cost to rebuild) is a necessary component in estimating the dollar amount of losses in a flood and, when coupled with a range of flood probabilities from the 10-year to 500-year flood depths, can help in describing the benefits and costs of mitigation actions in monetary terms. Information such as the first floor elevations, number of stories, the foundation type, and construction type of structures was not readily available in Santa Fe County at the time this Plan was developed.

Data for Structures—Coverage: The figures for City of Santa Fe homes and businesses vulnerable to flood in Table 9 are based on estimates from 2000 U.S. Census Tract figures, which does not provide an adequate basis to perform detailed risk assessments.



### OVERVIEW—SEVERE WEATHER IN SANTA FE COUNTY, NEW MEXICO

Santa Fe County experiences some form of severe weather activity annually based upon seasonal meteorological patterns and local topographical conditions. It is susceptible to a full range of severe weather conditions, including high winds, substantial rainfall, thunderstorms, dangerous lightning, fog, dust storms, hail, drought, and periodic temperature extremes. All areas of Santa Fe County are susceptible to severe weather conditions, although local topography, such as elevation and land contours, plays a significant part in how weather affects a particular area. At the time of storm occurrence, one community may experience severe damage while another, located nearby, escapes with minimal impact.

### PREVIOUS OCCURRENCES—SEVERE WEATHER

Between 1950 and 2000, the National Climatic Data Center (NCDC) reported 14 hazardous wind events in Santa Fe County with an average speed of 62 mph. These events caused approximately \$36,000 in reported damage and two injuries. It is not uncommon for high wind events, particularly in March, April, and May, to exceed 60 mph and on occasion reach up to 72 mph.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

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Thunderstorm events—tornado, hail, and lightning—also affect Santa Fe County. Nineteen weak tornadoes were reported in Santa Fe County between 1956 and 2002, all at or below an F1 magnitude on the Fujita Scale. Seven people were injured or killed throughout New Mexico between 1995 and 2003 from lightning strikes. Hail is responsible for a considerable percentage of property and crop damage across New Mexico.

### HAZARD PROFILE—SEVERE WEATHER

#### Hazard Characteristics

Thunderstorms are responsible for much of the severe weather across New Mexico. The storms are capable of producing lightning, flash flood events, hail, tornadoes, and strong winds (see “Flash Floods” subsection of this report for more information about flooding in Santa Fe County). The thunderstorm season in New Mexico is well defined, from early July through September. Thunderstorms are an almost daily occurrence during July and August, especially over the northwest and north central mountains of New Mexico, an area that includes Santa Fe County.

Lightning usually occurs as a result of the thunderstorms that move through New Mexico during the summer months, with peak lightning strikes occurring in July and August. Lightning does not normally cause significant damage to property, however, it is responsible for numerous power outages and is also the leading cause of weather related injuries and fatalities in New Mexico.

Hail ranks as the most frequent type of severe weather in New Mexico, and is responsible for a considerable percentage of property and crop damage. Damaging or severe hail (0.75 to 2.00 inches) is most common in May and June, as is very large hail (over 2.00 inches); however, a significant amount of hail is also reported from July through September.

Tornadoes are not a common occurrence in Santa Fe County. While the magnitude and location of tornadoes are unpredictable, those that have occurred in Santa Fe County in the past 30 years have been classified as low intensity (F0 and F1) and have resulted in minimal damage. The Fujita scale of tornado intensity (see Table 10) shows that tornadoes at the F0 classification cause light damage to chimneys, tree branches, and sign boards. Tornadoes of F1 magnitude can cause moderate damage to road surfaces, automobiles, and mobile homes.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Table 10: Fujita Tornado Measurement Scale

Category	Wind Speed (Fastest mile wind speed [mph])	3-Sec Gust Wind Speed (mph)	Examples of Possible Damage	Number in Santa Fe County	% of Santa Fe County Tornadoes
F0	Gale 40-72	45-77	Light damage. Some damage to chimneys, break branches off trees; push over shallow-rooted trees, damage to sign boards.	12	63%
F1	Moderate 73-112	78-118	Moderate damage. Peel surface off roofs, mobile homes pushed off foundations or overturned; moving autos pushed off roads.	4	21%
F2	Significant 113-157	119-163	Considerable damage. Roofs torn off frame houses, mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.	0	0%
F3	Severe 158-206	164-210	Severe damage. Roofs and some walls torn off well constructed houses, trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.	0	0%
F4	Devastating 207-260	211-262	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	0	0%
F5	Incredible 261-318	263+	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked; incredible phenomena will occur.	0	0%
Tornado of undetermined intensity				3	16%
Total tornadoes in Santa Fe County, 1956-2002				19	

### Severity and Probability of Occurrence

High winds occur frequently in Santa Fe County. According to the "Design Wind Speed Map for Community Shelters" in Figure 6, Santa Fe County lies within wind speed Zone II, with possible extreme wind speeds of 160 mph and an annual probability of exceedance of .02 (i.e., 50 year mean recurrence interval).

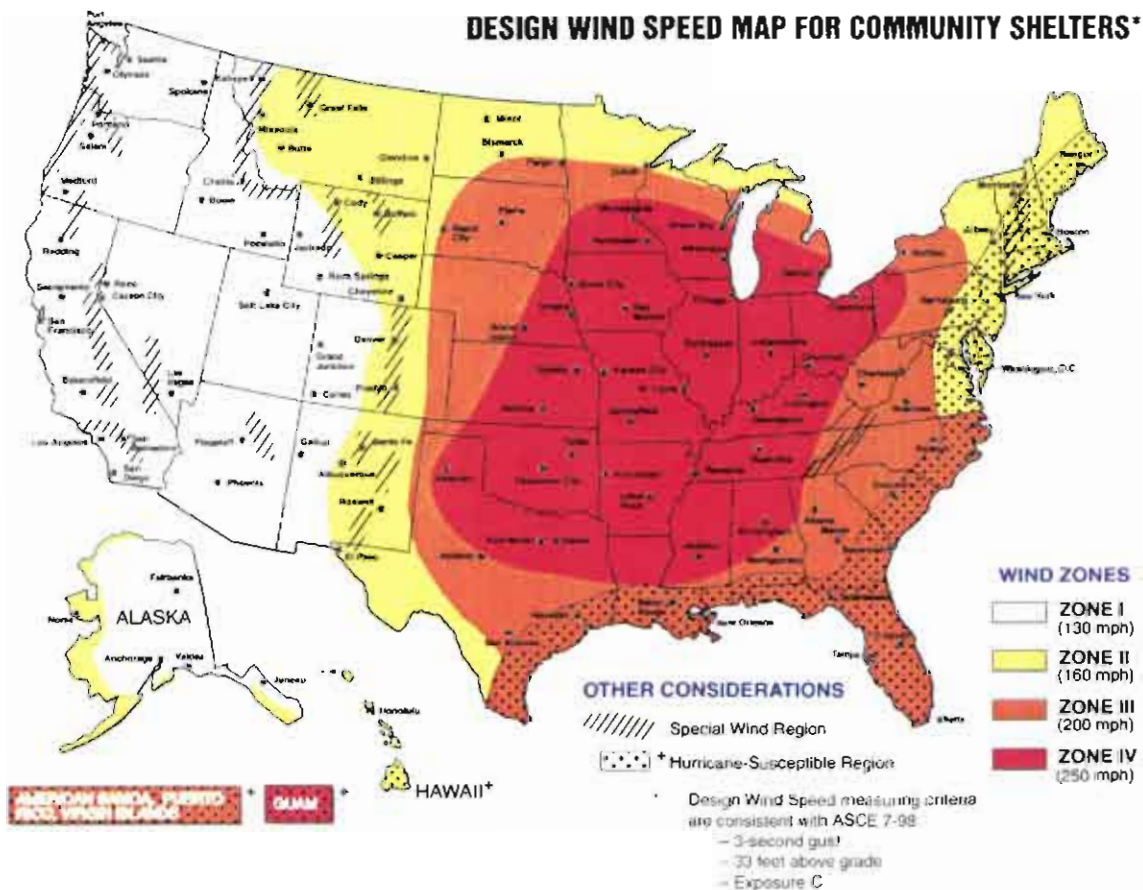
### VULNERABILITY ASSESSMENT—SEVERE WEATHER

#### Existing Community Assets

Tornadoes, thunderstorms, and other severe weather can be especially dangerous for manufactured homes and aged or dilapidated structures. Severe storm activity poses a significant threat to unprotected or exposed power lines. Generally, commercial power networks are very susceptible to interruption from lightning strikes, high winds, ice conditions, and hail. Other utilities, including underground pipelines, may be impacted if not protected from exposure.



The primary severe weather characteristic affecting vulnerability is high winds. A useful tool for determining vulnerability to high wind events like tornadoes is depicted on Figure 6. This map of design wind speeds was developed by the American Society of Civil Engineers (ASCE). It identifies wind speeds that occur frequently enough in different parts of the United States to be used as the basis for the design of buildings and facilities (such as utility transmission towers) and the evaluation of their structural integrity. While these design wind speeds refer to the wind loads necessary for community emergency shelters, the map shows that, compared to the rest of the U.S. New Mexico generally and Santa Fe County in particular have relatively low wind dangers.



Source: American Society of Civil Engineers, 7-98.

**Figure 6: Design Wind Speed Map for Community Shelters**

Since high wind events may affect the entire County, it is important to identify specific critical facilities and other assets that are most vulnerable to the hazard. Evaluation criteria include age of the building (and what building codes may have been in effect at the time of construction), type of construction, and condition of the structure (i.e., how well the structure has been maintained). Data for individual structures were not available for this study, so it was difficult to determine the exact number and types of structures in the County that have a heightened vulnerability to wind hazards. However, Santa Fe Planning and Zoning Department has

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

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identified 9,006 mobile homes in Santa Fe County, 1,155 in the City of Santa Fe, and 417 in Edgewood that may have a heightened vulnerability to wind hazards.

### **Critical Facilities**

Critical facilities are typically vulnerable to wind damage due to age of construction and possible poor condition, especially in the more rural and isolated areas of the County. No specific critical facilities were identified as vulnerable to strong winds; however, emergency communications capabilities, which use unreliable electric and telephone services, may be vulnerable to disruption.

Several critical facilities in the County are vulnerable to the effects of severe storms, due to potential disruption of services and transportation systems as well as possible structural failure due to high winds. Due to security issues, the list of critical facilities is not included in this document. However, Santa Fe County maintains the list at its Emergency Operations Office.

### **Future Development Trends**

Santa Fe County has estimated that more than 25,000 new home sites will be needed within the City of Santa Fe and surrounding areas to accommodate population growth. All new structures built within Santa Fe County are subject to the 1997 Uniform Building Code that has rigorous standards for wind shear and other severe storm effects. Current and future UBC regulations can be expected to retain or increase construction standards so additional new structures in the County do not measurably increase the risk associated with severe storms.

## **CONCLUSIONS—SEVERE WEATHER**

### **Summary of Hazard Identification and Vulnerability Assessment**

Santa Fe County and its municipalities experience the range of severe weather hazards, including tornadoes, hail storms, and thunderstorms. Features like lightning, heavy rain, and high winds can damage utility infrastructure, aged or dilapidated structures, and other assets in Santa Fe County, the City of Santa Fe, and the Town of Edgewood.

### **What Can Be Mitigated?**

Because severe weather can affect the entire County, effective mitigation efforts should have widespread benefits. Such far-reaching efforts would include public information capabilities, warning systems, and regulations guiding new development. Upgrading and consistently enforcing building codes and addressing structural issues provide the greatest benefit for new construction. Inspections and retrofits for existing critical facilities provide effective mitigation in a developing area. Because of time and budget realities, structure-by-structure mitigation projects would not be feasible on a broad scale; upgrading vulnerable critical facilities for specific hazards is more feasible.

### **Data Limitations**

The Santa Fe County Tax Assessor's office has not developed a detailed property database with the information necessary to determine the location and condition of manufactured homes and aged or dilapidated structures. Consequently, the Mitigation Planning Team could not determine vulnerability to high winds and other severe weather features. Subsequent versions of this plan will need to incorporate and respond to these data.

## **OVERVIEW—WINTER STORMS IN SANTA FE COUNTY, NEW MEXICO**

Cold temperatures and heavy snow or ice defines winter storms. Winter storms, which are regularly experienced in New Mexico, are considered hazards when:

- ✓ Local capabilities to handle disruptions to emergency services, traffic, communications, and electric power are overwhelmed;
- ✓ Residents in isolated communities run out of basic supplies, including food and fuel;
- ✓ Livestock suffer from severe cold and lack of feed; and
- ✓ The structural systems of buildings fail.

## **PREVIOUS OCCURRENCES—WINTER STORMS**

The southern portion of the County including the recently populated Edgewood area along NM Routes 472, 344 and 41 has suffered the most from severe winter storms within the last few years. A storm in January of 1997 produced walls of drifted snow ranging from three to ten feet in depth. Another storm in 2001 in the Edgewood area created drifts of three to six feet in depth. Both of these storms stranded homeowners and made roads impassible. The Santa Fe County Commission declared a State of Emergency for the 2001 storm. Snow removal costs for the 2001 storm exceeded \$141,000.

## **HAZARD PROFILE—WINTER STORMS**

### **Hazard Characteristics**

Winter storms begin as low-pressure systems that move through New Mexico following the jet stream. These storms can be heavy snowstorms, sleet storms, ice storms, blizzards, and severe blizzards. Major winter storms and occasional blizzard conditions bring bursts of heavy snow accumulating 3 to 6 inches in short periods or one to two feet in 12 to 24 hours. Blizzard conditions develop with winds over 35-mph. Freezing rain and drizzle will create a coating of ice that is hazardous to walk or drive on. Unusually heavy ice accumulations can damage trees, buildings, and power lines and other utilities.

Winter storms may contain one or more types of hazardous weather events. Table 11 provides definitions for these different types:



Table 11: Winter Storms

<b>Heavy Snowstorm</b>	Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period. The most common effects are traffic accidents; interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems.
<b>Sleet Storm</b>	Significant accumulations of solid pellets that form from the freezing of raindrops or partially melted snowflakes, causing slippery surfaces, posing hazard to pedestrians and motorists.
<b>Ice Storm</b>	Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.), causing slippery surfaces and damage from the sheer weight of ice accumulation.
<b>Blizzard</b>	Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile, prevailing over an extended period of time.
<b>Severe Blizzard</b>	Wind velocity of 45 miles per hour or more, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in inches, prevailing over an extended period of time.

New Mexico winters are generally mild, but occasionally winter storms produce large amounts of snow and below-freezing temperatures. The complex terrain of New Mexico, ranging from the eastern plains, to the high mountains across the northern and western regions, to the Rio Grande Valley, creates weather regimes that change quickly over relatively short distances. Highway travelers may find themselves first in light snow or rain then suddenly in heavy snow as the highway climbs through a mountain pass. The weather may be relatively mild and sunny along the Rio Grande Valley from Socorro to Albuquerque, with near blizzard conditions found across the high plains east of the central mountain chain.

The majority of the population and development in Santa Fe County are in the central and northwestern portions of the County where the average annual snowfall can exceed 40 inches per year. Snowfall in the City of Santa Fe is normally 34 inches per year and storms are generally short lived. While winter storm events in this area are usually short lived and average just a few inches of snowfall, they can cause disruption and damage to the community. School and business closures, as well as disruptions in transportation systems, electric power, telecommunications, and emergency services, are common occurrences with snowfall as minimal as two inches.

### Severity and Probability of Occurrence

Winter storms can and do occur frequently in Santa Fe County, with the most severe weather occurring in the north-central and northeastern mountainous portions of the County. According to the National Climatic Data Center (NCDC) and as shown in Table 12, data collected from four computerized data collection weather stations scattered throughout the County indicates that the annual percent chance of snowfall exceeding 12" within a 24-hour period range from 0.02% at the Golden metadata station (6,698 feet above mean sea level (MSL)), to .08% at Nambe metadata station (6,056 feet above MSL). No records were available for higher elevations that would be expected to exceed 12 inches in a 24-hour period.

Table 12: Annual Percent Chance of Snowfall

Golden	5.54%	4.46%	2.74%	0.50%	0.07%	0.02%
Nambe 1	5.76%	5.31%	3.26%	0.72%	0.14%	0.08%
Stanley 1 NNE	4.94%	4.10%	2.26%	0.33%	0.02%	0.02%

## VULNERABILITY ASSESSMENT—WINTER STORMS

### Existing Community Assets

Vulnerability to the effects of winter storms on buildings is dependent on the age of the building (and what building codes were in effect at the time it was built), type of construction, and condition of the structure (i.e., how well the structure has been maintained). Except for a few visual observations, data for individual structures were not available for this study, so it was difficult to determine the exact number and types of structures within Santa Fe County that have heightened vulnerability to winter storm snow loading. As more development occurs in the metropolitan areas, the potential for community impacts increases.

### Critical Facilities

Several critical facilities in the County are vulnerable to the effects of severe winter storms, due to potential disruption of services and transportation systems as well as possible structure failure due to heavy snow loads. Due to security issues, the list of critical facilities is not included in this document. However, Santa Fe County maintains the list at its Emergency Operations Office.

### Future Development Trends

Santa Fe County has estimated that more than 25,000 new home sites will be needed within the City of Santa Fe and surrounding areas to accommodate population growth. All new structures built within Santa Fe County are subject to the Uniform Building Code and as such are built to the applicable codes and are resistant to hazards such as severe winter storms. Current UBC regulations have rigorous standards for roof loads so new structures do not measurably increase the risk associated with winter storms.

With a projected increase in the County's population, the potential impact of winter storms on the County's infrastructure will increase. Impacts such as stranded motorists, delayed emergency responses due to impassable roads, and snowbound residences will likely occur with greater frequency as the County adds more residents. If new development is concentrated in established areas, this will help to minimize the increased impact of winter storms.

## CONCLUSIONS—WINTER STORMS

### Summary of Hazard Identification and Vulnerability Assessment

Snow and ice can be hazards in two respects: they reduce visibility and traction for vehicle operators, and they strain power lines, roofs, and other structures. Severe winter storms have been and will continue to be a significant threat to the economic and social well being of selected areas of the County. Disruptions of emergency and other essential services are the

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

main threats to the people and property. Isolated, difficult-to-reach mountain communities and limited snow removal equipment, exacerbate the effects of snow events in the County.

### What Can Be Mitigated?

One important part of mitigating snow and ice hazards is forecasting and warning so that people can prepare. Communities can prepare for winter storms by stockpiling sand and salt to improve road conditions, advising people to stay home or to use caution if they must go out, and recommending that people stock up on food, water, batteries, and other supplies. Snow fences in areas prone to high winds and heavy snowfall can increase roadway access and decrease emergency snow removal costs.

Severe storm activity poses a significant threat to unprotected or exposed lifeline systems. Generally, commercial power networks are very susceptible to interruption from lightning strikes, high winds, ice conditions and hail. Other utilities, including underground pipelines, may be impacted if not protected from exposure.

The greatest potential benefit for effective mitigation is upgrading and consistently enforcing building codes for new construction, and inspections and retrofits for existing critical facilities.

### Data Limitations

The Santa Fe County Tax Assessor's office has *not* developed a detailed property database with the information necessary to determine the location and condition of manufactured homes and aged or dilapidated structures. Consequently, the Mitigation Planning Team could not determine vulnerability to severe winter storms. Subsequent versions of this Plan will need to incorporate and respond to these data.

## OVERVIEW—HUMAN-CAUSED HAZARDS IN SANTA FE COUNTY, NEW MEXICO

Human-caused hazards include technological hazards (e.g., hazardous material releases) and terrorism. Both of these are distinct from natural hazards in that they result directly from the actions of people. The term technological hazard refers to incidents that can arise from human activities such as the manufacture, storage, transportation, and use of hazardous materials. Technological hazards are assumed to be accidental and their consequences unintended. The term terrorism, on the other hand, encompasses intentional, criminal and malicious acts involving weapons of mass destruction (WMDs), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous material releases; and cyber-terrorism (attacks via computer). Technological and terrorism hazards are interrelated in that facilities and transportation routes that handle hazardous materials may be potential targets.

The focus of this section addresses three types of human-caused hazards that are relevant to Santa Fe County: hazardous material releases, terrorism, and nuclear/radiological accidents.

## OVERVIEW—HAZARDOUS MATERIAL RELEASES IN SANTA FE COUNTY, NEW MEXICO

Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect the nearby population and contaminate critical or sensitive environmental areas.

Facilities that use, manufacture, or store hazardous materials in New Mexico must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)<sup>2</sup> and the State's reporting requirements under the Hazardous Chemical Information Act [74-4E-1 to 74-4E-9 NMSA 1978]. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities.

Key information about the chemicals handled by manufacturing or processing facilities is contained in the U.S. Environmental Protection Agency's (U.S. EPA's) Toxic Release Inventory (TRI) database. The TRI is a publicly available EPA database that contains information on toxic chemical releases and waste management activities reported annually by certain covered industry groups as well as federal facilities. This inventory was established under EPCRA and expanded by the Pollution Prevention Act of 1990. Facilities that exceed certain threshold levels must report TRI information to the U.S. EPA, the federal enforcement agency for SARA Title III, and the NMOEM.

EPCRA's primary purpose is to inform communities and citizens of chemical hazards in their areas. Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored onsite to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. EPCRA Section 313 requires the EPA and the states to collect data annually on releases and transfers of certain toxic chemicals from industrial facilities, and to make the data available to the public in the TRI. In 1990, Congress passed the Pollution Prevention Act, which required that additional data on waste management and source reduction activities be reported under TRI. The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed.

## PREVIOUS OCCURRENCES—HAZARDOUS MATERIAL RELEASES

There are 146 hazardous materials facilities and two major transportation routes in Santa Fe County. The County has experienced hazardous material release accidents both at facilities and along transportation corridors. No SARA Title III facilities in Santa Fe County filed TRI reports. However, 30 hazardous materials releases were reported to the National Response

<sup>2</sup>In 1986, Congress reauthorized and expanded the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The new act is known as the Superfund Amendments and Reauthorization Act (SARA). Title III of SARA addresses emergency planning and community right-to-know reporting on hazardous and toxic chemicals. The purpose of SARA Title III is to promote greater cooperation among government, industry, and citizens to prevent, plan and prepare for, and manage chemical emergencies. SARA Title III has four major components: emergency planning (Section 301 to 303); emergency release notification (Section 304); hazardous chemical inventory (Sections 311 & 312); and toxic chemical release inventory (Section 313).

Center for Santa Fe County between 1991 and 2002. A total of 18 releases were reported within the City of Santa Fe.

### HAZARD PROFILE—HAZARDOUS MATERIAL RELEASES

#### Hazard Characteristics

Hazardous material releases can occur at facilities (fixed sites) or along transportation routes. They can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary hazards. Hazardous material releases, depending on the substance involved and type of release, can directly cause injuries and death and contaminate air, water, and soils. The probability of a release at any particular facility or at any point along a known transportation corridor is relatively low. However, the consequences of releases of these materials can be very serious.

Over 200 facilities in Santa Fe County submitted Tier II reports. Facilities are required to submit Tier II reports if they store a hazardous substance exceeding 10,000 pounds or any extremely hazardous substance exceeding either 500 pounds or the threshold planning quantity (TPQ), whichever is less. The Tier 2 facilities are required to report annually to the State Emergency Response Commission, Local Emergency Planning Committees, and local fire departments for emergency planning. No facilities in Santa Fe County have submitted TRI reports. TRI facilities are those facilities in specific industries that manufacture, process, or use more than the threshold amount of one or more of 600 listed toxic chemicals. Most threshold amounts are 10,000 or 25,000 pounds per year, but can vary depending on the chemical.

#### Severity and Probability of Occurrence

The severity of the incident varies with the distance from the release and the time elapsed. The most immediate areas are generally at greatest risk yet, depending on the agent, a release can travel great distances or exist over a long time (e.g., nuclear radiation), resulting in far-reaching effects to people and the environment.

With a hazardous material release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect the severity of the release. Exacerbating conditions can enhance or magnify the effects of a hazard. Mitigating conditions, on the other hand, can reduce the effects of a hazard. These conditions include:

- Weather conditions that can affect how the released material is dispersed (e.g., high winds can increase the spread of gases or radioactive materials);
- How the chemical was released (e.g., explosion, volatilization, air or water release) and the nature of the substance;
- Micro-meteorological effects of buildings and terrain that can alter travel and duration of agents;
- Shielding in the form of sheltering in-place (staying indoors during an emergency) that protects people and property from harmful effects; and
- Non-compliance with applicable codes (e.g. fire and building codes) and maintenance failures (e.g., fire protection and containment features) that can substantially increase the damage to the facility and surrounding buildings.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

While hazardous material releases in Santa Fe County have occurred in the past, they are considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group (note: intentional acts are addressed under the subsection concerned with "*Terrorism*").

### VULNERABILITY ASSESSMENT—HAZARDOUS MATERIAL RELEASES

#### Existing Community Assets

Table 13 indicates the number of people, as determined from the 2000 Census, that live within either a ½ mile or 1 mile radius of known SARA Title III facilities in the County. The Town of Edgewood is outside the hazard zone for SARA Title III facilities.

**Table 13: Community Assets within ½ mile and 1 mile of Sara Title III Facilities**

Unincorporated County	Structures	3,581	7,304
	Population	12,547	20,083
	Critical Facilities	4	3
City of Santa Fe	Structures	19,877	26,249
	Population	39,760	53,440
	Critical Facilities	17	24

Table 13 and Plate 6 show that the City of Santa Fe has the most residents at risk of exposure to hazardous material releases. Approximately 37% of the County's population (over 52,000 people) live within a ½-mile radius of the facilities noted above and thus are at a relatively higher risk of being affected by accidental or intentional releases of hazardous materials.

#### Critical Facilities

Twenty-one critical facilities are listed within ½ mile of a hazardous materials facility, and an additional 27 critical facilities are located within one mile of a hazardous materials facility for a total of 48. Due to security issues, the list of critical facilities is not included in this document. However, Santa Fe County maintains the list at its Emergency Operations Office. Thirteen fire stations are located within one mile of a hazardous materials facility in the City of Santa Fe. In addition, five hospitals and seven police stations are within one mile of a hazardous materials facility.

#### Future Development Trends

Estimates of potential development identified 145 vacant lots that could be developed within ½ mile of hazardous material facilities. As development in the County continues and population density increases, hazardous materials may present an increased threat to the economic and social well being of selected areas of the County.

## **CONCLUSIONS—HAZARDOUS MATERIAL RELEASES**

Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect the nearby population and contaminate critical or sensitive environmental areas. Anticipated population growth and related residential and commercial development within the County will expose an increasing population to the possibility of hazardous materials (hazmat) emergencies. Due to size of Santa Fe County, emergency hazmat response will continue to be difficult in isolated or remote areas of the County.

### **What Can Be Mitigated?**

Individual facilities and transportation companies are responsible for maintaining facilities and operations in a safe manner. Regulation of these companies is beyond the responsibility of County-level government. However, the local community can become more involved and informed about specific aspects of these operations and in so doing, determine areas where mitigation actions may be possible such as public education, evacuation drills and response exercises, warning systems, etc. In addition, future development can be guided in such a way that new facilities and anticipated development patterns have limited overlap.

### **Data Limitations**

The Mitigation Planning Team needs more information about past hazardous material releases from fixed sites and vehicles transporting hazardous materials, the nature of the operations that already exist in the County, and the status of existing emergency action plans.

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## **OVERVIEW—TERRORISM IN SANTA FE COUNTY, NEW MEXICO**

Following a number of serious international and domestic terrorist incidents during the 1990s and early 2000s, citizens across the U.S. paid increased attention to the potential for deliberate, harmful actions by individuals or groups. There is no single, universally accepted definition of terrorism. However, terrorism is defined in the Code of Federal Regulations as "...the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 CFR, Section 0.85).

### **PREVIOUS OCCURRENCES—TERRORISM**

Sometime in the late 1980s, a bomb was discovered and removed without damage from a propane facility on Airport Road located next to a police station. A radical Puerto Rican group claimed responsibility for the act.



## **HAZARD PROFILE—TERRORISM**

### **Hazard Characteristics**

The Federal Bureau of Investigation (FBI) further characterizes terrorism as either domestic or international, depending on the origin, base, and objectives of the terrorist organization. However, the origin of the terrorist or person causing the hazard is far less relevant to mitigation planning than the hazard itself and its consequences. For the purposes of this Plan, "terrorism" refers to the use of WMDs, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional release of hazardous materials; and "cyber-terrorism." Within these general categories, however, there are many variations, particularly in the area of biological and chemical weapons, which comprise a wide variety of agents and delivery systems.

Terrorist methods can take many forms, including:

- Agriterrorism
- Armed attack
- Arson/incendiary attack
- Biological agent
- Chemical agent
- Conventional bomb
- Cyberterrorism
- Hazardous material release (intentional)
- Nuclear bomb
- Radiological agent ("dirty bomb")

### **Severity and Probability of Occurrence**

The severity of terrorist incidents depends on the method used; the proximity of the device to people, animals, or other assets; and the duration of exposure to the incident or device. For example, chemical agents are poisonous gases, liquids, or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death.

Biological agents are organisms or toxins that have illness-producing effects on people, livestock, and/or crops. Because some biological agents cannot be easily detected and may take time to incubate, it may be difficult to know that a biological attack has occurred until victims display symptoms. In other cases the effects are immediate. Those affected by a biological agent require immediate medical attention. Some agents are contagious, and victims may need to be quarantined.

An important consideration in estimating the likelihood of a terrorist incident is the existence of facilities, landmarks, or other buildings of national importance. While Santa Fe County has many notable landmarks from a local historic perspective, it does not contain any sites with national symbolism, or an extensive area of dense urban population; therefore, the likelihood of a terrorist attack because of the County's national significance is unlikely. However, terrorism takes many forms, and terrorists have a wide range of local, state, and national political interests or personal agendas, meaning that even unlikely potential targets cannot be ruled out.

### **VULNERABILITY ASSESSMENT—TERRORISM**

#### **Existing Community Assets**

Facilities and populations vulnerable to terrorist attacks in Santa Fe County have been identified as infrastructure, emergency response facilities, hospitals, government offices historical buildings, and special events. The Santa Fe County Emergency Manager has identified the most vulnerable locations within the County.

#### **Critical Facilities**

All individual critical facilities are listed as vulnerable to terrorism. The City of Santa Fe is also the capital for the State of New Mexico and houses a number of state government facilities. However, government facilities, as well as other vulnerable privately owned facilities have constructed physical barriers and increased security measures. Due to security issues, the list of critical facilities is not included in this document. However, Santa Fe County maintains the list at its Emergency Operations Office.

#### **Future Development Trends**

Future development does not necessarily increase vulnerability beyond the basic issue identified under Hazardous Material Releases; more development in proximity to known sources of potential intentional releases increases the number of people and property subject to the existing level of vulnerability.

### **CONCLUSIONS—TERRORISM**

#### **Summary of Hazard Identification and Vulnerability Assessment**

Human-caused hazards are difficult to predict. Terrorists can target any historic structures, popularly attended events, critical facilities, or agricultural lands. There are over 200 hazardous material facilities within Santa Fe County, many within relatively densely populated areas. Trucks transport hazardous materials along two major highways that intersect the County, I-25 and U.S. 284/85. These roads run through the most populated areas of the County. The Waste Isolation Pilot Plant (WIPP) site is located 26 miles southeast of Carlsbad, New Mexico. The WIPP Route from Los Alamos National Laboratory follows NM 502 to where it intersects with U.S. 285/84 south through Santa Fe County. WIPP is a salt mine designed for the permanent disposal of transuranic wastes (or TRU wastes) generated from defense-related activities (i.e., research and development of nuclear weapons). TRU wastes include laboratory clothing, tools, plastics, rubber gloves, wood, metals, glassware, and solidified waste contaminated with man-made radioactive materials including plutonium, americium, and neptunium. As of August 2003 56 shipments TRU shipments have passed through Santa Fe County.

#### **What Can Be Mitigated?**

Due to the uncertainty about where and when attacks can occur, much of the current effort by local emergency management agencies is focused on improving response and recovery capabilities in the event that an event occurs. The State of New Mexico is divided into 12 Homeland Security regions (based on existing State Police District Boundaries) and each region has completed a prioritized risk and vulnerability assessment as part of a Homeland Security Strategic Plan. A copy of the Plan is available in the Santa Fe County Emergency Services Office.

### Data Limitations

Determining the probability of terrorist attacks is difficult, as discussed above. Methods for calculating such probabilities are either being developed or, if available, are not widely accessible to communities. Knowing this information would allow communities to better focus mitigation resources with regard to critical facilities.

### OVERVIEW—NUCLEAR/RADIOLOGICAL ACCIDENTS IN SANTA FE COUNTY, NEW MEXICO

The term “nuclear facilities” encompasses all nuclear power plants, nuclear research facilities, uranium and plutonium mining and processing operations, and military installations with nuclear weapons on site. Nuclear facilities are present in virtually every state, including New Mexico. The closest nuclear facility to Santa Fe County is in neighboring Los Alamos County, at the Los Alamos National Laboratory (LANL). The University of California runs LANL for the National Nuclear Security Administration of the U.S. Department of Energy. The central mission of LANL is enhancing the security of nuclear weapons and nuclear materials worldwide through stewardship and management of the nation’s nuclear stockpile. The County lies outside the standard planning area designated for nuclear emergencies, although the County would likely receive evacuation traffic.

### PREVIOUS OCCURRENCES—NUCLEAR / RADIOLOGICAL ACCIDENTS

Between 1945 and 1982, there were eight nuclear related events in New Mexico. None of the events occurred in Santa Fe County; however, five occurred at nearby LANL (see Table 14).

**Table 14: Nuclear Related Events in New Mexico**

August 21, 1945	LANL worker killed building weapon
May 25, 1946	LANL worker killed building weapon
April 11, 1950	Plane with nuclear weapon crashed near Manzano Mountains
May 22, 1957	Bomb accidentally dropped on Albuquerque outskirts
December 30, 1958	LANL worker killed building weapon
September 3, 1974	Radioactive liquid escaped, spilling into street in Los Alamos
July 16, 1979	Dam holding uranium tailings failed, 1 million gallons of radioactive liquids released near Church Rock
October 1981	Plutonium leak in Los Alamos contaminated 15 people

### HAZARD PROFILE—NUCLEAR / RADIOLOGICAL ACCIDENTS

#### Hazard Characteristics

After a nuclear incident, the main concern is the effect on the health of the population near the incident. External radiation, inhalation and ingestion of radioactive isotopes, can cause acute health effects (death, severe physical impairment), latent health effects (cancers), and

psychological effects. Additional considerations include the long-term effects to the environment and agriculture.

Although radiation cannot be detected by the senses, sophisticated instruments can detect even the smallest levels of radiation.

### **Severity and Probability of Occurrence**

State and local governments, with support from the federal government and utilities, develop emergency response plans for nuclear facilities that include a "Plume Exposure Pathway," an emergency planning zone with a radius of 10 miles from the source and an "Ingestion Exposure Pathway," an emergency planning zone within a radius of 50 miles from the source.

"Plume Exposure Pathway" refers to whole body external exposure to gamma radiation from the plume and from deposited materials and inhalation exposure from the passing radioactive plume. The duration of primary exposures could range in length from hours to days.

The "Ingestion Exposure Pathway" refers to exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation. Nuclear facilities must notify the appropriate authorities in the event of an accident. The Federally recognized classification levels are: Unusual Event, Alert, Site Area Emergency, and General Emergency.

Plate 7—"Santa Fe County 10 and 50 Mile Buffer Los Alamos National Laboratory"—following this section shows the 10-mile and 50-mile radii around the LANL facilities. Within the 10 mile Plume Exposure Pathway planning zone, the portion of Santa Fe County closest to LANL is sparsely inhabited. Much of the County falls well within the 50-mile radius, meaning that, in the case of a large-scale general emergency, the County may be affected.

Several factors affect the severity of radiation exposure:

- **Time**—Most radioactivity loses its strength fairly quickly. Limiting the time spent near the source of radiation reduces the amount of radiation exposure received. Following an accident, local authorities monitor any release of radiation, determine the level of protective actions, and announce when the threat has passed.
- **Distance**—The more distance between the target and the source of radiation, the less radiation received. In the most serious nuclear accidents, local officials will likely call for an evacuation, thereby increasing the distance between people and radiation.
- **Shielding**—Heavy, dense materials between the target and the source of radiation provide protection from excess radiation. In some cases, the walls of residential and commercial structures would be sufficient shielding for a short period of time.
- **Availability of potassium iodide**—Potassium iodide saturates the thyroid gland and protects it from the uptake of radioactive iodine.

Across the U.S., a number of events that reach the level of "Unusual Event" or "Alert" (see Table 15 for definitions) occur each year at the 100+ nuclear facilities. These events warrant the notification of local emergency managers. Of these, "Alert" level emergencies occur less frequently. For example, in 1997, there were 40 notifications of unusual events and three alert-level emergencies nationwide. However, as with other human-caused hazards, the probability of accidents or deliberate incidents is difficult to determine.

**Table 15: Nuclear Event Warning Classifications**

<b>Notification of Unusual Event</b>	The least serious of the four levels. The event poses no threat to you or to plant employees, but emergency officials are notified. No action by the public is necessary.
<b>Alert</b>	Declared when an event has occurred that could reduce the plant's level of safety, but backup plant systems still work. Emergency agencies are notified and kept informed, but no action by the public is necessary.
<b>Site Area Emergency</b>	Declared when an event involving major problems with the plant's safety systems has progressed to the point that a release of some radioactivity into the air or water is possible, but is not expected to exceed EPA Protective Action Guidelines (PAGs) beyond the site boundary. Thus, no action by the public is necessary.
<b>General Emergency</b>	The most serious of the four classifications and is declared when an event at the plant has caused a loss of safety systems. If such an event occurs, radiation could be released that would travel beyond the site boundary. State and local authorities will take action to protect the residents living near the plant. The alert and notification system will be sounded. People in the affected areas could be advised to evacuate promptly or, in some situations, to shelter in place. When the sirens are sounded, you should listen to your radio, television and tone alert radios for site-specific information and instructions.

### **Critical Facilities**

Due to the relatively close location of LANL, all critical facilities are potentially vulnerable to nuclear/radiological accidents, especially airborne contaminants. However, risks decrease as distance increases and most critical facilities are located outside the 10-mile emergency planning zone.

### **Estimating Potential Loss**

There are no known nuclear facilities within Santa Fe County. The likelihood of structural damage to residences, commercial properties, or critical facilities due to a nuclear accident is extremely low. With such a low probability of damages due to nuclear incidents, there is no information available concerning potential loss.

### **Future Development Trends**

Projected development patterns are focused outside of the 10-mile emergency planning zone but fall within the 50-mile planning zone (see Plate 7 at the end of this section). The impacts of a nuclear accident are best addressed in an emergency operations plan. Santa Fe County will be updating its emergency operations plan by the end of 2004.

## **CONCLUSIONS—NUCLEAR/RADIOLOGICAL ACCIDENTS**

### **Summary of Hazard Identification, and Vulnerability Assessment**

The nearby location of LANL poses potential risks to populated areas. However, most of the County is located outside the 10-mile emergency-planning zone.

### **What Can Be Mitigated?**

Because of the unpredictability of human-caused hazards, mitigation should focus primarily on the possible targets/victims of human-caused hazards rather than on the hazard itself. Raising citizen awareness of what to do in the event of an emergency (for example, whether to evacuate or stay inside) and hardening critical facilities are two ways in which pre-disaster actions can limit vulnerability.

### Data Limitations

Determining the probability of nuclear/radiological accidents is extremely difficult. Methods for calculating such probabilities are not accessible to communities. Due to national security concerns, it is not possible to know the quantity and nature of radiological materials being used at LANL.

## OVERVIEW—EARTHQUAKES IN SANTA FE COUNTY, NEW MEXICO

Earthquakes result from sudden ground motion or trembling caused by a release of strain accumulated within or along the edge of the Earth's crustal plates. Earthquakes occur most frequently in the boundaries between the great crustal plates that form the earth's outer shell. As these plates move, stress accumulates. Eventually, when faults along or near plate boundaries slip abruptly, an earthquake occurs. Although earthquakes in the U.S. have caused less economic loss annually than other hazards such as floods, they have the potential to cause great, sudden loss in proximity to the epicenter. Within one to two minutes, an earthquake can devastate a city through ground-shaking, surface fault ruptures, and ground failures. Seismic hazards often trigger other devastating events, such as landslides, fires, and damage to dams and levees. Earthquakes can even trigger volcanic eruptions or cause tsunamis in coastal areas.

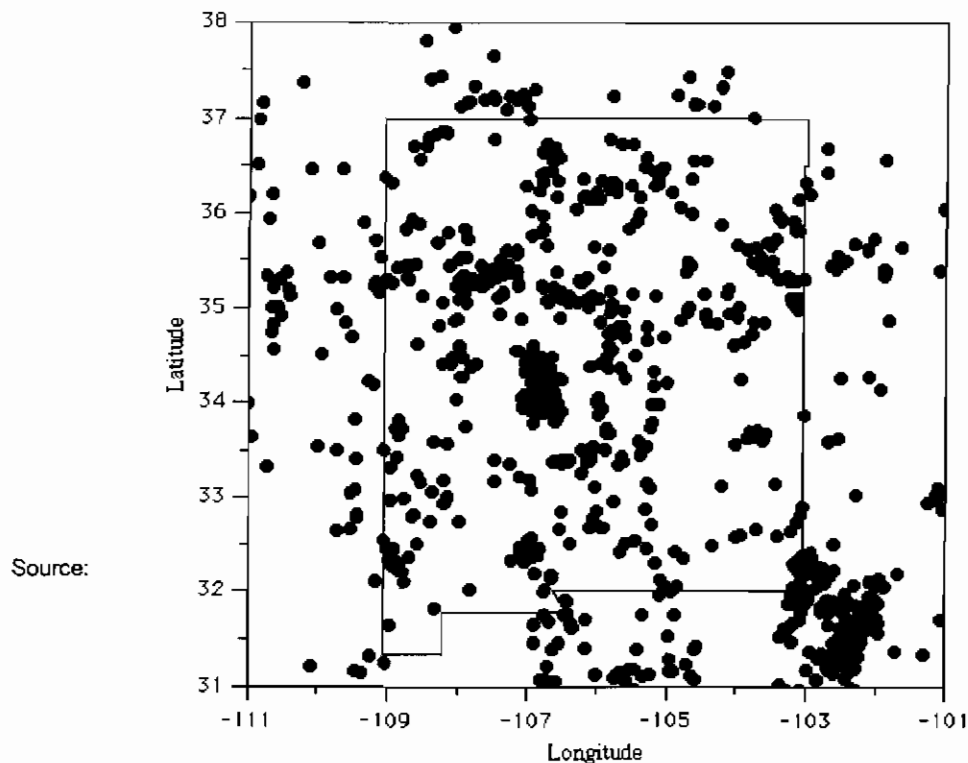
### PREVIOUS OCCURRENCES—EARTHQUAKES

Though not nearly as big or as numerous as in some other parts of the world, earthquakes have rattled New Mexico over the years. Earthquakes in 1906, with an estimated magnitude of 6.5, and in 1935, and 1966 with magnitudes of 5.5, caused damage to houses, schools, and other facilities in the State.

An earthquake in Bernalillo County in January 1971, approximately 60 miles south, of Santa Fe caused about \$40,000 of damage to the University of Albuquerque, West Mesa High School, and several shops in the Old Town area. In early 1989, a swarm of 34 earthquakes with magnitudes between 2.0 and 4.7 occurred near the town of Bernardo, which is located approximately 140 miles south of Santa Fe County.

Some small earthquakes in New Mexico have been triggered by human activity. Atomic bomb testing caused three of the earthquakes in the past, including the explosion of the first atomic bomb at the Trinity Site in 1945 and subsequent underground explosions near Carlsbad in 1961 and east of Farmington in 1967. Some earthquakes in southeastern New Mexico may be related to oil and gas production, and a series of earthquakes recorded near Heron and El Vado reservoirs in northern New Mexico were apparently caused by the weight of the water in the reservoirs.

Figure 7 depicts the approximate epicenters for past earthquakes in New Mexico and surrounding areas between 1962 and 1995. The map was prepared by seismologists of the Geophysics Program at New Mexico Tech.



<http://tremor.nmt.edu/EqMap.html>

**Figure 7: Past Earthquake Epicenters in New Mexico**

## HAZARD PROFILE—EARTHQUAKES

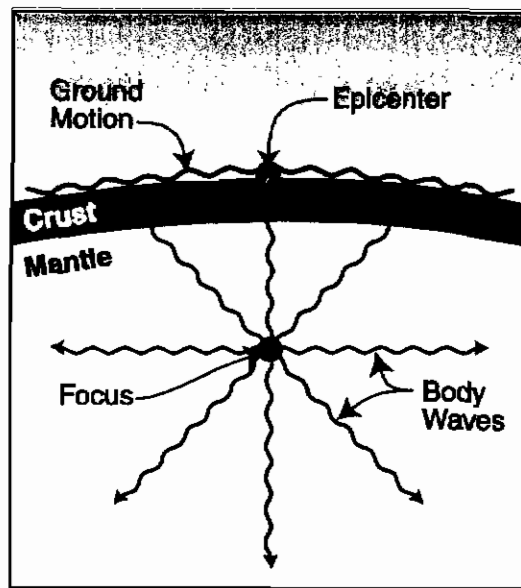
### Hazard Characteristics

The dense cluster of earthquakes in the very center of the state (Figure 7) is related to the activity of a body of magma (molten rock) about twelve miles deep within the Earth's crust. Seismologists cannot see the magma body directly, but careful measurements and studies of the way seismic waves move through the Earth's crust have allowed seismologists to map out its location.

### Severity and Probability of Occurrence

The severity of an earthquake depends upon the amount of energy released from the fault or epicenter of the earthquake (see Figure 8). The severity is described in terms of magnitude and intensity. Magnitude characterizes the total energy released, and intensity subjectively describes effects at a particular place. While an earthquake has only one magnitude, its intensity varies throughout the affected region.





**Figure 8: Definition Sketch for Earthquake**

The Richter scale is a logarithmic magnitude scale, which defines magnitude in terms of the motion that would be measured by a standard type of seismograph. On the Richter scale, magnitude is expressed in whole numbers and decimals. For every increase of 1.0 on the Richter scale, the energy released by the earthquake increases by tenfold. In more qualitative terms, an earthquake of 5.0 is a moderate event, 6.0 is a strong event, 7.0 is a major earthquake, and 8.0 or higher is catastrophic. The effect of an earthquake on the Earth's surface is called the intensity. In the U.S, the most commonly used intensity scale is the Modified Mercalli Intensity Scale (MMI).

Another way to express an earthquake's severity is to compare the rate at which the ground surface accelerates due to an earthquake's force with the rate of acceleration experienced by a falling object due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a percent of the established rate of acceleration due to gravity (where  $g = 980 \text{ cm/sec}^2$  or  $32 \text{ ft/sec}^2$ ). Although the specific damages caused by different magnitudes of earthquakes are listed in Table 16, as a rule, ground acceleration must exceed 15 PGA (or 15% of the gravitational acceleration rate) for significant damage to occur. Table 16 shows the relationship between PGA, magnitude, and intensity. The relationship is, at best, approximate and also depends upon such variables as the distance from the epicenter and depth of the epicenter.

## VULNERABILITY ASSESSMENT—EARTHQUAKES

### Existing Community Assets

Table 18 displays data for the different “zones” as depicted on Plate 8 at the end of this section—“Santa Fe County Earthquake Zones”—(referred to as EQ Zones) within Santa Fe County. EQ Zones correspond to the different PGA values that are associated with a 10% exceedance in 50 years. Data include the potentially affected population, housing units, and critical facilities. The largest population and number of housing units affected are in the “8” PGA zone, which includes the City of Santa Fe. The Mitigation Planning Team needs more information on these structures—their age, condition, and construction type—in order to rate their relative vulnerability. For example, unreinforced masonry structures built before current building codes are more susceptible to damage than others built to seismic-resistant codes.

**Table 18: EQ Zones and Assets Affected in Santa Fe County/City**

	4009	Unknown	36,943,	57,974	25,601	4636	125	129,288
Population Affected								
Housing Units Affected	1,207	N/A	17,660	28,328	11,395	1,576	33	60,199
Critical Facilities	2	0	26	24	10	2		64
Value of Assets	\$1.9 Million	\$0	\$4.9 Billion	\$6.4 Billion	\$1.9 Billion	\$2.1 Million	\$4.5 Million	\$13.7 Billion

### Critical Facilities

Sixty-four individual critical facilities are listed as vulnerable to damage from earthquakes. Fifteen of the individual facilities are emergency response facilities. More information on these facilities—their age, condition, construction type, for example—is needed to rate their relative vulnerability.

### Future Development Trends

There are 20 vacant lots within the “10%g” PGA earthquake zone in Santa Fe County. In total through all four of the earthquake zones identified above, there are a total of 3,880 vacant lots. In reality, it is unlikely that the entire area will develop, even given Santa Fe County’s rate of growth over the last two decades. Within the most severe earthquake zone (Zone 10), there are currently only 33 structures. New buildings constructed in the County must conform to the 1997 UBC (see discussion later in this section under Capabilities and Resources) and will be less vulnerable to potential earthquake damage than most existing structures.

## CONCLUSIONS—EARTHQUAKES

### Summary of Hazard Identification and Vulnerability Assessment

Significant earthquakes with epicenters in the County have not been detected, although they have been observed in the nearby areas of Bernalillo and Rio Arriba Counties. The shaking potential for such a disaster is low to moderate, as illustrated on the accompanying Plate 8: “Santa Fe County Earthquake Zones.” As explained in the “Severity” and “Vulnerability” sections, even the worst earthquake the County might expect would not inflict significant

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

damage if buildings were built to a code that incorporates seismic resistance. More detailed information on other structures in the County is required to identify vulnerable structures.

### What Can Be Mitigated?

Damage from earthquakes can be mitigated for existing buildings by structural retrofits. Structures erected before standard building codes, such as unreinforced masonry buildings, are typically vulnerable to earthquake damage. More detailed information on other structures in the County is required to identify those that are highly vulnerable. New buildings can be built stronger, according to the most recent seismic design specifications found in contemporary building codes, to minimize their vulnerability to earthquake damage.

### Data Limitations

The information on the probability and severity of a possible earthquake event is based on the relationship between PGA, magnitude, and intensity, which is approximate and depends upon such specifics as the distance from the epicenter and depth of the epicenter. More information regarding the existing buildings, e.g., unreinforced masonry buildings and critical facilities, would help the Mitigation Planning Team assess specific vulnerability and risk issues more accurately.

The Mitigation Planning Team reviewed three other hazards, but they present relatively less immediate risk to Santa Fe County. The Mitigation Planning Team decided not to address these hazards in this Plan because they are considered to be of lower priority to the County and the effort required to respond to the other hazard issues will require all existing and anticipated resources during the planning horizon of this Plan (i.e., five years). The three other hazards are landslides/land Subsidence, dam failures and volcanoes.

The following is a brief summary of some of the issues related to these hazards for reference in future updates of this Plan.

### OVERVIEW—LANDSLIDES AND LAND SUBSIDENCE IN SANTA FE COUNTY, NEW MEXICO

The term "landslide" describes the downward and outward movement of slope-forming materials (e.g., dirt, trees, and rocks) under the force of gravity. The term covers a broad array of events, including mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and earth flows.

Land subsidence, the loss of surface elevation due to the removal of subsurface support, ranges from broad, regional lowering of the land surface to localized collapse. Land subsidence can occur slowly and continuously over time or abruptly, such as in the sudden formation of sinkholes. A sinkhole can be defined as a subsidence feature that can form rapidly and is characterized by a distinct break in the land surface and the downward movement of surface material into the resulting hole or cavity. Subsidence is caused by a diverse set of human activities and natural processes that include the mining of coal, metallic ores, limestone, salt, and sulfur; the withdrawal of groundwater, petroleum, and geothermal fluids; dewatering of

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

organic soils; the wetting of dry, low-density deposits known as hydrocompaction; dissolution of underground strata; natural sediment compaction; liquefaction; and crustal deformation.

No records of past landslides or subsidence have been found for Santa Fe County. However, some areas of the County are considered susceptible to landslides (see Figure 9), several natural and human factors may contribute to them. The principal natural factors are topography, geology, and precipitation—periods of sustained, above-average precipitation, specific rainstorms, or snowmelt events. Other elements that determine slope stability are vegetative cover and slope aspect. The principal human activities that can contribute to slope failure include altering the slope gradient, increasing the soil water content, and removing vegetative cover. Mining and the construction of highways, buildings, and railroads are activities that can contribute to slope failure.

Significant landslide susceptibility exists on the margins of major uplift areas and near deeply incised river channels where slopes are steep and unconsolidated materials or incompetent shale beds are present. However, these areas are largely uninhabited and extensive development in the near future is not anticipated.

In addition, the County's Land Use Ordinances prohibit construction on slopes steeper than 30 percent and require 20- to 25-foot setbacks for structures and utilities.

### CONCLUSIONS

Landslides and sinkholes are possible in Santa Fe County but pose a generally low risk to life and property because the landslide susceptibility areas lie far from population centers.

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### OVERVIEW—DAM FAILURE IN SANTA FE COUNTY, NEW MEXICO

Dam failure can occur when a dam is overtopped (i.e., when it overflows). Overtopping is especially dangerous for an earthen dam because the downrush of water will erode the dam face and could breach the dam. There are several dams in Santa Fe County: Nambe Falls Dam and the Santa Cruz (more than one structure), the Two Mile Dam (more than one structure) and the Galisteo Dam, as well as several smaller earthen dams.

The San Juan-Chama Project is a diversion that brings 96,200 acre-feet of water to New Mexico under the Upper Colorado Basin Compact. The water is diverted from the San Juan River and brought through a tunnel across the Continental Divide to the Chama River. The Nambe Falls Dam and Reservoir is a tributary unit of the San Juan-Chama Project. The dam and reservoir provide a supplemental water supply for users on the Nambe-Pojoaque stream system. The effect of storage in Nambe Falls Reservoir upon the flow of the Rio Grande is offset by releases of San Juan-Chama Project water from Heron Reservoir (NM SEO, 2003). The Santa Cruz Dam system, located on the Santa Cruz River, is used for storage of irrigation water for the northern part of the County.

No known dam incidents and/or failures involving notable property damage have occurred in Santa Fe County. Two tailings dams failed in the late 1970s and three earthen dams failed prior to 1992 in other parts of the state. No failures have occurred since 1992, because of dry weather conditions as well as dam safety compliance (D. Lopez, former State Engineer, 2003).

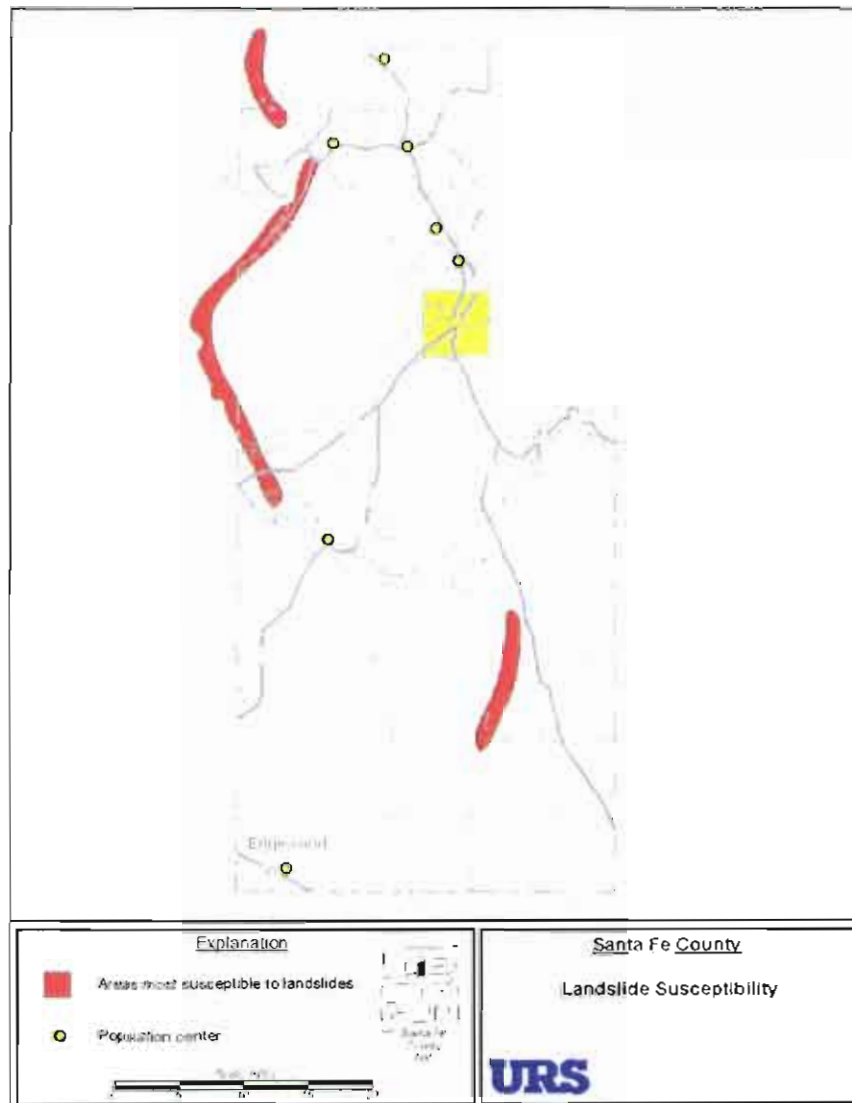


Figure 9: Landslide Susceptibility and Seismic Activity Map in Santa Fe County

Hydrologic or structural deficiencies are the primary cause of dam failure floods. However, the safety of the structure can be influenced by reservoir operations. Hydrologic deficiencies result from the following:

- Inadequate spillway capacity
- Excessive runoff after heavy precipitation
- Large waves generated from landslides into the reservoir
- Sudden inflow from upstream dam failures

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Structural deficiencies may be a result of the following:

- Seepage through the embankment
- Piping along internal conduits
- Erosion
- Cracking
- Sliding
- Overturning
- Rodent tunneling
- Landslides hitting the dam
- Other weaknesses in the structure

Dams in Santa Fe County and their hazard levels are depicted on Figure 10.

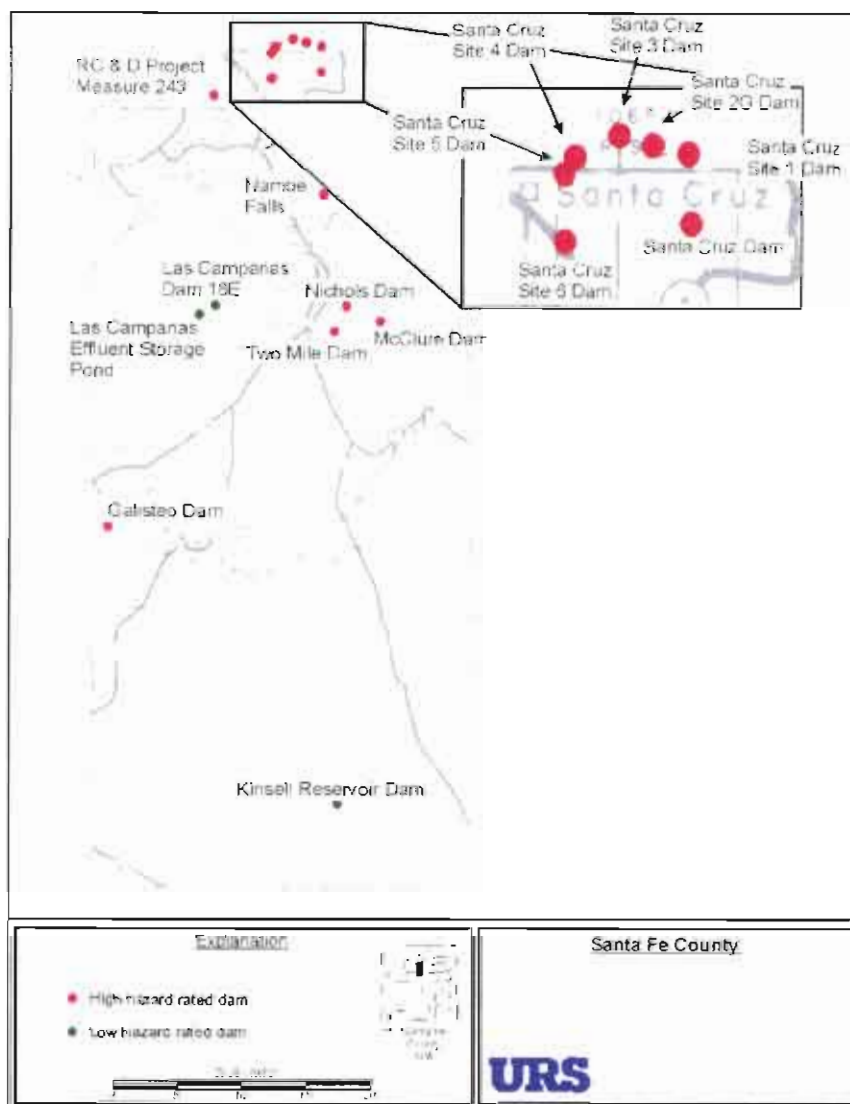


Figure 10: Dam Hazards in Santa Fe County



## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

When a dam failure occurs due to structural deficiencies, the subsequent flooding is characterized by a sudden rise in stream level, much like a flash flood from a thunderstorm. Dam failures can occur at any time; however, the risk of structural failure is increased during winter and spring because of increased precipitation and the runoff of melting mountain snow.

There are three classification definitions for dam hazard potential:

- **Low:** Hazard Classification is for those dams where failure or misoperation results in no probable loss of life and low economic and/or environmental losses. Losses are principally limited to the owner's property.
- **Significant Hazard Potential** is for those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifelines facilities, or can impact other concerns. These dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- **High Hazard Potential** is for those dams where failure or misoperation will probably cause loss of human life.

The Nambe Falls, Santa Cruz, Two Mile, and Galisteo Dams are rated as high hazard dams.

All of the dams located in Santa Fe County are required to complete Emergency Action Plans (EAP). These Plans include inundation maps as well as lists of critical facilities that may be threatened by the dams. Copies of the EAPs are located at the Santa Fe County Emergency Manager's Office.

### CONCLUSIONS—DAM FAILURE

Dam failure in times of heavy rains and high water levels would inundate the developed communities located downstream. Several dams in Santa Fe County have a "high" hazard rating, meaning that one or more persons could be affected by inundation in case of dam failure. However, they are considered to be maintained satisfactorily, and failures during normal operation are unlikely; therefore, vulnerability in Santa Fe due to dam failures is considered in general to be very low. In addition, dams were not on the priority list because the County is currently in a state of drought and the large dams in the state are below 50 percent capacity. Due to the severe drought conditions, it will take several years before the dams in Santa Fe County pose a risk to the community.

### OVERVIEW—VOLCANOES IN SANTA FE COUNTY, NEW MEXICO

Volcanic eruptions are one of the Earth's most dramatic and violent agents of change. Not only can powerful explosive eruptions drastically alter land and water for tens of kilometers around a volcano, but tiny liquid droplets of sulfuric acid erupted into the stratosphere can change our planet's climate temporarily. Eruptions often force people living near volcanoes to abandon their land and homes, sometimes permanently. Those living farther away are likely to avoid complete destruction, but their cities and towns, crops, industrial plants, transportation systems, and electrical grids can still be damaged by tephra (i.e., volcanic debris from explosions), lahars (i.e., mudslides or landslides caused by lava flows) and flooding.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

Volcanic activity since 1700 A.D. has killed more than 260,000 people, destroyed cities and forests, and severely disrupted local economies for months or years. Around the world, even with our improved ability to identify hazardous areas and warn of impending eruptions, increasing numbers of people face certain danger.

Volcanism in New Mexico is not extinct, but is dormant. The last known eruption in the state was 3,000 years ago in the El Malpais west of Grants, New Mexico. Socorro in southern New Mexico is one of the few areas where there are several young volcanoes associated with the Rio Grande Rift that runs through the middle of the state. No active volcanoes are listed in Santa Fe County (USGS, 2003).

### CONCLUSIONS—VOLCANOES

There are no active volcanoes in Santa Fe County. Due to the antiquity of known volcanism and the absence of associated historical seismic activity in Santa Fe County, the near-term risk of volcanic eruption in the County is low.

### CAPABILITIES

Santa Fe County and the incorporated jurisdictions have a number of resources that can be called on to help implement hazard mitigation actions. These resources are both private and public, and exist at the local, state, and federal levels. The diversity of Santa Fe County's landscape, culture, and residents is reflected in the varying level of community service found in different parts of the County. The areas surrounding the City of Santa Fe benefit from the readily available public services such as police and fire protection, hospitals, and clinics. Services in rural parts of the County are scarcer. A small portion of the City of Española is located within Santa Fe County, but the majority of Española is in Rio Arriba County and the City works more closely with Rio Arriba. The incorporated areas' capabilities are summarized in Table 19.

**Table 19: Santa Fe County/Incorporated Municipalities Capability Assessment Matrix**

Santa Fe County	•	•	•	•	•	•	•	•	•	•	•	•	•
City of Santa Fe	•	•	•	•	•	•	•	•	•		•	•	•
Edgewood	•	•	•	•	•	•	•	•	•		•		

<sup>1</sup>The State of New Mexico has adopted the 1997 Uniform Building Code as the minimum standard for all communities in the state.

## SECTION ONE: HAZARD IDENTIFICATION/RISK ASSESSMENT

The County and municipalities have adopted several development regulations. The Uniform Building Code (UBC), implemented statewide, and the floodplain ordinance, implemented locally, are two of the most important capabilities that the County utilizes to prevent potential damage from floods, wind, and other hazards.

- ✓ *Uniform Building Code*—Building codes are important mitigation tools because they are tailored to fit specific hazards present in each region. Consequently, structures that are built to applicable codes are resistant to hazards such as strong winds, floods, and wildfires, and can help mitigate the effects of these hazards. New Mexico has adopted the 1997 UBC code as a minimum standard for all communities and provides inspection services through the Construction Industry Division of the New Mexico Department of Regulations and Licensing. Individual counties and municipalities are at liberty to adopt the most current UBC but have not yet chosen to do so.
- ✓ *Land Use Codes* (Ordinance No. 1980-6, amended 1996) include Subdivision Regulations (1973), a Terrain Management Plan, the Santa Fe Water Conservation Ordinance (2002), the Santa Fe Extraterritorial Zoning Ordinance (1997), and the Santa Fe Flood Plain Ordinance (1996).
- ✓ *Floodplain Ordinance*—Through administration of floodplain ordinances, the municipalities ensure that all new construction or substantial improvements to existing structures located in the 100-year floodplain are built with first-floor elevations above the base flood elevation.

The County also undertook several important planning initiatives prior to this hazard mitigation plan:

- ✓ Santa Fe County developed and began implementation of a comprehensive plan document in March of 1980. The Comprehensive Plans emphasizes the need for planned growth within Santa Fe County. All of these policies and strategies presented in the Plan promote sound land use and regional cooperation among local governments to address planning issues. The Comprehensive Plan was updated in 1999 and does not contradict the goals and objectives of the Plan.
- ✓ Santa Fe County has participated in the National Flood Insurance Program (NFIP) since 1995. Santa Fe County has had flood damage prevention ordinances since 1996. These ordinances were designed to minimize flood losses within the County.
- ✓ Santa Fe County has completed a capital improvement plan aimed at enhancing the economic viability of its communities.
- ✓ Santa Fe County has completed a Wildfire Assessment for the unincorporated areas of the County. This document will be used to assess threat and establish priorities for mitigation.
- ✓ Santa Fe County has taken steps to address water conservation and reduce the severity of drought for the County by implementing a Water Conservation Ordinance (No. 2002-13). This ordinance mandates water conservation measures for residents and businesses within Santa Fe County. The Santa Fe County Water Conservation Ordinance is outlined in the Drought Hazard Identification portion of the plan.

## RESOURCES

Additional community-based, technical and funding resources currently available for Santa Fe County include the following:

### Community-based Organizations

- ✓ *Firewise Communities/USA*—is a project of the National Wildfire Coordinating Group's Wildland Urban Interface Working Team. It provides information and guidance for communities in the wildland-urban interface area. Hyde Park Estates and Aztec Springs are two Firewise communities in Santa Fe County. The communities have sponsored two workdays and provided a chipper for residents to use to dispose of yard wastes. ([www.firewise.org](http://www.firewise.org)).

**Technical Resources**—to help in future decision making:

- ✓ *FEMA elevation certificates* - are kept on file at Santa Fe County Planning and Zoning. Certificates are in paper format only but provide detailed information that can be used to determine risk on a building-by-building basis.
- ✓ *Community Development Block Grants (CDBG) Geographic Information System (GIS)* capabilities at the County level.

**Funding Opportunities** for possible support of mitigation or multiple objective actions, including:

- ✓ *Community Development Block Grants (CDBG)*—The Community Service Department administers the CDBG program for the County.
- ✓ *Debt Capacity*—Authority to incur debt through special tax, general obligation bonds, revenue bonds, and private activity bonds.
- ✓ *Capital Improvement Program*.
- ✓ *Taxes*—The County and municipalities have the authority to levy sales taxes.
- ✓ *Fees*—The County and municipalities have the authority to levy fees for water, sewer, gas, trash collection, landfills and electric service.
- ✓ *Emergency Management Response Plan*—Adopted in 2000.

## SUMMARY OF CAPABILITIES AND RESOURCES

The Capabilities and Resources of Santa Fe County related to mitigation planning can be summarized in term of opportunities and deficiencies to be addressed in the mitigation plan and implementation strategy as follows:

### **Opportunities**

- ✓ Updates to the Comprehensive Plan for Santa Fe County provide opportunities to integrate information about hazard vulnerability into the process of determining development suitability and long-range strategies in the County that will lead to sustainable growth.
- ✓ Community Rating System planning is consistent with and complementary to the mitigation planning process undertaken for the Disaster Mitigation Act of 2000 and can help in developing more detailed mitigation activities for flood related disasters in Santa Fe County.
- ✓ The City of Santa Fe has not yet developed a Wildfire Assessment for those wildland-urban interface areas located within the City limits.

### **Deficiencies**

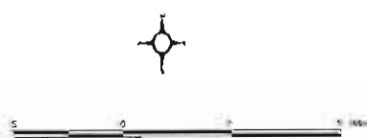
- ✓ Local communities facing development pressures may need to develop local code enforcement capacity.
- ✓ Mitigation projects and planning would benefit from the participation of tribal governments.
- ✓ Communities in Santa Fe County do not have wildfire prevention ordinances.
- ✓ Santa Fe County has not applied to FEMA to become part of the Community Rating System (CRS). The CRS is an NFIP-established program recognizing and encouraging communities that implement floodplain management practices that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community actions that meet the requirements of CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote awareness of flood insurance.
- ✓ Development is still allowed in the floodplain although there are provisions to provide some measure of mitigation and despite the fact that there is ample developable land outside the floodplain.

# SANTA FE BASE MAP



LEGEND	
	State
	Indian Reservation
	Water/Stream
	Transportation
	Medical Clinic
	Water/Water Line
	Small/Other Building
	Community Center
	Highway
	Police
	Fire Station
	Library
	Medical Services
	Other
	Public Land
	Private Land
	Water
	State Land (Private/Managed/Other)
	County
	County Boundary
	Unincorporated and Other Designated Areas

URS

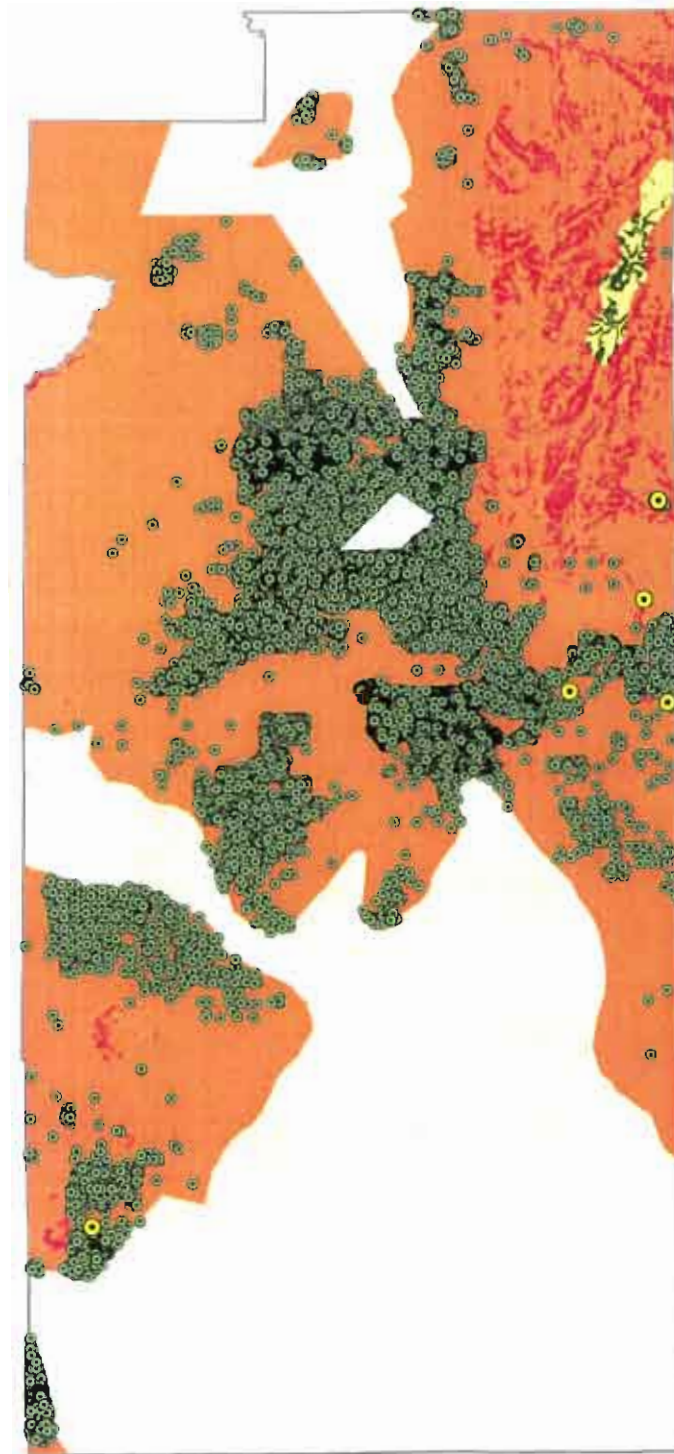




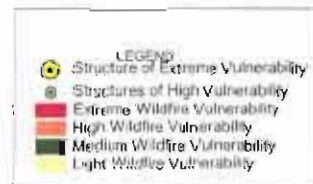
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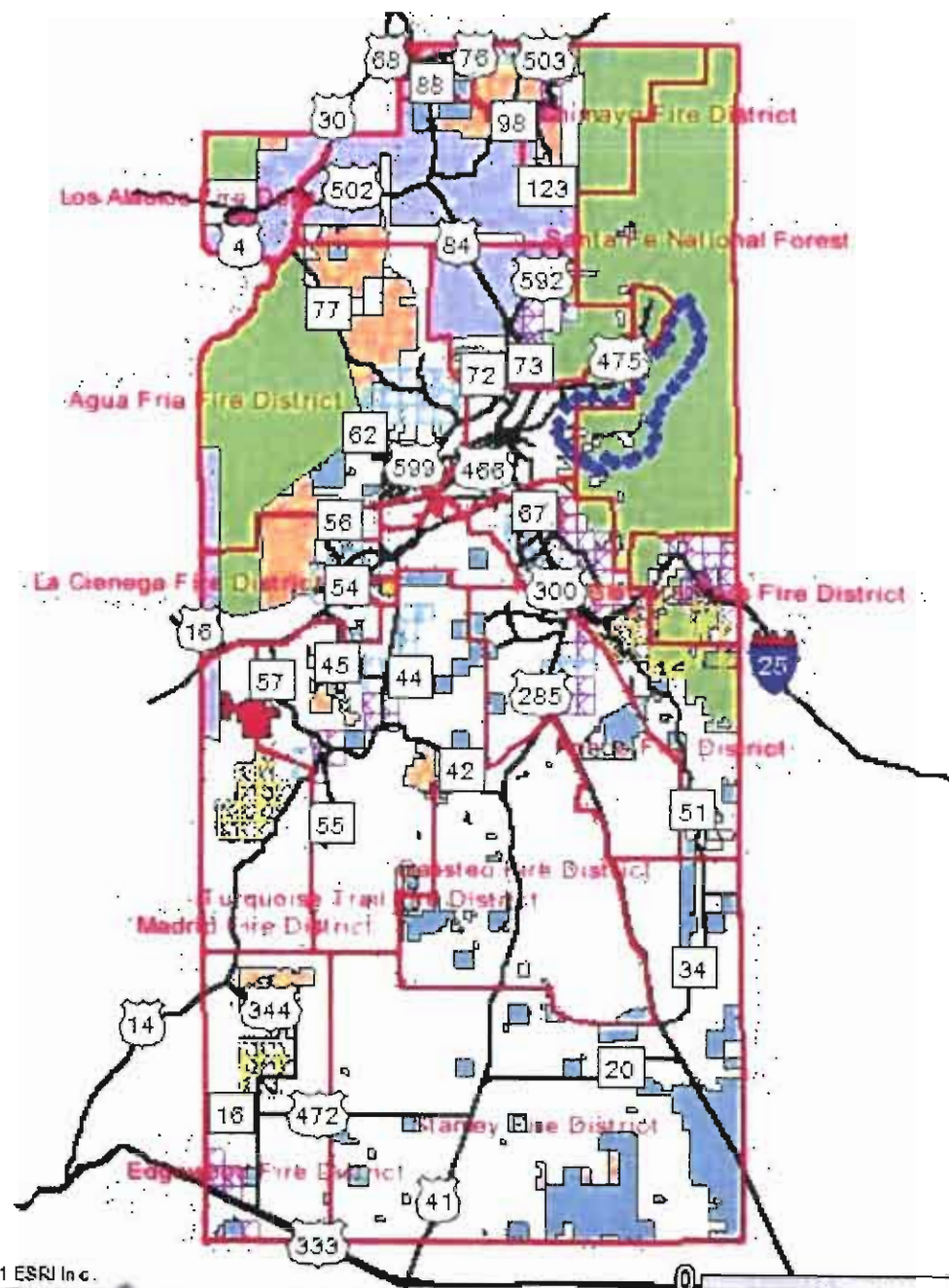


# SANTA FE WILDFIRE VULNERABILITY ASSESSMENT



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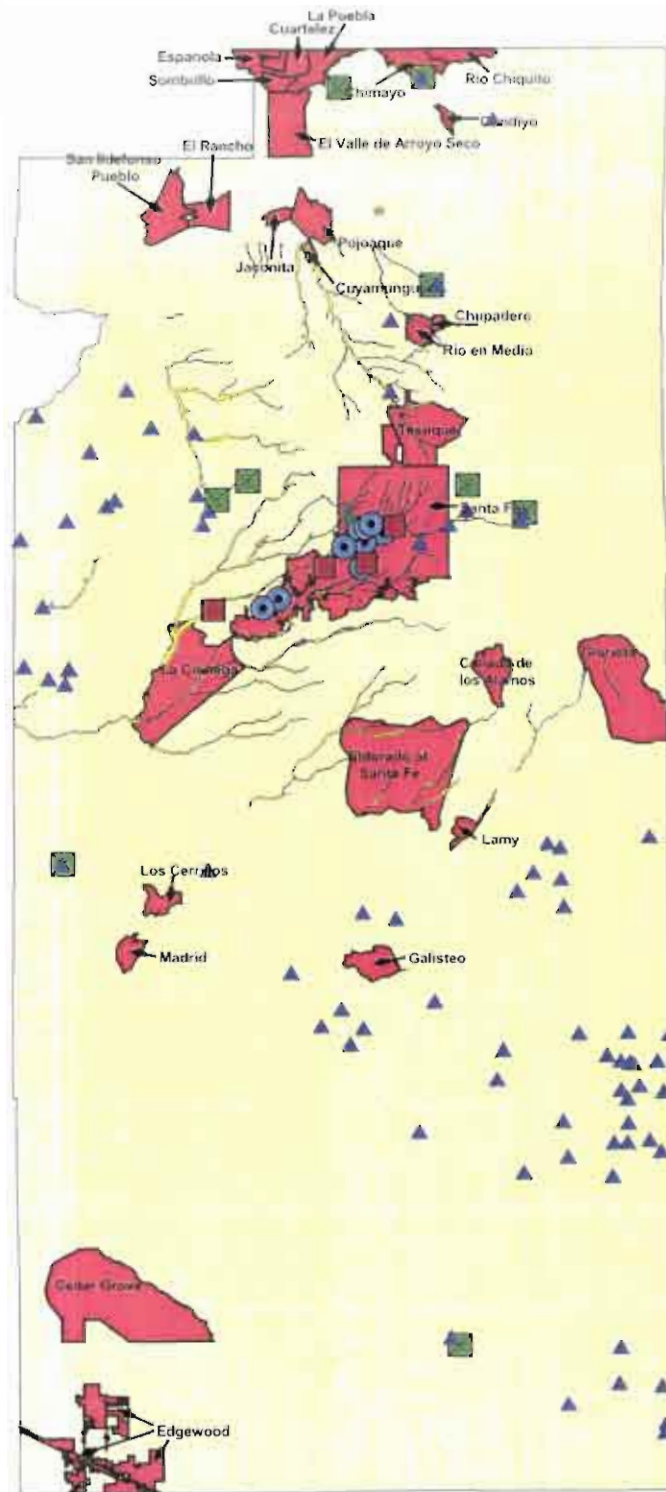




Map created with ArcIMS - Copyright (C) 1992-2001 ESRI Inc.

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# SANTA FE FLOODPLAIN



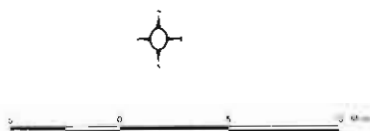
## Legend

- ▲ Reservoirs
- ⬮ Transfer Stations
- Wastewater Sites
- Dams
- Public Wells
- Santa Fe River Basin Reservoirs

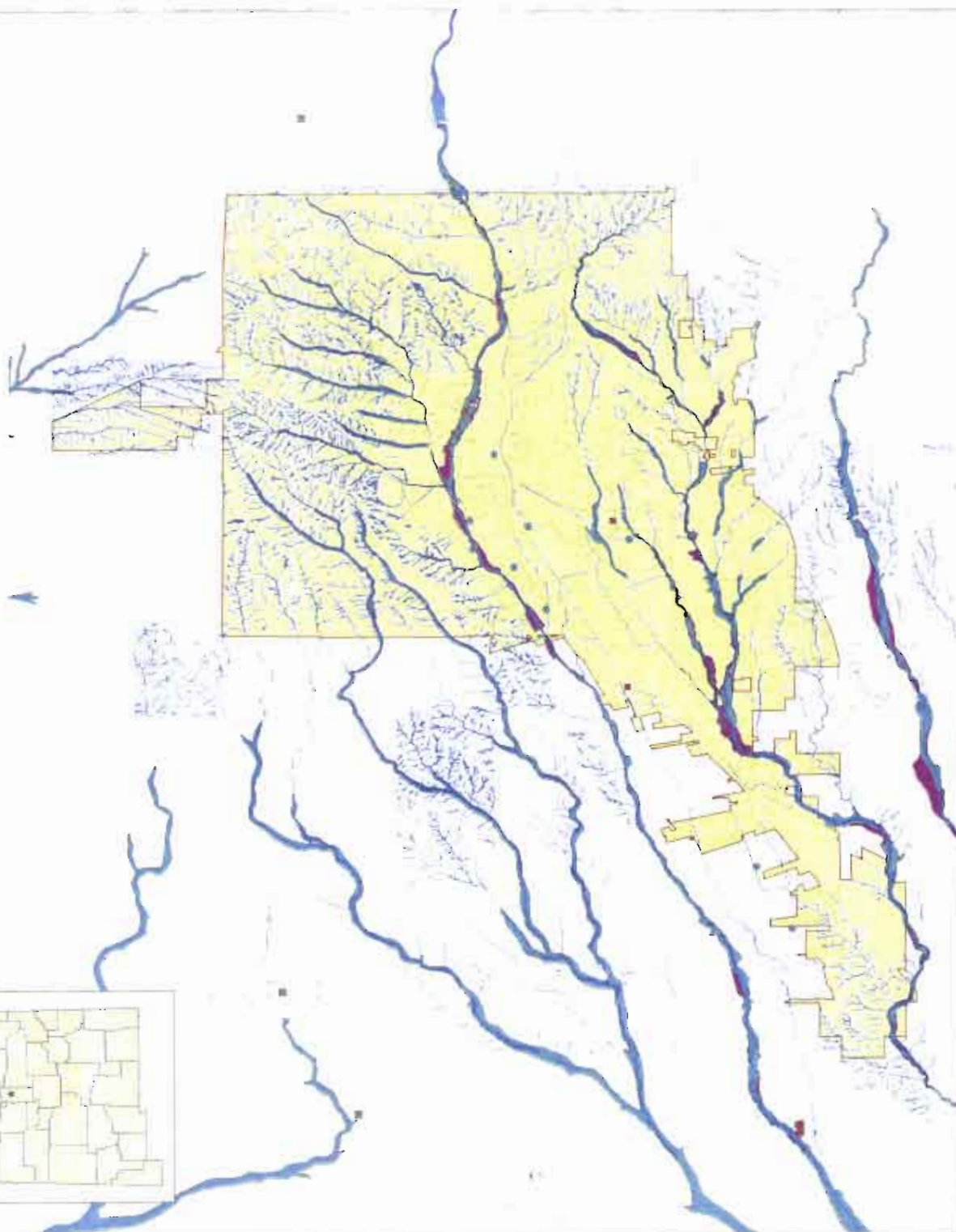
## Floodplain

- 100- Year
- 500- Year
- Incorporated and Census Designated Places
- County

URS







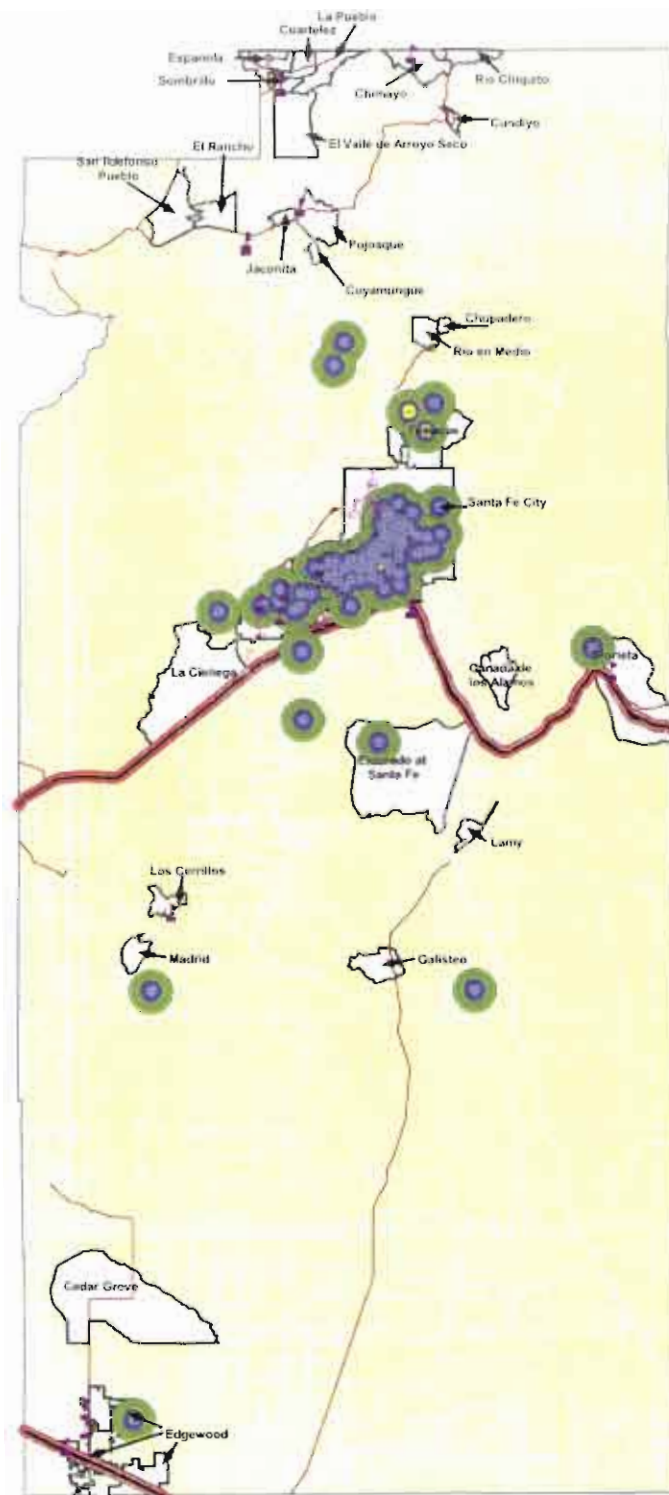
**LEGEND**

- 1 Traveler (Season)
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URS

# SANTA FE HAZARDOUS MATERIALS

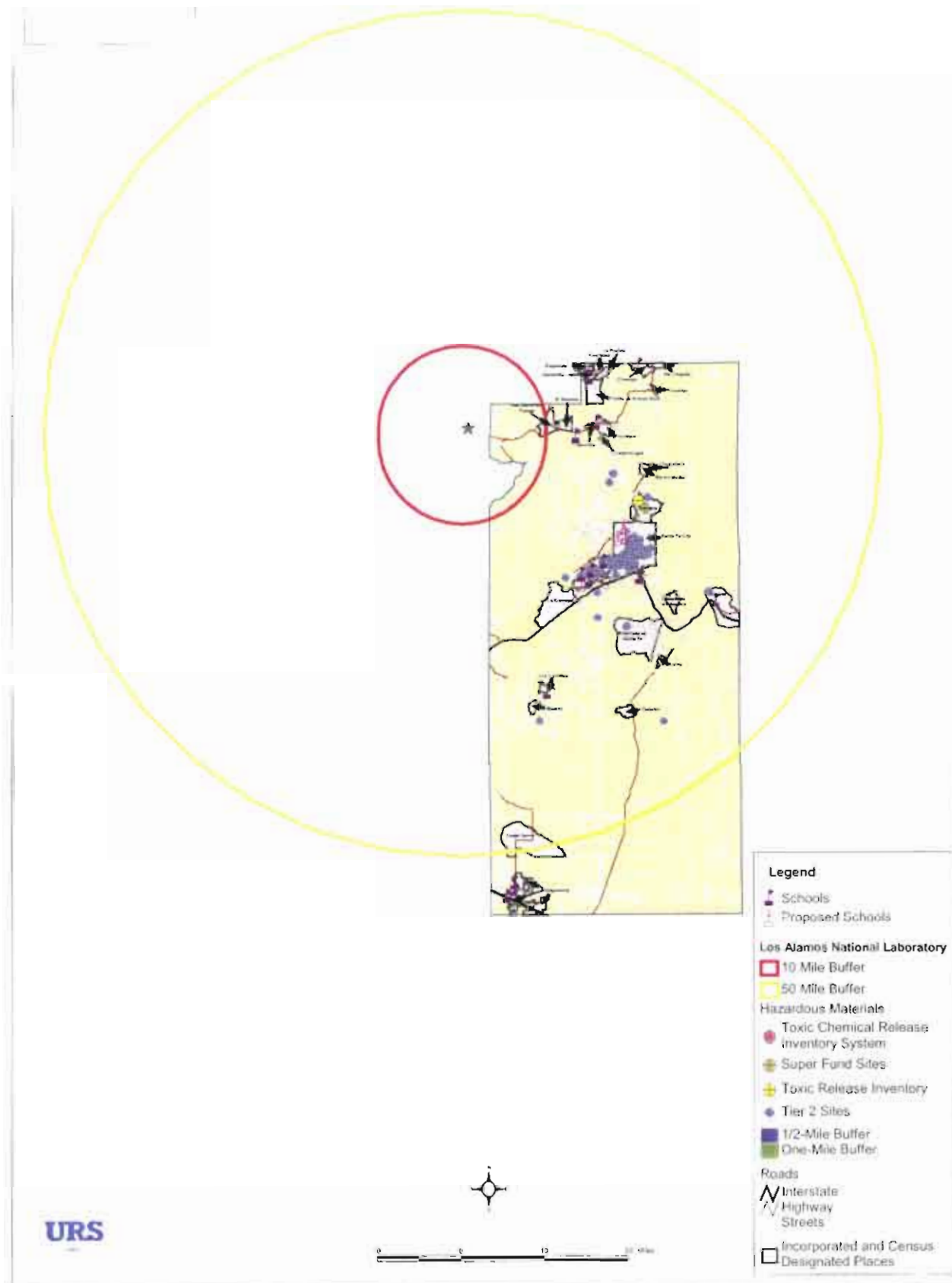


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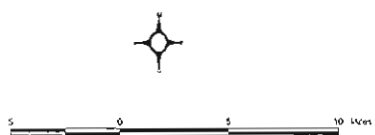
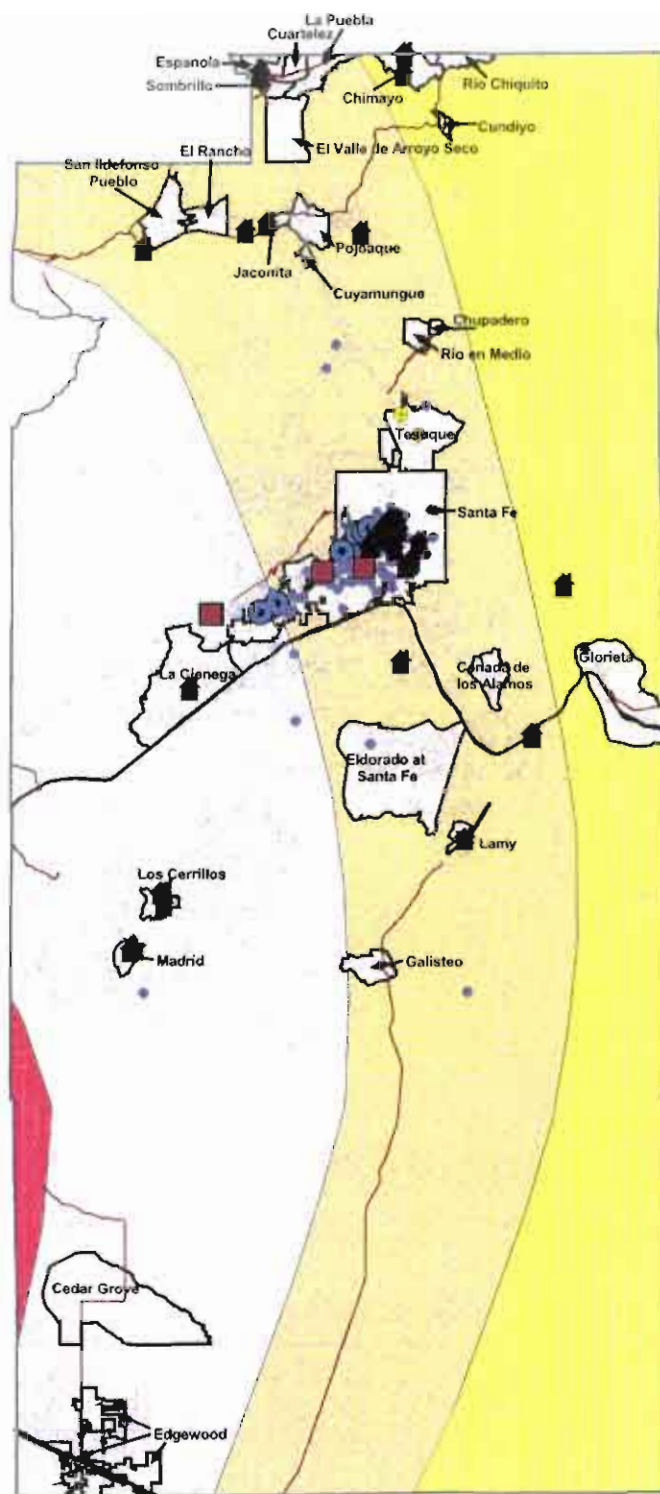
- Schools
- Proposed Schools
- Hazardous Materials**
- Toxic Chemical Release Inventory System
- Super Fund Sites
- Toxic Release Inventory
- Tier 2 Sites
- 1/2-Mile Buffer
- One-Mile Buffer
- Roads**
- Interstate
- Highway
- Streets
- One-Quarter Mile Interstate Buffer
- Incorporated and Census Designated Places

# SANTA FE HAZARDOUS MATERIALS

## LOS ALAMOS NATIONAL LABORATORY



# SANTA FE EARTHQUAKE HAZARD





## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

This section presents a series of goals, objectives, and alternative mitigation actions to help guide the County and municipalities in addressing their hazard vulnerabilities. The identified mitigation actions reflect the vulnerabilities discussed in Section One by identifying measures that may help the County avoid, prevent, or otherwise reduce damages from hazards.

**Goals** are general guidelines that explain what Santa Fe County, the City of Santa Fe, and the Town of Edgewood want to achieve. Goals are usually expressed, as broad policy statements representing desired long-term results. In this Plan, goals directly respond to the results of the hazard identification and risk assessment.

**Objectives** describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.

**Actions** provide more detailed descriptions of specific work tasks to help the jurisdictions achieve the goals and objectives. For each objective statement, there are alternatives for mitigation actions that must be evaluated to determine the best choices for each situation.

**Mitigation Plans** include a listing and description of the preferred mitigation actions and the strategy for implementation (i.e., who is responsible, how will they proceed, when the action should be initiated and/or completed, etc.).

The goals and objectives presented below were developed in light of the risk assessment findings presented in Section One, the desires of Santa Fe County citizens, and guidance provided by NMOEM.

Current criteria under DMA 2000 recommend that local mitigation plans be consistent with and support their State's hazard mitigation plan. The State of New Mexico's existing State Hazard Mitigation Plan, created prior to the DMA 2000 planning criteria, details the mitigation goals, objectives, and strategies based on the state's risk assessment. The state's hazard mitigation goals are presented in Table 19.

In public meetings held in April and May 2003, the Santa Fe County Planning Team- composed of local government representatives- identified goals and objectives based on the findings of the risk assessment. Consistent with the Santa Fe Growth Management Plan, the Team expressed the chief desire that mitigation objectives should maintain the rich historic, recreational, and agricultural fabric of the community. Furthermore, objectives should recognize the necessity of commercial interests. *First and foremost, however, mitigation objectives should protect people, property, local governments, and the local economy from the effects of hazards.*

The mitigation objectives and actions identified by the Mitigation Planning Team are presented below generally according to hazard type in the same order as Section One. However, this listing does not reflect the order in which the projects will be implemented. In Section Three, recommended projects are prioritized for implementation as resources become available.

**Table 19: State of New Mexico Hazard Mitigation Goals**

- Develop strategic mitigation plans and identify funding sources to support them.
- Adopt and enforce all-hazards building codes.
- Adopt incentives and disincentives to encourage mitigation.
- Develop administrative structures to support implementation of mitigation programs and priorities.
- Incorporate mitigation of natural hazards into their land use management plans and programs.
- Develop, support, and conduct ongoing public information campaigns on natural hazard mitigation.

- Develop business interruption plans and implement mitigation to minimize loss of jobs and business activity.
- Develop incentives for mitigation with insurance and banking institutions.
- Promote awareness of hazard risk and mitigation solutions among customers and the public.

- Become aware of the natural hazards that may affect them and their communities.
- Support adoption and enforcement of measures designed to reduce their vulnerability.
- Take other appropriate actions to protect their lives and property against the impacts of natural hazards.

Wildfires pose a significant threat to Santa Fe County. The arid climate, dense timber stands, large accumulation of fuel from under-story growth, and steep slopes make the County highly susceptible to wildfire. Tree densities in the wildland-urban interface areas of the County are several times greater than what is considered normal in a healthy forest. The threat has worsened in recent years due to drought and to insect infestation that has killed large numbers of piñon pines, ponderosa pines, and juniper trees.

Some of the wildfire mitigation actions listed below are derived from the *Santa Fe County – Wildland-Urban Interface Inventory Assessment* dated February 2001. This report identified residential communities in the County that are within the wildland-urban interface and assigned a “hazard rating” to each of those areas. The report estimates that there are 156 square miles and 7,816 residential lots (both developed and vacant) within the wildland-urban interface in Santa Fe County. It also emphasizes the importance of protecting the Santa Fe River watershed since the area supplies 40% of Santa Fe’s water.

Appendix F includes typical mitigation actions that can be taken to address wildfires, but there are limitations to the data available to make detailed determinations for risks. Therefore, the following recommendations for actions include a number of follow-on efforts to better assess relative vulnerability and risk.

- ✓ **Action 1:** Reduce fuel loads and create defensible spaces in the wildland-urban interface in Santa Fe County.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

- ✓ **Action 2:** For all new developments, establish County standards for defensible space and fire safe landscaping (Santa Fe County Wildland-Urban Interface Area Inventory Assessment, Feb. 2001).
- ✓ **Action 3:** Develop dependable sources of water for fire suppression in all residential areas of the County.

- [REDACTED]
- ✓ **Action 1:** Perform detailed assessments of individual SARA Title III facilities within wildfire hazard areas including presence or absence of vegetation close to the buildings; power supply lines, communication lines, etc. In the cases where vegetation is present, follow-on efforts would include an assessment of the available fuel within the forested areas, type of construction materials on the facility (in particular the roof, siding and window coverings) etc., to determine more detailed assessments of vulnerability and risk. In cases where vulnerability and risk are considered to be relatively high (e.g., high fuel levels, proximity of vegetation, combustible materials), follow-on efforts should include investigating the extent to which "defensible space" practices (see Appendix F) would alleviate the problems in a cost effective manner.

- [REDACTED]
- ✓ **Action 1:** Perform similar assessments for critical facilities located in high or extreme wildfire hazard areas to the process described in I.B.1.

- [REDACTED]
- ✓ **Action 1:** Establish a FireWise program through the National Fire Prevention Association to promote strategies for reducing fire potential in residential areas (Santa Fe County Wildland-Urban Interface Area Inventory Assessment, Feb. 2001)
  - ✓ **Action 2:** Hold public meetings for and send flyers to residents to educate them on defensible space and construction in fire prone communities in the County.

[REDACTED]

Droughts in Santa Fe County affect the entire County and can disrupt public and rural water supplies for human and livestock consumption; water quality; natural soil water or irrigation water for agriculture; water for forests and for fighting forest fires; and water for navigation and recreation. The following actions are focused on actions to reduce the effects of droughts on Santa Fe County.

- [REDACTED]
- ✓ **Action 1:** Continue efforts to encourage residents to use water-saving landscaping techniques.
    - Provide incentives for xeric landscaping to replace existing high water use landscaping.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

- ✓ **Action 2:** Employ municipal and county zoning, subdivision, and building regulations to promote water conservation.
  - In new subdivisions, limit or prohibit areas planted with high water use landscaping such as Kentucky bluegrass.
  - Revise subdivision ordinances and building regulations to promote natural stormwater management techniques such as directing stormwater to impervious areas to increase groundwater recharge.
- ✓ **Action 3:** Implement pilot projects to use County and Municipal treated effluent for non-potable uses.

- ✓ **Action 1:** Pursue imported sources of water to augment existing surface and groundwater supplies.
- ✓ **Action 2:** Pursue potential for aquifer injection to augment groundwater supply

As detailed in Section One, Santa Fe County is highly susceptible to flash floods with occurrences nearly every year. Heavy thunderstorms in the summertime, steep slopes, sparse vegetative cover, and fine-grained soils lead to rapid runoff of large volumes of water. The situation is exacerbated by wildfire and drought, which reduce vegetative cover and expose the soil to even greater runoff. Appendix F describes a variety of property protection actions that the County can take to mitigate hazards and evaluates their feasibility. However, data limitations in many cases restrict the ability to determine the most appropriate mitigation actions for specific affected properties at this time.

- ✓ **Action 1:** Develop a countywide Drainage and Stormwater Management Plan.
- ✓ **Action 2:** Develop a plan to correct flood and erosion problems for along SR 76 between Chimayo and Espanola.
- ✓ **Action 3:** Build levees, culverts, and earthwork to channel water away from roads and homes in La Cienega.

- ✓ **Action 1:** Update floodplain and floodway maps in Santa Fe County.
- ✓ **Action 2:** Work with municipal and county officials to increase awareness among property owners including information mailings to property owners in the 100-year floodplain; and sponsoring a series of workshops about costs and benefits of acquiring and maintaining flood insurance coverage for property owners in the 100-year floodplain.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

- ✓ **Action 1:** Complete structure data records in the Santa Fe County Geographic Information System to allow future revisions of this plan to more easily incorporate information about property values, construction types, etc.
- ✓ **Action 2:** Obtain information for all remaining structures in the 100-year floodplain to determine the best property protection methods to promote with individual property owners including first floor elevations for properties within the 100-year floodplain, market and/or replacement value, construction type etc. Techniques for gathering information over time should include developing and implementing a program for integrated information "capture" at key points in normal municipal administrative procedures including applications for building permits at municipal and County levels.

There are a number of mitigation actions that can be used to mitigate wind and weather hazards. Unlike flood and wildfire, which have limited geographic extents, severe weather potentially affects the entire County. Therefore, strategies for identifying wind and weather mitigation actions usually involve identifying individual structures or particular critical facilities with known/assumed vulnerability. Additional efforts might include actions that can reach the entire County through public education or by improving County implementation capabilities and strengthening regulations. Appendix F includes a list of wind hazard mitigation actions with information about their suitability for use in Santa Fe County.

- ✓ **Action 1:** Conduct non-technical evaluation process for remaining critical facilities to determine relative vulnerability and gather information for subsequent refinements of this mitigation plan.

- ✓ **Action 1:** Complete structure data records in the Santa Fe County Geographic Information System to allow future revisions of this plan to more easily incorporate information about property values, construction types, etc.

- ✓ **Action 1:** Install snow fences along County roads in southern Santa Fe County.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

Human-caused hazards are difficult to mitigate since they either do not occur in predictable locations (i.e., hazardous material spills along major transportation routes) or result from the actions of unstable individuals. In some cases, as detailed in Section One, the locations where accidental or intentional releases of hazardous materials can be identified and established programs for protecting lives and property put in place. For example, hazardous material handling sites and nuclear power generating facilities must comply with State and federal regulations, including meeting design standards, notifying the appropriate authorities in the case of an accident, and having emergency response plans.

In the case of Santa Fe County, the initial focus is on areas where relative risk is higher or where an accidental or intentional release would result in greater relative impacts.

- ✓ **Action 1:** The Mitigation Planning Team should work with facility owners and operators identified in Section One as having the greatest potential impact (based on population in the immediate vicinity) to ensure:
  - Facilities are in compliance with all relevant local, state and federal requirements;
  - Neighboring property owners understand the potential extent of the risk; and
  - Alert and warning systems are appropriate to the situation.

Pursue the installation of warning systems around hazardous material facilities when and if it is determined that existing warning systems are inadequate for the purposes of alerting neighboring property owners.

- ✓ **Action 1:** Assess need to and ways to harden critical facilities against the effects of human-made hazards, e.g., the accidental or intentional release of chemical, biological, or radioactive material; the accidental or intentional detonation of explosives; or acts of random violence or terrorism.

- ✓ **Action 1:** Update equipment used to respond to hazardous materials incidents.
- ✓ **Action 2:** Update Emergency Operations Plan to include Homeland Security rules and regulations to be followed.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

- ✓ **Action 1:** Install an emergency communication system that is not dependent on local telephone and electrical services for rural communities within the County

- ✓ **Action 1:** The Mitigation Planning Team should work with individual municipalities and communities, as well as directly seek ways (newspaper articles, websites, etc.), to inform individuals and business owners regarding recommendations for how to prepare for hazardous material releases. The recommendations will advise taking some of the same actions taken to prepare for earthquakes, floods, and fires, i.e., store a three-day supply of food and water, make sure flashlights, portable radios, and spare batteries are on hand; and identify out-of-town contacts and a place to reunite if separated from family members. All residents can be better prepared by becoming more aware of surroundings and reporting suspicious activity to local officials.

Damage from earthquakes can be mitigated for existing buildings by retrofitting them and for new buildings by building them stronger, i.e. according to the most recent seismic design specifications as specified in building codes. Appendix F includes more specific information about techniques to use as part of a coherent mitigation process. However, the risk from earthquakes is relatively low in Santa Fe County and pursuit of retrofits should be taken only for critical facilities or areas with special needs populations.

- ✓ **Action 1:** Conduct non-technical assessment to determine relative vulnerability/risk.

The two remaining goals address important aspects of the mitigation planning effort for Santa Fe County that go beyond addressing existing problem areas. These goals are based on the ideas of prevention through appropriate land-use and development controls and increasing the general awareness of the public regarding the potential effectiveness of mitigation actions at the individual, community, and County levels.



## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

- ✓ **Action 1:** Distribute and promote the inclusion of the vulnerability analysis information as part of periodic plan review and revisions at the municipal and County level.
- ✓ **Action 2:** Utilize a GIS for identifying "sensitive area" properties in the County.



- ✓ **Action 1:** Promote adoption of the Wildland-Urban Interface Code by all municipalities and the County.



- ✓ **Action 1:** Work with the State, County and municipal building inspectors to consistently enforce the building code from jurisdiction to jurisdiction.



- ✓ **Action 1:** Make rural addressing consistent in all unincorporated parts of the County.



- ✓ **Action 1:** Complete structure data records in the Santa Fe County Geographic Information System to allow future revisions of this plan to more easily incorporate information about property values, construction types, etc.



- ✓ **Action 1:** Identify and publicize success stories as part of an overall consistent public relations program.



- ✓ **Action 1:** Convene regular meetings with the Mitigation Planning Team to discuss issues and progress related to the implementation of the plan.
- ✓ **Action 2:** Promote partnerships among the municipalities and the County to develop a countywide approach to mitigation activities.
- ✓ **Action 3:** Incorporate hazard mitigation concepts into regular County and municipal operations.

## SECTION TWO: GOALS, OBJECTIVES AND MITIGATION ACTIONS

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- ✓ **Action 1:** Renew and expand commitments to business partner organizations.

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

A hazard mitigation plan is a community's plan for evaluating hazards, identifying resources and capabilities, selecting appropriate actions, and developing and implementing the preferred mitigation actions to eliminate or reduce future damage from those hazards in order to protect the health, safety, and welfare of residents in that community. The implementation strategy outlines the key information about responsibilities and funding that are necessary to implement the mitigation actions.

There may be differences in the amount of information and analysis, or the number of proposed initiatives, for each separate jurisdiction. This may be a result of the different characteristics of each jurisdiction, the information and data available for the analysis, and the time available for the jurisdiction's representatives to conduct the planning process.

The Mitigation Plan and Implementation Strategy also identifies procedures for keeping the Santa Fe County Hazard Mitigation Plan current and for updating it at least once every five years, as prescribed by the Disaster Mitigation Act of 2000.

The Santa Fe County Planning Team identified and ranked hazard mitigation actions for the respective jurisdictions. The Planning Team will present their prioritized lists of hazards and projects to the communities of the City of Santa Fe, the Town of Edgewood, and the Pueblos within the County. The Emergency Manager, James Leach, will present the lists to each of the communities via letter. Each community will be requested to prioritize the mitigation actions and return their response to Mr. Leach. Copies of this correspondence will be included in Appendix. The Santa Fe County Planning Team will use this information to prioritize these actions into a countywide consensus.

The Planning Team identified the hazards in the County based on the list provided in the New Mexico All Hazard Plan developed in 1999. Each of the hazards was discussed and ranked by the Team by consensus. The Team then identified proposed mitigation actions and brainstormed to identify new mitigation actions. A copy of the table created during this meeting is located in Appendix C Meetings.

During the meeting, team members reviewed maps, goals, and objectives. Team members used the following considerations to make their decisions:

- **Hazard priority.** How does the action relate to the hazard order of priority?
- **Plan goals and objectives.** How does the mitigation action address the goals and objectives of the plan?
- **Equity.** Does this action benefit most, if not all, the communities within the County? Is there an equitable distribution of actions by municipality?
- **Countywide impacts.** How does it affect the County as a whole?
- **Ease of implementation.** Can this action be easily implemented first? Does the County or town have the capability (funding, regulatory authority, staff) in place now to implement the action?
- **Multi-objective actions.** Does this action achieve multiple community goals?

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

- **Time.** Can this action be quickly accomplished compared to those that would take a long time to obtain the necessary approvals or funding?
- **Post-disaster mitigation.** Is this action more feasible in a post-disaster setting? Would the extent of damages, political will, and access to State and federal mitigation funds dramatically alter the feasibility of implementation?
- **Cost Benefit Analysis.** Is this the project that produces the greatest net cost benefit?

The Mitigation Planning Team discussed each mitigation project and decided by consensus how to rank it relative to other projects. Each project was analyzed for its cost, ease of implementation, consistency with overall hazard priorities, and equity within the community. The hazard mitigation action plan contains the list of mitigation actions, the rationale for inclusion, responsible organizations, estimated costs, possible funding sources, and timeline for implementation.

Table 20 presents the priorities set by the team.

**Table 20: Mitigation Planning Team Priorities**

Reduce fuel loads and create defensible spaces in the wildland-urban interface <input type="checkbox"/> Fuel Load Calculation in Wildland-Urban Interface	Wildfire	1	County
Update floodplain and floodway maps in Santa Fe County.	Flood/Flash Flood	2	County
Install snow fences along County roads in southern Santa Fe County.	Severe Weather	3	County
Update equipment used to respond to hazardous materials incidents.	HazMat	4	
Continue efforts to encourage residents to use water-saving landscaping techniques. <input type="checkbox"/> Fund program to meter domestic wells <input type="checkbox"/> Expand the City of Santa Fe water reduction use program <input type="checkbox"/> . Feasibility study on use of treated effluent for non-potable uses such as irrigating public spaces and golf courses	Drought	5	City/County
Develop dependable sources of water for fire suppression in all residential areas of the County.	Wildfire	*	County
Develop County-wide storm water management plan	Flood/Flash Flood	*	County
Install an emergency communication system that is not dependent on local telephone and electrical services.	Severe Weather	*	County
Create a task force to improve information sharing between County assessors, appraisers, and inspectors	Flood/Flash Flood Wildfire Human Caused Severe Weather	*	County

## SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

Ensure compliance with the recently adopted wildland-urban interface ordinance by hiring additional staff to do on-site inspections and enforcement.	Wildfire	*	County
Develop a CERT training program for all areas of the City and County.	All	*	City/County
Convene regular meetings with the Mitigation Planning Team to discuss issues and progress related to the implementation of the plan	All	*	City/County
Conduct non-technical assessment to determine relative vulnerability/risk for earthquakes.	Earthquake	*	*
Develop a public relations and information program. <input type="checkbox"/> Identify and publicize success stories as part of an overall consistent public relations program. <input type="checkbox"/> Renew and expand commitments to business partner organizations. <input type="checkbox"/> Include vulnerability analysis information as part of periodic plan review and revisions at the county and municipal level <input type="checkbox"/> Incorporate hazard mitigation concepts into regular County and Municipal operations.	All	*	*

The Hazard Mitigation Action Plan contains the list of mitigation actions, including the rationale for inclusion, responsible organizations, estimated costs, possible funding sources, and timeline for implementation. Projects listed below are listed in order of priority and the overall priority, ranking per the preceding discussion is indicated as well.

### ***Santa Fe County***

Comments:	Reduce fuel loads and create defensible spaces in the wildland-urban interface areas
Responsible Organization:	Santa Fe County Fire Department
Estimated Costs:	1,000/acre
Possible Funding Sources:	FEMA, Santa Fe County
Timeline for Implementation:	Immediately and on-going –FY04 through FY08
Cost Benefit Analysis	Average value of home in County is over \$200,000. 21,114 structures identified as being at risk for wildfire.

Comments	Raw LIDAR data combined with bare earth DTM can be used to efficiently quantify fuel loads in these areas. Relatively low cost for effective tool to help target fuel load reduction projects that will reduce potential losses to residential structures.
Responsible Organization	Santa Fe County, New Mexico State Forestry, U.S. Forest Service
Estimated Costs:	\$50,000 – \$80,000
Possible Funding Sources:	County has acquired LiDAR for entire County – valued at \$750,000
Timeline for Implementation:	June 2004
Cost Benefit Analysis	Average value of home in County is over \$200,000. 21,114 structures identified as being at risk for wildfire.

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

Comments: Current FIRMS and available D-FIRMS are outdated  
Responsible Organization: FEMA, Santa Fe County, and City of Santa Fe  
Estimated Costs: \$8500/ mile –  
Possible Funding Sources: County already has 2 foot elevations of entire County  
Timeline for Implementation: As soon as possible; FY04  
Cost Benefit Analysis: Leverage County's existing data to update flood maps at reduced cost.  
Aggregate value of homes in floodplain exceeds 84 million dollars.

Comments: Area prone to severe snow and wind conditions  
Responsible Organization: Santa Fe County Public Works Department  
Estimated Costs: \$300,000 –30 miles at \$10,000/ mile  
Possible Funding Sources: County willing to provide labor and equipment  
Timeline for Implementation: Dependent upon available funds – can be built incrementally  
Cost Benefit Analysis: Snow fences will reduce the cost of snow removal and reduce vehicular accidents.  
Snow removal costs for one storm in 2001 exceeded \$141,000.

Comments: Santa Fe County is in need of a Hazmat response truck and updated hazmat suits to level A and level B suits.  
Responsible Organization: Santa Fe County  
Estimated Costs: \$315,000  
Possible Funding Sources: Homeland security department of Justice  
Timeline for Implementation: Immediately after funding  
Cost Benefit Analysis: As shown in Table 12, over 50,000 people reside within mile of a SARA Title III facility

Comments: Domestic well use is currently unregulated and impacting limited groundwater supplies  
Responsible Organization: Santa Fe Public Works  
Estimated Costs: \$3,000/well  
Possible Funding Sources: Office of State Engineer, Santa Fe County  
Timeline for Implementation: FY06 through FY08  
Cost Benefit Analysis: N/A

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

Comments: City has established program and incentives for reducing water use including rebates for low flow toilets, xeriscape requirements and reduced cost on purchasing rain catchment barrels. Expand to include incentives for replacing inefficient washing machines and evaporative coolers. Reduces need to develop new sources of water. More thorough cost benefit analysis will be provided with request for funding

Responsible Organization: City of Santa Fe Water Department

Estimated Costs: Not available at this time; will be generated at time of request for funding

Possible Funding Sources: Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.

Timeline for Implementation: Scope of Work and issue RFP within 9 months. Complete Plan by end of 2005

Cost Benefit Analysis N/A

Comments: Use existing water supply more efficiently by recycling water. Successfully implemented in several Southwest cities

Responsible Organization: City of Santa Fe

Estimated Costs: \$500,000

Possible Funding Sources: Office of State Engineer, State legislative funds, Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.

Timeline for Implementation: RFP for study out in 2005, complete study by end of 2006

Cost Benefit Analysis New water sources cost more than \$6,000/acre-foot of water. Each acre-foot of water typically serves three households. Re-use of treated effluent equals cost of adding 250 new households.

Comments: Using information from Santa Fe County Wildland Urban Interface Area Inventory, target at-risk residential communities that lack water. Initiate study to estimate costs for upgrading/developing water system for fire suppression.

Responsible Organization: Santa Fe County Fire Department

Estimated Costs: \$500,000

Possible Funding Sources: New Mexico State Fire Fund, Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.

Timeline for Implementation: RFP for study out in 2004, complete study by 2005

Cost Benefit Analysis Per Table 3, assets at risk to fire in Santa Fe County total \$5,533,682,649.



### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

Comments:	Develop or update current flood/flash flood plan for Santa Fe County. Plan should cover both natural and artificial drainage systems and identify general hazards, deficiencies, and other problems. Formulate a strategy and cost estimates for addressing specific flooding concerns in County. Comprehensive strategy for reducing chronic losses from flooding.
Responsible Organization:	Emergency Services, County Public Works
Estimated Costs:	\$100,000
Possible Funding Sources:	FEMA, Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.
Timeline for Implementation:	Scope of Work and issue RFP within 9 months. Complete Plan by end of 2005
Cost Benefit Analysis	Per Table 8, assets within the 100-year flood plain in Santa Fe County total over \$110 million.

Comments:	Currently the County is limited to receiving and transmitting capabilities with local dispatch and law enforcement. In certain emergency situations where electric power and phone service is interrupted, the County's Fire and Emergency Medical Services would not be able to communicate with Federal, State, and local entities. Implementation would require approval by the Federal Communications Commission (FCC) for various frequency accesses via radio transmitters, and receivers. Minimal investment to improve emergency response services.
Responsible Organization:	County Emergency Offices
Estimated Costs:	\$10,000
Possible Funding Sources:	Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.
Timeline for Implementation:	After funding and FCC permission, the project can be completed within five months (depending on manufacturing and shipping).
Cost Benefit Analysis	N/A

Comments:	Improve and expand structure data records in the Santa Fe County GIS <i>Improve information sharing between County assessors, appraisers and building inspectors. Maintain rural addressing in all unincorporated parts of the County. Currently no method for capturing and sharing structure data to improve and update County's GIS.</i>
Responsible Organization:	County Assessor's Office
Estimated Costs:	\$20,000
Possible Funding Sources:	FEMA, Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.
Timeline for Implementation:	2004
Cost Benefit Analysis	N/A

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

Comments:	Hire one FTE in County to enforce existing zoning and building regulations and ensure compliance with recently adopted wildland/urban interface code. Work with the State, County and municipal building inspectors to consistently enforce the building code from jurisdiction to jurisdiction. County currently lacks staff to effectively enforce existing regulations
Responsible Organization:	Santa Fe County P&Z
Estimated Costs:	\$50,000/yr.
Possible Funding Sources:	Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.
Timeline for Implementation:	Advertise, select and hire employee by end of 2004
Cost Benefit Analysis	Per Table 3, assets at risk to fire in Santa Fe County total \$5,533,682,649.

Comments:	The CERT training will improve emergency response capabilities for the community.
Responsible Organization:	Office of Emergency Services
Estimated Costs:	\$20,000
Possible Funding Sources:	FEMA, Pre-Disaster Mitigation Assistance funds administered by NMOEM, Hazard Mitigation Grant Program Technical Assistance funds administered by NMOEM.
Timeline for Implementation:	2004
Cost Benefit Analysis	N/A

The Mitigation Planning Team developed an action plan that includes monitoring, evaluating, and updating the Plan. It recommends the establishment of a permanent hazard mitigation team to lead the implementation of the plan and continue the hazard mitigation planning process beyond this Plan.

Monitoring, evaluating, and updating the Plan are critical to maintaining its relevance. Effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for monitoring, evaluating, and updating the Plan, and what those responsibilities entail. This section also lays out the method and schedule of these activities and describes how the public will be involved on a continuing basis.

A permanent entity needs to be responsible for maintaining the Plan and for monitoring, evaluating, and updating it. This Plan recommends creating a permanent planning group, the Santa Fe County Mitigation Planning Team, with representation from all participating municipalities. The Team will represent citizen, municipal, business, educational, volunteer, and County interests through a balanced membership. A Mitigation Coordinator will lead the Team, in conjunction with the County Director of Emergency Services.

### SECTION THREE: MITIGATION PLAN AND IMPLEMENTATION STRATEGY

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The Hazard Mitigation Team will oversee the progress made on the implementation of the identified action items and update the plan, as needed, to reflect changing conditions. The Team will therefore serve as the focal point for coordinating countywide mitigation efforts. The Team should meet quarterly to address all its responsibilities. It will serve in an advisory capacity to the Santa Fe County Planning Commission and Department of Emergency Services.

The Team will monitor the mitigation activities by reviewing reports from the agencies identified for implementation of the different mitigation actions. The Team will request that the responsible agency or organization submit a semi-annual report, which provides adequate information to assess the status of mitigation actions. The Team will provide their feedback to the individual agencies.

Evaluation of the Plan will include not only monitoring whether mitigation actions are implemented, but also assessing their degree of effectiveness. The Mitigation Team will review the qualitative and quantitative benefits (or avoided losses) of the mitigation activities, which will then be compared to the goals and objectives that the Plan set out to achieve. The Team will also evaluate mitigation actions to see if they need to be modified or discontinued in light of new developments. The Team will document progress annually.

The County will update the Plan every five years, as required by the DMA 2000, or following a disaster. The updated Plan would account for any new developments in the County or special circumstances (e.g., post-disaster). Issues that come up during monitoring and evaluation that require changes in mitigation strategies and actions will be incorporated in the Plan at this stage.

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The Planning Team will involve the public during the evaluation and update of the Plan through annual public education activities, public workshops, and public hearings. The Team will also keep the public informed through newsletters, mailings, and the different agencies implementing the plan. The County's website could serve as a means of two-way communication by providing information about mitigation initiatives and supplying feedback forms and other means for the public to express their views and comments. The Planning Team will incorporate the public comments in the next update of the Plan.

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Throughout the hazard analysis and vulnerability assessment, descriptions of missing or inadequate data indicate some areas in which the County and municipalities can improve their ability to identify vulnerable structures. As the County and municipal governments work to increase their overall technical capacity and implement their comprehensive planning goals, they should also attempt to improve their ability to identify assets vulnerable to hazards. In short, the County and municipalities in subsequent versions of this plan can improve the hazard identification and vulnerability assessment by:

- Revamping County and municipal building permit and data collection systems to require and keep on file elevation certificates for all new construction, elevated structures, and other substantial improvements within the 100- and 500-year floodplains.
- Completing a Wildland-Urban Fire Assessment to identify additional site-specific mitigation measures to reduce the future risk of wildfires.

### SECTION THREE: **MITIGATION PLAN AND IMPLEMENTATION STRATEGY**

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- Updating the tax and GIS databases with information such as addresses, foundation type, construction type, and first-floor elevations for each structure. The updated Plan will be better able to identify structures in need of mitigation based on first-floor elevations.
- Obtaining refined topographic contour information for the entire County, which will allow better identification of steep slopes.
- Incorporating existing and pending stormwater management plans and projects into the vulnerability assessment and mitigation strategy, which will provide a better connection between localized flooding issues and riverine flooding issues.

These recommendations are also noted in the action plan. Several of these improvements are already underway and will produce an even more effective vulnerability assessment and mitigation plan upon revision.

**APPENDIX A: DISASTER MITIGATION ACT OF 2000  
INTERIM FINAL RULE REQUIREMENTS  
AND CORRESPONDING SECTIONS**

Adoption by the Local Governing Body (§201.6(c)(5))	Not Applicable (applies to single jurisdiction)
Multi-jurisdictional Plan Adoption (§201.6(c)(5))	Resolutions of Adoption
Multi-jurisdictional Participation (§201.6(a)(3))	Introduction
Documentation of Planning Process (§201.6(c)(1))	Introduction: Planning Process and Community Background
Identifying Hazards (§201.6(c)(2)(i))	Section One: Hazard Identification/Risk Assessment
Profiling Hazard Events (§201.6(c)(1))	Section One: Hazard Identification/Risk Assessment
Assessing Vulnerability: Overview	Section One: Hazard Identification/Risk Assessment
Assessing Vulnerability: Identifying Assets (§201.6(c)(2)(ii)(A))	Section One: Hazard Identification/Risk Assessment
Assessing Vulnerability: Estimating Potential Losses (§201.6(c)(2)(ii)(b))	Section One: Hazard Identification/Risk Assessment
Assessing Vulnerability: Analyzing Development Trends (§201.6(c)(2)(ii)(c))	Section One: Hazard Identification/Risk Assessment
Multi-jurisdictional Risk Assessment (§201.6(c)(2)(iii))	Introduction and Section One: Hazard Identification/Risk Assessment
Local Hazard Mitigation Goals (§201.6(c)(3)(i))	Section Two: Goals, Objectives, and Alternative Mitigation Actions
Identification and Analysis of Mitigation Actions (§201.6(c)(3)(ii))	Section Two: Goals, Objectives, and Alternative Mitigation Actions and Appendix F
Implementation of Mitigation Actions (§201.6(c)(3)(iii))	Section Three: Mitigation Plan and Implementation Strategy
Multi-jurisdictional Mitigation Strategy (§201.6(c)(3)(iv))	Section Three: Mitigation Plan and Implementation Strategy
Monitoring, Evaluating, and Updating the Plan (§201.6(c)(4)(i))	Section Three: Mitigation Plan and Implementation Strategy
Implementation Through Existing Programs (§201.6(c)(4)(ii))	Section Three: Mitigation Plan and Implementation Strategy
Continued Public Involvement (§201.6(c)(4)(iii))	Section Three: Mitigation Plan and Implementation Strategy

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AGENDA

WEDNESDAY, SEPTEMBER 18, 2002

Meeting Time: 7:00 p.m. Sweeney Center

**Santa Fe Hazard Mitigation Planning Workshop**

Moderator: James Leach, Emergency Manager, Santa Fe City/County

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**7:00 PM to 8:00 PM Introduction**

James Leach, Emergency Manager, Santa Fe City/County  
Project Impact Steering Committee Member

- **Disasters in Santa Fe**
- **Who We Are: The Santa Fe Mitigation Planning Team**
- **Recent Activities**

**Presentation**

Victoria Locklear, Project Manager, URS Corporation

- **What Is Hazard Mitigation Planning?**
- **Benefits of Hazard Mitigation**
- **The Santa Fe City Mitigation Planning Process**
  - Organize resources
  - Assess risks
  - Develop the mitigation plan
  - Implement the plan and monitor progress*
- **Citizen Involvement**
  - Outline of upcoming activities*

**8:00 PM to 8:30 PM Discussion with the Audience**

**Upcoming Workshops and Public Meetings (All dates tentative):**

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**October 2002:** Presentation of the Draft Hazard Mitigation Plan

**December 2002:** Public Hearing with Santa Fe City Commissioners

**January 2002:** Final Presentation of the Plan

For more information about hazard mitigation or the planning process, please contact:

James Leach, Director  
Santa Fe City/County Emergency  
Management  
505-992-3086  
sfoem@yahoo.com

Victoria Locklear, Project Manager  
URS Corporation  
301-670-5473  
Victoria\_Locklear@urscorp.com

**DRAFT AGENDA**  
**April 29, 2003 10:00 AM**

**SANTA FE EMERGENCY OPERATIONS CENTER**

**Introductions**

- Community Planning Team Members

**Presentation**

- Where are we in the Process?

**Draft Risk Assessment Data**

**Capability Assessment Questionnaire**

**Hazard Priorities/Goals**

**Mitigation Plans**

**Next Steps**

- Schedule next meeting
- Data needed

## APPENDIX C: PLANNING TEAM MEETINGS

### Santa Fe County Mitigation Planning Committee Meeting

**Meeting Minutes, April 29, 2003**

**Santa Fe Emergency Management Meeting Room**

**10:00 am**

The meeting began with introductions of the URS personnel and planning team members. A Record of Attendance sheet is attached.

Lora Sedore, URS, gave an update of the Mitigation Plan status and the steps necessary for completion of the data-gathering phase for the Draft Plan.

She also explained that the main purpose of this meeting was to determine a countywide prioritization of hazards and mitigation actions based on the list used by the State of New Mexico in its All-Hazard Plan.

The following hazards, resources (capabilities) and mitigation actions were identified in Santa Fe County:

Wildfire	Firewise	More public education on defensible space etc	County-wide forested areas
	County Wildfire Assessment	Vegetation management projects	
		Study bark beetle	
	Urban Interface Specialist		
Drought	Grey water legislation	Public education	County wide
	Drought plan		
		Study of well development/water sources	
		Study of vegetation management practices that may be over zealous and wasting water resources	
Flood/flash floods	Flood plain ordinances		County-wide
		County-wide drainage stormwater plan	County-wide
		Study of restoration of vegetation to control erosion	Along the Santa Fe River in the City
			La Cienega
		Drainage/erosion studies	La Cienega, Nambe River/Santa Cruz River on SR 76, Chimayo and Espanola area
Winter Storms		Snow fences	Edgewood area
		All terrain emergency vehicles	County-wide
Haz Mat		HAZ MAT equipped truck	County-wide
		Study to find funding for clean up- possible legislature to pay or county ordinances	
Wind		Vegetation management- wind breaks with trees-public education	County-wide
Civil disorder	Prison population around 2600. EOP with prison		
Dam Failure	EP with Emergency manager		Santa Cruz- Nambe
Power outages	Public service radio announcements	Info on power outages on emergency radio announcements	
Terrorism	Local law enforcement	Training programs	County-wide

The next meeting was scheduled for May 29 at 10am at the same location.

AGENDA  
May 29, 2003 10:00 AM

SANTA FE EMERGENCY OPERATIONS CENTER

**Introductions**

- Community Planning Team Members

**Updates**

- Draft Santa Fe Hazard Mitigation Plan
- Priority Projects
- Timeline
- Data needed for final report

Schedule next meeting.

Meeting Notes  
May 29, 2003 10:00 AM

**SANTA FE EMERGENCY OPERATIONS CENTER**

**Attendees: James Leach, Robert Martinez, Chris Rivera, Bill Ewing, Evonne Gantz, Tom Griego, Lora Sedore, Will Gleason**

Will opened the meeting with introductions. The team then briefly reviewed the draft Santa Fe County Hazard Mitigation Plan. The following initial comments were made about the draft mitigation plan that was presented to the team:

- ✓ James requested a global change from urban wildland to wildland urban
- ✓ James encouraged team members to review and return comments as soon as possible.
- ✓ Copies will be sent to department heads for review- different sections will be reviewed by the appropriate departments (ie flood plain) James will take draft to the LEPC on June 4
- ✓ A copy of the plan on disc will be sent to the Pueblos for review
- ✓ Rob Yardman, Santa Fe County, will be contacted by James to post a notice that the plan is available for review in the Emergency Manager's Office

The team reviewed the list of mitigation actions and the team made numerous suggestions for revising the list. A copy of the revised changes was sent to James. The revised list is provided following the notes.

Will/Lora will draft a letter for James to send to other communities (Edgewood, Tesuque, Nambé and San Ildefonso) requesting that they review the priority list and make suggestions for anything else that they deem is a hazard mitigation priority.

Discussion about process of adoption revealed that timeline for adoption by FEMA by November is still feasible but will require quick turnaround on FEMA review and streamlined adoption process by County and City of Santa Fe. James will forward copies of draft report (with changes) to City and County attorneys.

Next meeting scheduled for Thursday, June 26<sup>th</sup>, at 10:00AM at Santa Fe Emergency Operations Center.

## APPENDIX C: PLANNING TEAM MEETINGS

Reduce fuel loads and create defensible spaces in the urban-wildland interface <input type="checkbox"/> Expand Chipping Program	1
Update floodplain and floodway maps in Santa Fe County.	2
Install snow fences along County roads in southern Santa Fe County.	3
Update equipment used to respond to hazardous materials incidents.	4
Continue efforts to encourage residents to use water-saving landscaping techniques.  <input type="checkbox"/> Fund program to meter domestic wells <input type="checkbox"/> Enforce existing zoning and building regulations on water use <input type="checkbox"/> Expand City of Santa Fe incentive program <input type="checkbox"/> Implement pilot projects to use treated effluent for non potable uses	5
Develop dependable sources of water for fire suppression in all residential areas of the County.	*
Following policies in the SF Emergency Operation Plan and the Homeland Security Response Plan, assess need to and means to harden critical facilities against the effects of human-made hazards.	*
Develop a plan to install an emergency communication system that is not dependent on local telephone and electrical services for rural communities within the County.	*
Improve and expand structure data records in the Santa Fe County GIS <input type="checkbox"/> Improve information sharing between County assessors, appraisers and building inspectors <input type="checkbox"/> Maintain rural addressing in all unincorporated parts of the County	*
Work with the State, County and municipal building inspectors to consistently enforce the building code from jurisdiction to jurisdiction.	*
Ensure compliance with the recently adopted urban-wildland interface ordinance by hiring additional staff to do on-site inspections and enforcement.	*
Develop a CERT training program for all areas of the City and County.	*
Convene regular meetings with the Mitigation Planning Team to discuss issues and progress related to the implementation of the plan	*
Conduct non-technical assessment to determine relative vulnerability/risk for earthquakes.	*
Develop a public relations and information program. <input type="checkbox"/> Identify and publicize success stories as part of an overall consistent public relations program. <input type="checkbox"/> Renew and expand commitments to business partner organizations. <input type="checkbox"/> Include vulnerability analysis information as part of periodic plan review and revisions at the county and municipal level <input type="checkbox"/> Incorporate hazard mitigation concepts into regular County and Municipal operations.	*

\* Note: The first five mitigation actions are ranked according to their priority. The remaining actions are not assigned a numerical ranking; they all have merit as mitigation actions and should be pursued as funds and resources allow.



Meeting Notes  
July 8, 2003 10:00 AM

**SANTA FE EMERGENCY OPERATIONS CENTER**

**Attendees: James Leach, Erle Wright, Captain Andrew Leysa, Lt. Cindy Waterworth, Lora Sedore, Beverley Frieday**

The purpose of the meeting was for Team members to deliver marked up copies of the hazard mitigation plan to the URS staff for inclusion in the final plan.

Erle Wright, GIS Coordinator for Santa Fe County provided extensive comments on the Maps included in the plan. Mr. Wright was asked for the data sets to correct the map errors. In addition, Mr. Wright provided copies of maps entitled "Fire Districts & Wildland Urban Interface Areas" for Santa Fe County.

Captain Leysa and Lt. Waterworth of the Santa Fe Police Department were recently assigned to the team and had not had an opportunity to review the Plan. James Leach provided his marked up copy for them to take and review.

No additional meeting was scheduled.

### Santa Fe County Hazard Mitigation Plan

After the Cerro Grande Fire, Congress authorized funds for mitigation for the communities affected by the Fire. The funds were made available through FEMA. Using these funds Santa Fe County has initiated a plan to create a realistic strategy to reduce damage from hazards with a process known as hazard mitigation planning. A planning team from the community has been formed that includes emergency response, safety, disaster volunteers, and employees from Santa Fe County and all the incorporated communities, along with URS to draft a Pre-Disaster Mitigation Plan for the community. The team has met multiple times to implement this planning process.

Please take a few minutes and complete this questionnaire and return it after the meeting or forward it to James Leach, Santa Fe County Emergency Services. The completed questionnaire will be reviewed and your recommendations will be incorporated into the Santa Fe County Hazard Mitigation Plan.

1. Please rank the following hazards in order of concern, numbering them 1-5 or 6. Please designate #1 for the hazard of most concern, #6 for the hazard of the least concern, using each number only once.

___ Flash flood	___ Hazardous Materials spills
___ Wildfire	___ Power failure
___ Drought	___ Dam failure
___ Other _____	

2. What do you think should be done to reduce the future losses from these hazards? \_\_\_\_\_

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3. What other recommendations would you like to make for the authors of the Hazard Mitigation Plan? \_\_\_\_\_

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4. Name and Address-OPTIONAL \_\_\_\_\_

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The assets vulnerable to wildfire include 21,114 structures scattered throughout forested areas in the County.

Wildfire mitigation can and should involve a variety of actions ranging from public education to strategies for managing vegetation.

### **PARTNERSHIPS**

One key to solving the wildland-urban interface problem is the development of a unified, collaborative partnership among federal agencies; Tribal, State, and local governments; and the private sector. This partnership should identify risks, hazards, values, and responsibilities. To be successful, the emphasis must be at the local level, supported by the State and coordinated with federal agencies. This fire protection and prevention issue cannot be solved by any one entity acting independently. Meanwhile, these long-term issues do not preclude federal agencies from developing a compatible policy for wildland-urban protection on the lands they administer.

### **PUBLIC EDUCATION**

Citizens should know how to create a defensible space around structures located in the wildland-urban interface. Local officials, in partnership with the private and non-profit sectors, could develop a public education campaign targeting residents in the wildland-urban interface area. In addition, information should be developed to make residents aware of what to do in the event of a wildfire in their communities.

### **LANDSCAPING**

**Defensible Spaces:** Structures, especially roofs, can be protected through the creation of buffer spaces around buildings. By simply pruning back the vegetation that grows near the house, a property owner can reduce the threat of flames spreading from a wildfire to the house. Mitigation action items should be targeted to properties and residents in vulnerable areas.

### **RESPONSE ENHANCEMENTS**

**Warning systems:** Warning systems could be installed for areas vulnerable to the wildfire.

**Training:** Appropriate training for responding to wildfire hazards should be provided locally or at the State level.

### **REGULATIONS**

**Building Codes/Safety Codes:** Zoning and land use restrictions are useful for protecting people from hazards that come from the forest and for protecting forests from the people. Zoning and land use requirements are essential to establishing livable and defensible spaces within the forest. Building codes requiring fire resistant building materials, especially for roofs, and defensible areas around structures can save lives as well as property.

All jurisdictions within Santa Fe County, including the County government, use the statewide building code UBC 97.

### Vegetation Management/Fuels Reduction

Vegetation management (fuel reduction) projects are key to mitigating wildfires and restoring forest health. Vegetation management or fuel reduction is a process of tree thinning and controlled burns to reduce fuels in areas of high wildfire risk. Since the danger of wildfire extends over much of the County, emphasis should first be placed on the wildland-urban interface areas. There are a variety of forest ecosystems throughout the County that will require a variety of prescriptions, based on factors such as location, slope, vegetation type, and wildlife.

### PRIORITIES FOR WILDFIRE MITIGATION ACTIONS

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

Table F3: STAPLE+E Criteria for Wildfire Mitigation Actions

<b>S</b> ocial	3	3	3	3	3	3
<b>T</b> echnical	3	0	3	3	3	3
<b>A</b> dministrative	3	0	3	3	3	0
<b>P</b> olitical	3	3	3	3	3	3
<b>L</b> egal	3	2	3	3	3	3
<b>E</b> conomic	3	3	3	3	3	3
<b>E</b> nvironmental	3	3	3	3	3	3
<b>Total</b>	<b>21</b>	<b>14</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>18</b>

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent

Drought is a regular event in New Mexico. It occurs in the state in recurring cycles. Major long-term droughts occurred in New Mexico during 1931–41 and 1942–79, and is currently the situation throughout the State. Due to the unpredictable nature of droughts, planning is required decades before an event occurs. In the past, the State has been able to weather droughts. However, due to the increase in population during the last decade, water supplies are less able to meet demand during a drought. Community planning is essential if the County is to be better prepared for the decreased water supplies caused by drought.

### PLANNING

Planning for droughts is key to mitigation. A water conservation plan has been prepared and a drought contingency plan should be prepared for the County. Precipitation for a region cannot be reliably predicted, and by the time a drought is recognized, it has been going on for some time. Since the County is currently in a drought and residents are more aware of the future implications of an extended drought, the County should immediately begin the planning process

for a drought contingency plan. Hard choices such as limiting growth are never easy, and political support is often missing, but heightened awareness of drought will serve to facilitate the implementation of a plan. The sooner mitigation begins, the better prepared the community will be when the drought is severe and long-term.

### Warning Systems

Since drought is not a one-time event and has no recognizable starting point, a warning system would include a program to monitor drought conditions in Santa Fe County. The U.S. Drought Monitor is available at the website <http://drought.unl.edu/dm>.

### Public Awareness/Education Programs

Programs to educate the public on the importance of water conservation and to increase cooperation with voluntary conservation measures are an important first step in drought mitigation. Public awareness will also keep residents informed on the status of drought, which is important when conservation measures become restrictive.

### Water Survey, Maintenance, and Retrofit Programs

Before meaningful conservation can begin, a survey of commercial and residential users should be completed to evaluate water uses. The surveys can be used to develop water conservation strategies, such as the installation of low-flow plumbing fixtures and repairs of existing water systems to maintain efficient operation.

### PRIORITIES FOR DROUGHT MITIGATION ACTIONS

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

Table F4: STAPLE+E Criteria for Drought Mitigation Actions

<b>S</b> ocial	3	3	3	3
<b>T</b> echnical	3	3	3	2
<b>A</b> dministrative	3	3	3	1
<b>P</b> olitical	3	3	3	3
<b>L</b> egal	3	3	3	1
<b>E</b> conomic	3	3	3	3
<b>E</b> nvironmental	3	3	3	3
<b>Total</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>16</b>

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent

The following discussion of flood hazard mitigation options presents alternative actions that can be taken to mitigate flood hazards and evaluates the feasibility of the alternatives based on the vulnerability assessment.

Several categories of flood hazard mitigation actions are possible for neighborhoods and structures within flood hazard areas. The following mitigation alternatives were considered when developing recommendations:

### **Structural Flood Control Methods**

Dikes, levees, dams, channelization, channel widening, and stream realignment are structural projects that keep floodwaters away from flood-vulnerable structures by creating a barrier or conveying the water away from the structures. Structural projects tend to be expensive to build and maintain; they can increase flooding downstream or on the side of the waterway opposite the flood control measure. Reliance on structural flood control measures can create a false sense of security, which often leads to even greater destruction when these structural projects fail during a large flood event. However, localized structural measures are often necessary to protect existing critical facilities, such as water and wastewater treatment plants, that must locate near water. In Santa Fe County, these measures may be most appropriate where flash floods occur often and increased conveyance is a requirement to protect the population and assets, such as in the State Road 76 near Espanola. There is development in the identified floodplains.

### **Planning and Development Regulations**

Comprehensive Plans – These plans specify where development should and should not occur in a community. Through these plans, uses allowed in the floodplain can be limited to those that won't be harmed by flood. Flood-prone areas can be reserved for parks, golf courses, backyards, or natural areas. These plans may have limited authority, but they often drive other local measures, such as zoning and subdivision ordinances. Santa Fe County has a flood damage prevention ordinance in place that regulates future development in the floodplain, so this action is ongoing.

Stormwater Management Plans – Stormwater management plans lay the foundation for regulations that require developers to build on-site detention basins for runoff caused by new subdivisions, malls, and other developments that contain large areas of impervious surface. Stormwater is not allowed to leave the property at a rate higher than before the site was developed. The problem of sedimentation, which can fill channels and lakes and reduce their ability to carry or store floodwaters, can be addressed by requiring sedimentation and erosion controls at construction sites. These controls keep sediment from flowing off the site and into nearby streams and rivers. Stormwater management plans can also incorporate drainage maintenance requirements to help reduce flooding. This alternative is one of the most appropriate for Santa Fe County, since flash flooding occurs due to local topography and excess runoff from neighboring areas.

### **Warning Systems**

A flood threat recognition system provides early warning of an impending flood. The warning can be disseminated via sirens, a mobile public address system, radio, or television. A flood warning system does not provide the long-term damage reduction that is gained through a

comprehensive flood mitigation program; however, an early warning system gives residents time to evacuate. This measure is appropriate for Santa Fe County, especially for smaller municipalities that do not have the capability to undertake more expensive flood mitigation actions.

### **Property Protection**

Since the flood hazard in Santa Fe County is primarily associated with flash flooding, property protection actions such as floodproofing, elevation, acquisition, and relocation are of limited value, because they are more appropriate for riverine flooding. Also, the detailed information required for using these methods (first floor elevations, age and condition of structures, etc., as discussed under Data Limitations in Section 1) is not available. These alternatives are discussed so they can be employed when detailed information becomes available for particularly vulnerable buildings.

**Acquisition:** With acquisition, the municipal government purchases structures in the floodplain and either relocates or demolishes them. The land is permanently deed-restricted for open space uses in order to restore the natural and beneficial functions of the floodplain. Structures that have been repeatedly flooded, or that experience high flood depths, velocities greater than 5 feet per second, or flooding of long duration, tend to be the best candidates for acquisition. Acquisition is considered one of the most effective flood mitigation measures because it entirely removes structures from the pathway of floods. However, it can damage intact neighborhoods. It is cost-effective for structures with high flood vulnerability, but the process of obtaining the homeowner's approval, securing funds, and managing the implementation of the project can be difficult.

**Barriers:** Barriers constructed of soil (berms), or concrete or steel (floodwalls), keep floodwaters from reaching structures. To be effective, earthen berms require 3 horizontal feet for each vertical foot.

**Dry Floodproofing:** Dry floodproofing means making impervious the part of a structure that sits below the base flood elevation. Walls can be coated with a waterproofing compound or plastic sheeting. Openings such as doors, windows, and vents are closed, either permanently or with removable shields. Dry floodproofing is appropriate for buildings on sound slab foundations that are subject to less than 3 feet of flooding. Most walls and floors are not strong enough to withstand the hydrostatic pressure from more than 3 feet of water. However, this method does not remove the structure and its contents from the path of floods.

**Wet Floodproofing:** Wet floodproofing entails letting floodwaters inside the structure and moving assets like furniture or appliances out of harm's way. Wet floodproofing avoids the problems of pressure from floodwaters presented by dry floodproofing. Wet floodproofing is usually used for basements and garages and is not used for one-story houses because the flooded areas would be the living areas.

**Elevation:** Raising a building above the base flood elevation is the best on-site property protection method. Water flows under the building, causing little or no damage to the structure or its contents. Alternatives are elevation on an open foundation, on continuous foundation walls (creating an enclosed space below the building), or on compacted earthen fill (which can be more costly than open foundation or continuous foundation walls). If open foundation or continuous foundation walls raise the structure 8 or more feet, the lower area can be floodproofed and used for parking or storage.



## APPENDIX F: ALTERNATIVE MITIGATION ACTIONS

Elevation is suitable where flood depths are less than 10 feet and have low velocity (less than 5 feet per second). Elevation is also suitable for off-channel areas that have minimal potential for damaging floating debris. Elevation is not suitable for areas with long-duration flooding, because gaining access to the structures would be difficult or unsafe in flood situations. Factors such as foundation type, soil type and bearing capacity, weight of the house, lateral forces on the house from water (and other natural hazards such as winds and earthquake), condition of the house, and height of the proposed elevation above the grade influence the method for elevating a specific house. Politically and socially, elevation may be the most feasible option, because it leaves neighborhoods intact, prevents damage from floods, and allows residential structures used primarily for water-related recreation to remain near the water.

When appropriate information becomes available, as discussed in the beginning of the Property Protection discussion, the decision matrix shown in Table F1 may be used to pick the most suitable method for individual properties. Properties that are at or above base flood elevation (other than those with basement foundations) are not considered in the following decision matrix because they are considered to be outside the regulatory floodplain and are of low mitigation priority compared to other flood structures.

**Table F1: Property Protection Decision Matrix**

< 2 feet	Barrier	Dry Floodproof
≥ 2 feet	Elevate	Relocate/Acquire
> 9 feet	Relocate/Acquire	Relocate/Acquire
≥ 0 feet	Elevate	Elevate
> 9 feet	Relocate/Acquire	Relocate/Acquire
≥ 0 feet	Elevate, fill in basement	Relocate/Acquire
> 9 feet	Relocate/Acquire	Relocate/Acquire
≥ 0 feet	Elevate	Elevate
> 9 feet	Relocate/Acquire	Relocate/Acquire

### PRIORITIES FOR FLOOD MITIGATION ACTIONS

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

**Table F2: STAPLE+E Criteria for Flood Mitigation Actions**

	S	T	A	P	L	E
Social	1	0	1	1	1	
Technical	3	3	0	1	0	
Administrative	1	1	1	1	1	
Political	1	0	1	1	1	
Legal	1	1	1	1	1	
Economic	0	1	1	0	0	
Environmental	0	1	1	1	1	
<b>Total</b>	<b>7</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>5</b>	

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent

A number of mitigation actions can be used to mitigate wind and weather hazards. Unlike flood and wildfire, wind and weather hazards affect the entire County; there is no particular zone that is more likely to experience wind or weather damage than other areas in the County. Therefore, some wind and weather mitigation strategies affect individual structures with known or assumed vulnerability, particular critical facilities; others affect the entire County, usually through public education, improved County capabilities, or stronger regulations.

The following is a list of wind hazard mitigation actions with information about their suitability for use in Santa Fe County. These actions are technically feasible and should be used in combination with each other. Other than regulatory improvements, most of these actions should be implemented by property owners with assistance from County and municipal governments.

## REGULATIONS

**Building Codes/Safety Codes:** Properly constructed buildings can resist the force of high winds. Model building codes are designed using wind-speed maps produced by ASCE that are based on a constant probability of occurrence in different parts of the County. The designs based on these wind speeds can resist the majority of tornadoes and other strong winds if the building is constructed properly. Building codes are also important for preventing the collapse of buildings under heavy snow loads (Source: Natural Hazard Mitigation Insights, Institute for Business and Home Safety).

All jurisdictions within Santa Fe County, including the County government, use the statewide building code UBC 97.

## BUILDING STRENGTHENING

**Manufactured home tie-downs:** Manufactured homes are quite vulnerable to high winds because they have thin walls that cannot withstand wind pressure and wind-blown projectiles. Manufactured homes also have a large surface area relative to their weight, making them susceptible to overturning. Furthermore, many manufactured homes are not adequately installed. When manufactured homes are properly tied down with the correct number of anchors and the correct type of anchors for the soil conditions, they are less vulnerable to wind damage. Education and inspection programs can aid in the upgrading of manufactured homes.

Santa Fe County has a number of manufactured home parks containing structures for which tie-downs may be appropriate. Manufactured homes installed on permanent foundations, especially double-wide manufactured homes on permanent foundations, are significantly less vulnerable to wind hazards than other manufactured homes and should be a lower mitigation priority. The County or concerned property owners will have to identify which manufactured homes are in need of tie-downs.

Retrofitted tie-downs cost about \$1,000 to \$1,500 to install. For low-income property owners, this can be a significant cost. The County and municipal governments should assist with loans and grants where possible.

**Retrofits:** Retrofits like safety glass, roof bracing, structural connectors, or storm shutters can strengthen existing structures. Not every building will need such measures. Those built to modern codes should be sturdy enough to withstand most strong winds. Those built before the

codes were in place are more susceptible to wind and snow damage and should be a greater mitigation priority. The County tax assessment database can be used to identify buildings built before contemporary codes took effect.

### LANDSCAPING

**Buffers and Windbreaks:** Structures can be protected by a buffer zone around them. Simply by pruning back overhanging or dead branches from trees, property owners can prevent damage to their buildings—especially to the roofs—from falling limbs.

On the other hand, tall trees on the northern exposure can serve as a windbreak. The typical windbreak has several components: (1) dense conifer trees to reduce wind velocity; (2) conifer trees to extend the area of protection; (3) low shrubs to trap snow, provide wildlife habitat, and/or provide aesthetic value.

Because most structures can benefit from simple attention to landscaping and vegetation, all property owners should be informed of this mitigation action.

### WARNING SYSTEMS

**Sirens:** Sirens or other warning systems can alert residents when tornadoes or other hazards threaten vulnerable areas. Manufactured home parks (for both permanent residents and vacationers) are especially vulnerable to severe storms; to reach adequate shelter, residents may need the extra time that a warning from a siren or National Oceanic and Atmospheric Administration (NOAA) weather radio can provide.

### SHELTERING

**Emergency Shelters:** For extreme wind events like tornadoes, ordinary, in-house protection measures, such as basements or in-house safe rooms, are not available for people living in manufactured homes. For them, community shelters offer protection from severe storms. A community shelter is defined as a shelter that is designed and constructed to protect a large number of people from a natural hazard event. Community shelters include stand-alone shelters, which are separate buildings (not within or attached to any other building) designed to withstand high winds and the impact of windborne debris (missiles) during tornadoes, hurricanes, or other extreme wind events.

**Internal shelters** are rooms or areas within or attached to larger buildings, but they are designed to be structurally independent and to provide the same wind and missile protection as a stand-alone shelter. These shelters are intended to provide protection during a short-term high-wind event (an event that lasts no more than 36 hours). They are not recovery shelters intended to provide services and housing for people whose homes have been damaged or destroyed by fires or other disasters. Both stand-alone and internal community shelters may be constructed near or within school buildings, hospitals, nursing homes, commercial buildings, and other facilities designed to be occupied by large numbers of people. Stand-alone community shelters may be constructed in neighborhoods where existing homes lack their own individual safe rooms. Community shelters may be intended for the occupants of buildings that contain the shelters or are located nearby, or they may be intended for residents of surrounding neighborhoods or designated areas (source: FEMA 361, *Design and Construction Guidance for Community Shelters*, [http://www.fema.gov/pdf/fima/361\\_ch01.pdf](http://www.fema.gov/pdf/fima/361_ch01.pdf)).

**PUBLIC INFORMATION AND EDUCATION**

Many of the mitigation measures presented can be economically implemented by property owners who are educated about them. Public information is the most effective method of mitigating the effects of severe storms. It involves the issuance of timely and accurate weather forecasts and public safety warnings, which alert people to impending severe weather and give them time to take protective action.

**PRIORITIES FOR SEVERE WINTER STORMS MITIGATION ACTIONS**

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

**Table F5: STAPLE+E Criteria for  
Severe Winter Storm Mitigation Actions**

Social	1	0	1	1	0
Technical	3	3	0	1	0
Administrative	1	1	1	1	1
Political	1	0	1	1	1
Legal	1	1	1	1	1
Economic	0	1	1	0	0
Environmental	0	1	1	1	1
<b>Total</b>	<b>7</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>4</b>

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent

Human-caused hazards are difficult to mitigate since they depend on the unpredictable nature of people. Hazardous materials and nuclear facilities must comply with State and Federal regulations, including meeting design standards, notifying the appropriate authorities in case of an accident, and having emergency response plans in place. What actions the community can take fall primarily in the response category: knowing what to do in the event of an accident or attack. Thus, educating the public to be aware of these hazards and to take appropriate actions is important for reducing loss of life and property. Communities can also work with the private sector and local officials to enhance response measures. Finally, communities can take human-caused hazards into account when making land-use planning decisions.

## **PUBLIC EDUCATION**

Citizens should be aware of the procedures to follow after a hazardous materials incident. Local officials, in partnership with the private and non-profit sectors, could develop a public education campaign targeting residents within the SARA Title III -mile buffer and -mile highway buffer. Another campaign could be developed to educate the general public about response procedures in the event of a terrorism incident, and how to become more aware of their surroundings.

## **RESPONSE ENHANCEMENTS**

**Highway call boxes:** Trucks carrying hazardous materials travel the two major transportation routes in the County, Highway I-25 and U.S. 84/285. Call boxes could be installed at various points along the highway so that emergency services can respond more quickly to an accident involving hazardous materials.

**Warning systems:** Citizens should be able to monitor the media for emergency information and bulletins. The community should designate certain radio stations to carry emergency messages to alert citizens to hazard events when they happen. Warning systems could be installed for areas vulnerable to the human-caused hazards identified in Section Three.

**Training:** Training should be provided locally or at the State level to ensure an appropriate response to human-caused hazards.

## **LAND USE PLANNING**

**Segregation of transportation routes:** Segregating hazardous material trucks from other traffic could help reduce the risk from a transportation accident. Alternate routes should be considered during the preparation of future transportation improvement programs and comprehensive plans for the County.

**Siting of hazardous material facilities:** Hazardous material facilities should be prohibited in areas prone to natural hazards. Best management practices should be required in less hazard-prone areas.

**Buffer zones around hazardous material facilities:** When siting new facilities, or where space permits around existing facilities, appropriate buffer zones should be established. This can be accomplished through a buffer-zone ordinance or voluntary program.

**Reconstruction in less hazard-prone areas:** In the event of a disaster, affected structures that fall within the buffer zones of SARA Title III facilities or highways should be relocated or rebuilt outside of buffer areas or in less hazard-prone areas.

## **PRIORITIES FOR HUMAN-CAUSED HAZARDS MITIGATION ACTIONS**

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

## APPENDIX F: ALTERNATIVE MITIGATION ACTIONS

**Table F6: STAPLE+ E Criteria for Human-Caused Hazards Mitigation Actions**

<b>S</b> ocial	3	1	3	3	3	3	3	1	3
<b>T</b> echnical	3	1	3	3	3	3	3	1	3
<b>A</b> dministrative	3	1	1	1	1	1	1	1	1
<b>P</b> olitical	3	1	1	1	1	1	1	1	1
<b>L</b> egal	3	1	1	1	1	1	1	1	1
<b>E</b> conomic	3	1	3	3	0	1	1	1	3
<b>E</b> nvironmental	3	1	3	3	3	3	3	1	3
<b>Total</b>	<b>21</b>	<b>7</b>	<b>15</b>	<b>15</b>	<b>12</b>	<b>13</b>	<b>13</b>	<b>7</b>	<b>15</b>

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent

Earthquake damage to existing buildings can be mitigated by retrofitting; damage to new buildings can be mitigated by constructing them according to the most recently developed seismic design specifications as set forth in building codes.

### Technical Studies

Buildings in the County that are more susceptible to earthquake damage because of their age or method of construction should be identified by the County or interested jurisdictions. There is a Rapid Visual Screening Method devised by FEMA to score buildings to reflect their relative vulnerability to earthquakes. The screening method is based on an inspection that records information on the building's construction type, age, use, occupancy, and condition. The buildings identified as most susceptible could be provided technical and financial assistance for retrofitting. Such a process would be suitable for historic buildings and critical facilities such as hospitals, fire stations, and schools.

### Building Codes and Standards

Builders that use building codes in the United States generally use one of the three prominent national model building codes, published by three different private organizations. The UBC is published by The International Conference of Building Officials, the National Building Code by Building Officials Code Administrators, and Standard Building Code by Southern Building Code Congress International. The seismic provisions of all three codes are substantially equivalent to the provisions of the National Earthquake Hazard Reduction Program that contain technically advanced and widely accepted seismic design specifications (source: *Building For the Earthquakes of Tomorrow: Complying with Executive Order 12699*, FEMA, 1995)].

All jurisdictions within Sandoval County, including the County government, use the statewide building code UBC 97.

### Public Awareness

Nonstructural mitigation measures can be implemented by people themselves if they are aware of them. Actions such as anchoring tall bookcases and file cabinets, installing latches on drawers and cabinet doors, restraining desktop computers and appliances, using flexible connections on gas and water lines, mounting framed pictures and mirrors securely, anchoring and bracing propane tanks and gas cylinders, all reduce the risk of injury and damage that these items cause during an earthquake. Public awareness is politically and legally favorable and is not detrimental socially, technically, administratively, economically, or environmentally; it is applicable to both existing and future development.

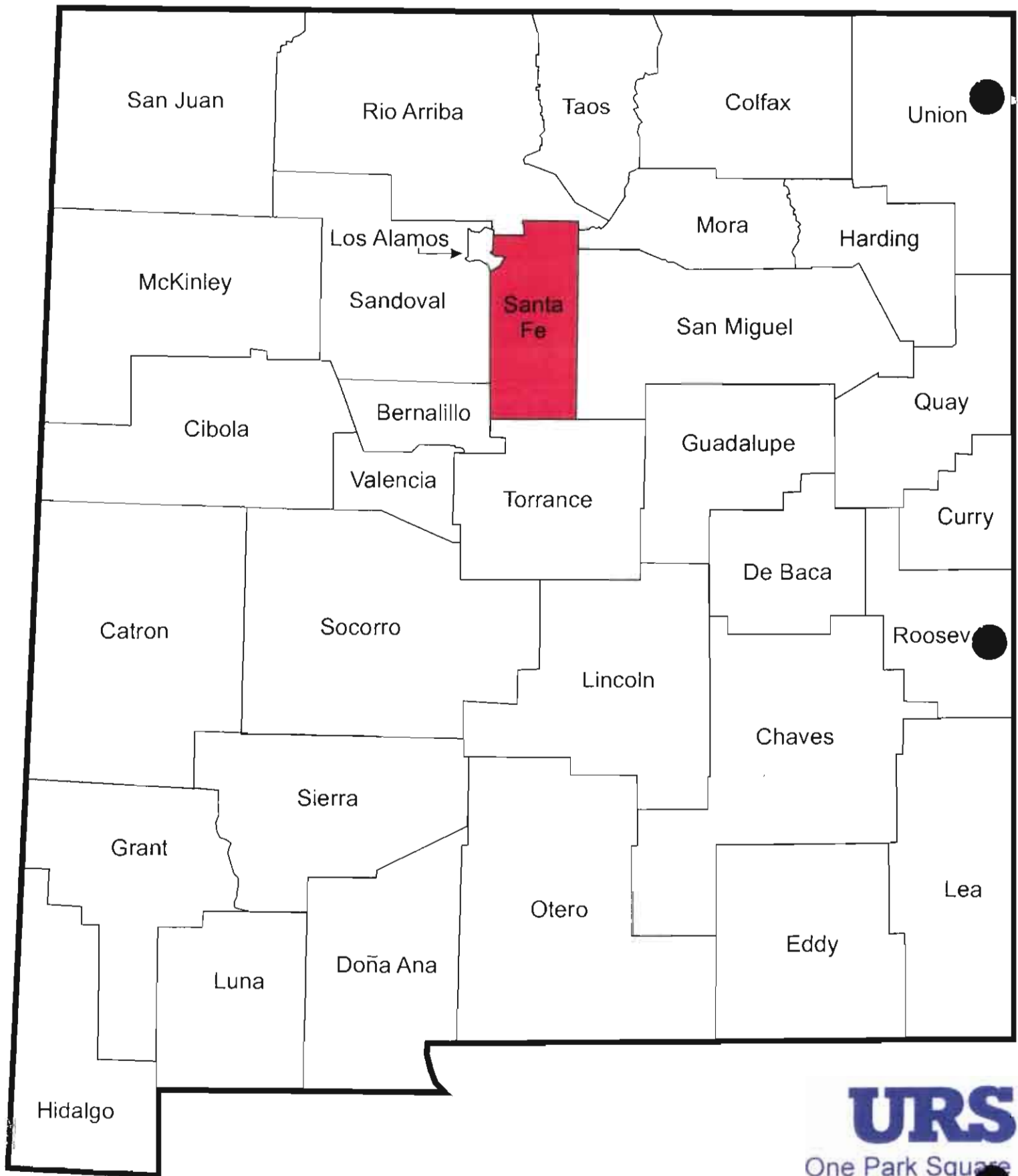
### PRIORITIES FOR EARTHQUAKE MITIGATION ACTIONS

From the above discussion, the STAPLE+E can be used to rate the options. Methods receive a "1" or "fair" as the default rating if there are no particularly notable poor or good potential consequences of the method.

**Table F7: STAPLE+E Criteria for Earthquake Hazard Mitigation Actions**

<b>S</b> ocial	1	1	1
<b>T</b> echnical	1	3	0
<b>A</b> dministrative	1	0	1
<b>P</b> olitical	1	0	1
<b>L</b> egal	1	1	1
<b>E</b> conomic	1	1	1
<b>E</b> nvironmental	1	1	1
<b>Total</b>	<b>7</b>	<b>7</b>	<b>6</b>

0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent



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