Santa Fe County

Hazard Mitigation Plan

PUBLIC REVIEW DRAFT July 2016




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July 2016

Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Santa Fe County developed this Local Hazard Mitigation Plan (LHMP) to make the County and its residents less vulnerable to future hazard events. This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 so that Santa Fe County would be eligible for the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation and Hazard Mitigation Grant programs.

The County followed a planning process prescribed by FEMA, which began with the formation of a hazard mitigation planning committee (HMPC) comprised of key County representatives, and other regional stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the County, assessed the County's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The County is vulnerable to several hazards that are identified, profiled, and analyzed in this plan. Wildfires, floods and severe weather are among the hazards that can have a significant impact on the County.

Based on the risk assessment, the HMPC identified goals for reducing the County's vulnerability to hazards. The goals of this multi-hazard mitigation plan are:

Plan Goals:

Goal 1: Reduce the number of injuries and fatalities from hazards

Goal 2: Reduce the amount of property damage, both public and private, from hazards

Goal 3: Minimize recovery time for both community function and the natural environment after natural hazard events

Goal 4: Enhance communication, collaboration and integration among county, federal, state, and tribal agencies in regards to hazard mitigation.

This plan was originally developed in 2015-2016.

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1 INTRODUCTION

1.1 Purpose

Santa Fe County prepared this Hazard Mitigation Plan (HMP) in 2015-2016 to better protect the people and property of the County from the effects of hazard events. This plan demonstrates the community's commitment to reducing risks from hazards and serves as a tool to help decision makers direct mitigation activities and resources. This plan was also developed, among other things, to ensure Santa Fe County's eligibility for certain federal disaster assistance; specifically, the FEMA Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and the Flood Mitigation Assistance Program (FMA). Mitigation planning can also earn credits for the National Flood Insurance Program's Community Rating System (CRS) which provides for lower flood insurance premiums in CRS communities.

1.2 Background and Scope

Each year in the United States, natural disasters take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters, because additional expenses incurred by insurance companies and nongovernmental organizations are not reimbursed by tax dollars. Many natural disasters are predictable and much of the damage caused by these events can be reduced or even eliminated.

Hazard mitigation is defined by FEMA as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on mitigation saves society an average of $4 in avoided future losses in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2005).

Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. This plan documents Santa Fe County's hazard mitigation planning process and identifies relevant hazards and vulnerabilities and strategies the County will use to decrease vulnerability and increase resiliency and sustainability in the community.

This plan was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the Federal Register on February 26, 2002, (44 CFR §201.6) and finalized on October 31, 2007. (Hereafter, these requirements and regulations will be referred to collectively as the Disaster

Mitigation Act (DMA) or DMA 2000.) While the act emphasized the need for mitigation plans and more coordinated mitigation planning and implementation efforts, the regulations established the requirements that local hazard mitigation plans must meet in order for the County to be eligible for certain federal disaster assistance and hazard mitigation funding under the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288). This planning effort also follows FEMA's *Local Mitigation Planning Handbook* (March 2013). Because the Santa Fe County Planning Area is subject to many kinds of hazards, access to FEMA's Hazard Mitigation Assistance programs is vital.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local land use policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan is a single-jurisdictional plan that includes the unincorporated areas of Santa Fe County.

The planning area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and establishing eligibility for mitigation-related federal funding.

Plan Organization

The Santa Fe County Local Hazard Mitigation Plan is organized as follows:

- Chapter 1: Introduction
- Chapter 2: Community Profile
- Chapter 3: Planning Process
- Chapter 4: Risk Assessment
- Chapter 5: Mitigation Strategy
- Chapter 6: Plan Adoption
- Chapter 7: Plan Implementation and Maintenance
- Appendices
  - Appendix A Planning Process
  - Appendix B Hazard Mitigation Planning Committee
  - Appendix C Adoption

2 COMMUNITY PROFILE

2.1 Community Profile

Santa Fe County is located in north-central New Mexico and is home to the state capital of Santa Fe. Pre-Columbian history of the area dates back to c.1050-1150 AD with historic remnants of Pueblo Indian settlements being found in the Rio Grande river valley as well as in the modern City of Santa Fe. Spanish settlers made efforts to colonize the area in 1598 establishing the region as a province of New Spain. New Mexico's second Spanish Governor, Don Pedro de Peralta, founded the provincial capital of *La Villa Real de la Santa Fe de San Francisco de Asisi* (which later became shortened to Santa Fe) in 1610, making it the oldest state capital in the United States[1].

2.1.1 Location and Geography

Santa Fe County includes portions of the Santa Fe National Forest on the east, the Town of Espanola to the north, and Interstate 40 to the south. The Rio Grande River crosses through the northwestern portion of the County. Several tributaries of the Rio Grande River drain the high elevations in the northeastern county. Figure 2.1 illustrates Santa Fe County's location and surrounding counties. The County has a total area of 1,911 square miles, making it the fifth smallest New Mexico County by size[2]. While small compared to other New Mexico counties it is the third most populous county. Santa Fe County includes the southernmost portion of the Sangre de Cristo Mountains, the southernmost subrange of the Rocky Mountains that extend north into Colorado. The highest point in the county is the summit of Santa Fe Baldy peak standing at 12,621 feet above sea level.

2.1.2 Land Ownership and Population

The County covers approximately 1,911 square miles, of which nearly 60% is privately held. The rest of the county is owned by the US Forest Service (19.4%), tribal governments (8.3%), the State of New Mexico (6.5%) and the Bureau of Land Management (5.7%). The remaining 0.4% is owned by various state and federal entities, see Table 2.1.

Population density per square mile of land area was: 68 people/sq. mi. in the 2000 Census and 74 people/sq. mi. in the 2010 Census. Total population for the County was estimated at 148,164 in 2014[3]. The population of the unincorporated area is estimated at 63,960 as of 2014.

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1 "Santa Fe – A Rich History" City of Santa Fe. Retrieved October 19, 2015.

2 "2010 Census Gazetteer Files". United States Census Bureau. August 22, 2012. Retrieved October 19, 2015.

3 US Census – American Fact Finder: http://factfinder.census.gov/

Figure 2.1: Santa Fe County Base Map

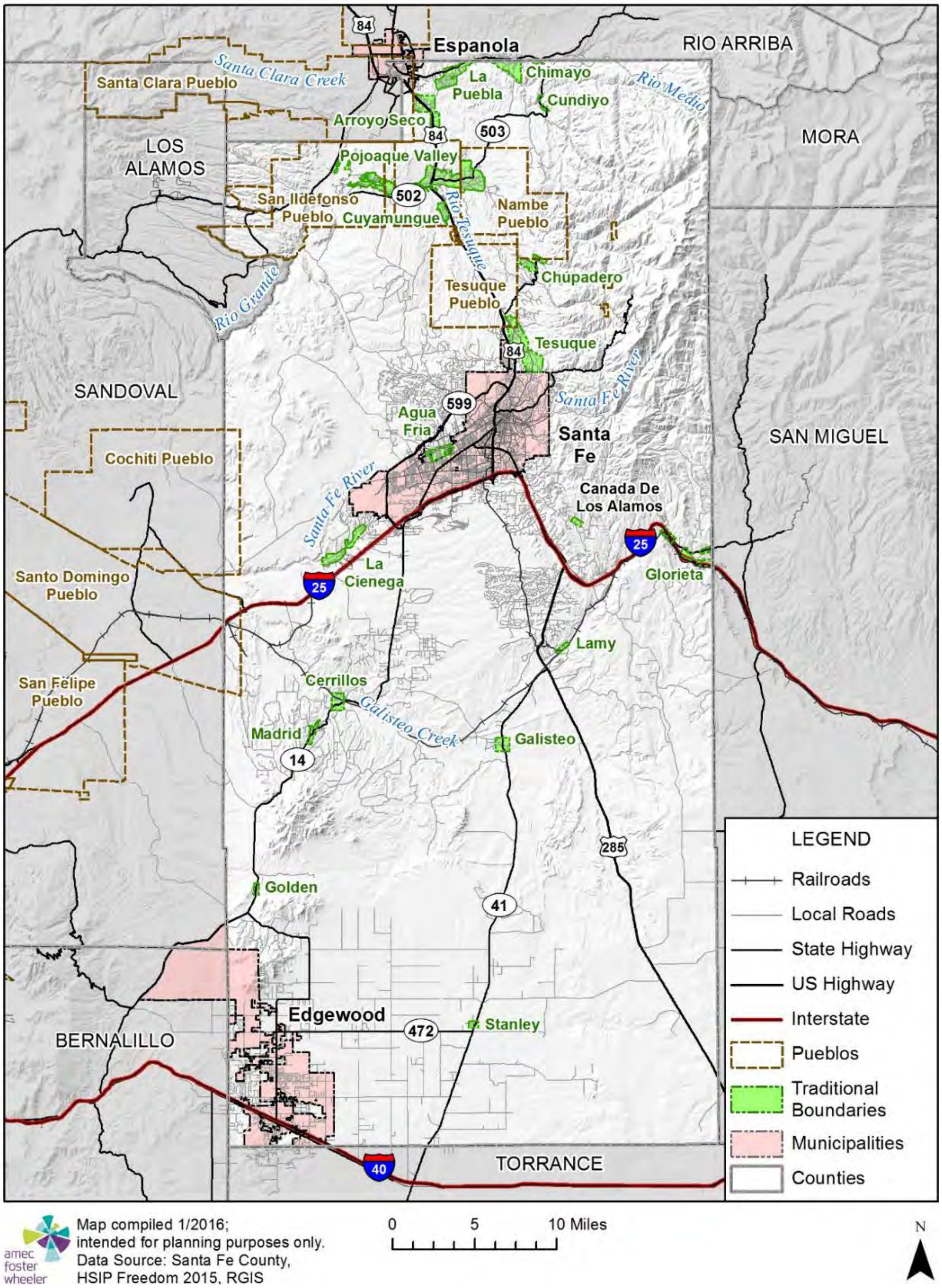


Table 2.1: Santa Fe County Land Ownership

Owner	Acres	% of Total Area
Private	730,044	59.7%
Forest Service	236,667	19.4%
Tribal	101,415	8.3%
State Owned	79,376	6.5%
Bureau of Land Management	69,350	5.7%
Department of Defense	2,755	0.2%
Department of Energy	1,693	0.1%
National Park Service	1,245	0.1%
State Park	356	0.0%
Total	**1,222,902**	**100.0%**

Source: Amec analysis done with data from University of New Mexico data portal: http://rgis.unm.edu/getdata/#map

2.1.3 History

Santa Fe County was established on March 15, 1848 and included practically all of the area of New Mexico which at the time was claimed by the Republic of Texas and later by the state of Texas. At the time it was established, the Texas Legislature passed a joint resolution laying before the United States Congress the assertion that Santa Fe County was a part of Texas and authorizing the governor of Texas to issue a proclamation to organize the county. The territory was made the eleventh judicial district of Texas on March 20, 1848. In October 1848 citizens of New Mexico held a mass meeting in Santa Fe to protest the incorporation with Texas, partially because Texas was a slave state and partially because of long animosity between the area and the Texas government.

In 1849, Texas Governor Peter H. Bell threatened to claim the area by force; however, once the area's animosity toward the Texas government was made public, the Compromise of 1850 was drafted and signed by US Congress and the State of Texas. This Act ceded to the United States all Texas' claims to the upper Rio Grande area, which precipitated the creation of the New Mexico territory and eventual state of New Mexico in 1912[4].

[4] Hans Peter Nielsen Gammel, comp., *Laws of Texas, 1822–1897* (10 vols., Austin: Gammel, 1898). C. R. Wharton, "Spruce McCoy Baird," *New Mexico Historical Review* 27 (October 1952).

2.1.4 Economy

U.S. Census estimates show economic characteristics for the County. These are shown in Table 2.2. Educational services, professional services, and arts and entertainment make up the largest sectors of the local economy.

Table 2.2: Santa Fe County Civilian Employed Population 16 years and over, 2013

Industry	Estimated Employment	Percent
Total civilian employed population 16 years and over	69,113	100%
Educational services, and health care and social assistance	14,086	20.40%
Professional, scientific, and management, and administrative and waste management services	11,078	16.00%
Arts, entertainment, and recreation, and accommodation and food services	9,593	13.90%
Retail trade	8,021	11.60%
Public administration	6,790	9.80%
Construction	4,707	6.80%
Other services, except public administration	4,146	6.00%
Finance and insurance, and real estate and rental and leasing	3,881	5.60%
Transportation and warehousing, and utilities	2,076	3.00%
Manufacturing	1,845	2.70%
Information	1,234	1.80%
Wholesale trade	970	1.40%
Agriculture, forestry, fishing and hunting, and mining	686	1.00%

Source: American Fact Finder; U.S. Census Bureau (2013)

3 PLANNING PROCESS

Requirements §201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

3.1 Background on Mitigation Planning in Santa Fe County

This Multi-Hazard Mitigation Plan is the first county-specific plan of its kind for Santa Fe County. The County, with the Santa Fe County Fire Department - Office of Emergency Management (OEM) as the lead agency, recognized the need and importance of this plan and was responsible for initiating its development. The County contracted with Amec Foster Wheeler in 2015 to facilitate and develop the plan. Amec Foster Wheeler's role was to:

- Assist in establishing the Hazard Mitigation Planning Committee (HMPC) as defined by the Disaster Mitigation Act (DMA);
- Meet the DMA requirements as established by federal regulations and following FEMA's planning guidance;
- Facilitate the entire planning process;
- Identify the data requirements that HMPC participants could provide and conduct the research and documentation necessary to augment that data,
- Assist in facilitating the public input process;
- Produce the draft and final plan documents; and
- Coordinate New Mexico Department of Homeland Security and Emergency Management (NMDHSEM) and FEMA Region VI plan reviews.

The remainder of this chapter provides a narrative description of the steps taken to prepare the hazard mitigation plan (HMP).

3.2 Local Government Participation

This LHMP is a single-jurisdictional plan that covers unincorporated Santa Fe County. The City of Santa Fe has its own HMP and thus participated as a stakeholder. The incorporated communities of Edgewood and Espanola are multi-county jurisdictions and were invited to participate as stakeholders. The DMA planning regulations and guidance stress that local governments seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the Hazard Mitigation Planning Committee (HMPC);
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Santa Fe County Planning Area's HMPC, "participation" was defined at the outset of the plan as the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Completing and returning the Amec Foster Wheeler Data Collection Guide;
- Collecting and providing other requested data (as available);
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by the governing board.

In the interest of completing a robust process that would ultimately result in FEMA approval the County met all of these participation requirements. In most cases one or more representatives for each agency attended the HMPC meetings described in Table 3.2 and also brought together department staff to help collect data, identify mitigation actions and implementation strategies, and review and provide data on plan drafts. Appendix A provides additional information and documentation of the planning process.

3.3 The 10-Step Planning Process

The process for developing the Santa Fe County Local Hazard Mitigation Plan followed the DMA 2000 planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1) Organize Resources;
2) Assess Risks;
3) Develop the Mitigation Plan; and
4) Implement the Plan and Monitor Progress.

Into this process, Amec Foster Wheeler integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of the Hazard Mitigation Assistance grants (HMA, including Hazard Mitigation Grant Program - HMGP, Pre-Disaster Mitigation program - PDM, Flood Mitigation Assistance - FMA), Community Rating System, and the flood control projects authorized by the U.S. Army Corps of Engineers (USACE). FEMA's March 2013 *Local Mitigation Planning Handbook* recommends a nine step process within the four phase process. Table 3.1 summarizes the four-phase DMA process, the detailed CRS planning steps and workplan used to develop the plan, the nine handbook planning tasks from FEMA's 2013 *Local Mitigation Planning Handbook*, and where the results are captured in the Plan. The sections that follow describe each planning step in more detail.

Table 3.1: Mitigation Planning Processes Used to Develop the Santa Fe County Local Hazard Mitigation Plan

FEMA 4 Phase Guidance	Community Rating System (CRS) Planning Steps (Activity 510) and Amec Foster Wheeler Workplan Tasks	FEMA Local Mitigation Planning Handbook Tasks (44 CFR Part 201)	Location in Plan
Phase I: Organize Resources	Task 1. Organize Resources	1: Determine the Planning Area and Resources	Chapters 1, 2 and 3
		2: Build the Planning Team 44 CFR 201.6(c)(1)	Chapter 3, Section 3.3.1
	Task 2. Involve the public	3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)	Chapter 3, Section 3.3.1
	Task 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.3.1 and Chapter 4, Section 4.4
Phase II: Assess Risks	Task 4. Assess the hazard	5: Conduct a Risk Assessment 44 CFR 201.6(c)(2)(i) 44 CFR 201.6(c)(2)(ii) & (iii)	Chapter 4, Sections 4.1-4.3
	Task 5. Assess the problem		Chapter 4, Sections 4.1-4.3
Phase III: Develop the Mitigation Strategy	Task 6. Set goals	6: Develop a Mitigation Strategy 44 CFR 201.6(c)(3)(i); 44 CFR 201.6(c)(3)(ii); and 44 CFR 201.6(c)(3)(iii)	Chapter 5, Section 5.2
	Task 7. Review possible activities		Chapter 5, Section 5.3
	Task 8. Draft an action plan		Chapter 5, Section 5.4
Phase IV: Adopt and Implement the Plan	Task 9. Adopt the plan	8: Review and Adopt the Plan	Chapter 6, Appendix C
	Task 10. Implement, evaluate, revise	7: Keep the Plan Current	Chapter 7
		9: Create a Safe and Resilient Community 44 CFR 201.6(c)(4)	Chapter 7

3.3.1 Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With Santa Fe County's commitment to develop the plan, Amec Foster Wheeler worked with OEM to establish the framework and organization for the process. Organizational efforts were initiated with the County to inform and educate the plan participants of the purpose and need for the countywide hazard mitigation plan. The planning consultant held an initial call to discuss the organizational aspects of this plan update process with County OEM, who took the lead on this project. Invitations to the kickoff meeting were extended to key county departments and key state partners. Using FEMA planning guidance representatives from the HMPC base membership was established, with additional invitations extended as appropriate to other federal, state, tribal, and local stakeholders and the public throughout the planning process. The list of agencies and individuals invited to participate is included in Appendix B with documentation of participation included in Appendix A.

The HMPC was established as a result of this effort, as well as through interest generated through outreach conduced for this project. The HMPC, comprising key County and other government and stakeholder representatives, developed the plan with leadership from the County OEM and facilitation by Amec Foster Wheeler. The HMPC also included other agency and public stakeholders with an interest in hazard mitigation. The following participated on the HMPC:

Santa Fe County

- Fire Department - Office of Emergency Management
- Administration Services - Risk Management
- Growth Management – Planning Division
- Growth Management – Building and Development Services
- Growth Management - Geographic Information Systems (GIS) Division
- Management Office
- Public Works – Open Space and Trails
- Public Works – Roads Maintenance
- Public Works – Utilities
- Sheriff

A list of participating HMPC representatives for the County is included in Appendix B.

The planning process officially began with a kick-off meeting held on October 23, 2015. The meeting covered the scope of work and an introduction to the DMA planning requirements. Participants were provided with a Data Collection Guide, which included worksheets to facilitate the collection of information necessary to support development of the plan. Using FEMA guidance, Amec Foster Wheeler designed these worksheets to capture information on past hazard events, identify hazards of concern to the County, quantify values at risk to identified hazards, inventory existing capabilities, and record possible mitigation actions. Copies of Amec Foster Wheeler's Data Collection Guide for this project are included in Appendix A. The County completed and returned the worksheets to supply Amec Foster Wheeler information for incorporation into the plan document.

During the planning process, the HMPC communicated through face-to-face meetings, email, and telephone conversations. Draft documents were also posted on the County website so that the HMPC members and the public could easily access and review them.

The HMPC held three primary planning meetings during the planning period (October, 2015-July, 2016). The purposes of these meetings are described in Table 3.2. Agendas for each of the meetings are included in Appendix A. Additional focus meetings of the HMPC were held in follow-up to the meetings below. The HMPC met on November 6, 2015 to prepare input to Amec Foster Wheeler's data collection guide. Another meeting on April 20th, 2016 was held to further develop the mitigation actions identified at the March 30th meeting.

Table 3.2: HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)
HMPC #1 Kick-off Meeting	1) Introduction to DMA and the planning process 2) Overview of current LHMP; 3) Organize Resources: the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders 4) Introduction to Hazard Identification	October 23, 2015
HMPC #2	1) Risk assessment overview 2) Introduction to mitigation goals	February 10, 2016
HMPC #3	1) Development of mitigation goals 2) Identification and prioritization of mitigation actions	March 30, 2016

Planning Step 2: Involve the Public

Early discussions with County OEM established the initial plan for public and stakeholder involvement. Public outreach for this plan update began at the beginning of the plan development process with an informational press release to inform the public of the purpose of the hazard mitigation planning process for the Santa Fe County Planning Area and to invite the public to participate in a series of public meetings held in various regions in the County. At the planning team kick-off meeting, the HMPC discussed additional strategies for public involvement and agreed to an approach using established public information mechanisms and resources within the community. Public involvement activities for this plan update included: press releases; use of the County email newsletter/notification system, development of a backgrounder handout for the public meetings; two public workshops and the collection of public and stakeholder comments on the draft plan.

Two regional public meetings were held to solicit public and stakeholder input prior to finalizing the updated plan. Outreach meeting on the plan are detailed in Table 3.3. Public outreach for both the northern region and southern region public meetings included an email newsletter distributed to 2,330 addresses including subscribers of District 1, a media distribution list, neighborhood association list, subscribes to resident e-news, and Santa Fe County employees. The meeting notice was also posted on the homepage of County website under news and announcements. Twenty three persons attended the meetings. Two members of the Edgewood police department, members of the Santa Fe County Fire Department and a reporter from the Mountain View Telegraph attended the southern regional meeting. An article on the meeting was published in the Mountain View Telegraph March 31st edition. Press releases, email newsletters, meeting sign in sheets and summaries are documented in Appendix A.

Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan, including the risk assessment and sections that address mitigation goals and strategies. Summaries of the meetings were shared with the HMPC and are included in Appendix A. The public meetings validated HMPC concerns with dam safety in the northern region and raised awareness of specific areas of concern with flood and arroyo erosion that were taken into account during the development of the plan's mitigation strategy.

Prior to finalization of the plan a draft was made available on the County website for a 14 day public comment period.

Table 3.3: Public and Stakeholder Meetings

Meeting Topic	Meeting Date	Meeting Locations
Regional public workshop - North	February 11,2016	Pojoaque Fire Station
Meeting with Santa Cruz Irrigation District including Rio Arriba County Emergency Management	February 11, 2016	District office
Regional public workshop - South	March 29, 2016	Edgewood Fire Station

Other stakeholder meetings were held as part of the plan development process. Due to the presence of high hazard dams in the planning area coordination with the dam owners occurred to discuss ways this plan could initiate strategies to help analyze and reduce risks. This coordination included a meeting with Santa Cruz Irrigation District and Rio Arriba County Emergency Management.

The San Juan – Pojoaque Soil Conservation District was also coordinated with regarding their flood control dams along the northern border of the project, including a planned project to rehabilitate one of the dams that had siltation issues.

The Pueblos of Pojoaque, Nambe, San Ildefonso and Tesuque were invited to public meetings. The Pueblo of Pojoaque indicated that they were in the process of updating their own hazard mitigation plan.

Planning Step 3: Coordinate with Other Departments and Agencies

Early in the planning process, the HMPC determined that data collection, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. The following groups were invited to participate or provide input into the planning process based on their involvement in hazard mitigation planning, knowledge of hazards, their status as a land manager in the County, and/or their interest as a neighboring jurisdiction.

State Agencies

- New Mexico Division of Homeland Security and Emergency Management
- New Mexico State University
- New Mexico Office of the State Engineer – Dam Safety
- New Mexico Bureau of Minerals and Geology
- New Mexico Department of Transportation
- New Mexico Abandoned Mine Land Program

Tribal Agencies

- Pojoaque Pueblo
- Nambe Pueblo
- Tesuque Pueblo

Local Agencies

- City of Santa Fe Emergency Management
- Town of Edgewood
- City of Espanola
- Rio Arriba County Emergency Management (neighboring County)
- Los Alamos County Emergency Management (neighboring County)
- Bernalillo County Emergency Management (neighboring County)
- Torrance County Emergency Management (neighboring County)

- San Miguel County Emergency Management (neighboring County)

Federal Agencies

- USACE - Silver Jackets

Universities

- University of New Mexico - Earth Data Analysis Center

Non profit/Other

- The Nature Conservancy
- Santa Cruz Irrigation District
- Pojaque Valley Irrigation District/Santa Fe Pojaque Soil Conservation District

Coordination with key agencies, organizations, and advisory groups throughout the planning process allowed the HMPC to review common problems, development policies, and mitigation strategies as well as identifying any conflicts or inconsistencies with regional mitigation policies, plans, programs and regulations. They often provided a resource for information on potential hazards in the County. For example, representatives from NM Bureau of Minerals and Geology provided input on the potential for swelling soils and collapsible soils (as a subset of land subsidence), landslides and other geologic hazards.

Phone calls and emails were used during plan development to directly coordinate with key individuals representing other agencies or regional programs. The County Emergency Manager also worked as the liaison to this plan and other planning efforts to ensure successful coordination and input with other ongoing plans.

As part of the public review and comment period for the draft plan, key agencies and were again specifically solicited to provide any final input to the draft plan document. This input was solicited both through membership on the HMPC and by direct emails to key groups and associations to review and comment on the plan. As part of this targeted outreach, these key stakeholders were also specifically invited to attend the public meeting to discuss any outstanding issues and to provide input on the draft document and final mitigation strategies. Appendix A includes documentation of these email solicitations.

The HMPC also used technical data, reports, and studies from the following agencies and groups, just to name a few:

- New Mexico State Forestry Service

- New Mexico Institute of Mining and Technology
- U.S. Geological Survey
- National Weather Service

Other Community Planning Efforts and Hazard Mitigation Activities

Coordination with other community planning efforts is also paramount to the success of this plan. Hazard mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Santa Fe County uses a variety of comprehensive planning mechanisms, such as the County Sustainable Growth Management Plan and Sustainable Land Development Code, to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives listed in Table 3.4.

Table 3.4: Incorporated Planning Mechanisms

Plan	How Incorporated
County Community Wildfire Protection Plan 2008	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy
Santa Fe County Sustainable Growth Management Plan, 2010	Incorporated by reference in Mitigation Strategy and discussed in Section 4.4 Capabilities Assessment
Santa Fe County Emergency Operations Plan and Threat Hazard Identification and Risk Assessment	Informed Risk and Vulnerability Assessment
2013 State of New Mexico Natural Hazard Mitigation Plan	Used as reference for Risk and Vulnerability Assessment. Goals referenced during mitigation goals update.

An example of coordinating with other planning efforts that occurred during the development of this plan was coordination with County Transportation Master Plan update. The planner leading the Transportation Master Plan Update from County Growth Management – Planning Division participated on the HMPC and was provided the HMP backgrounder and press releases for coordinated public outreach. Other efforts that could be coordinated with in the future include greenway/river planning efforts and Santa Fe County Sustainable Growth Management Plan updates. Members of the Santa Fe County Fire Department participated on the Santa Fe Fireshed coalition and shared information about the hazard mitigation plan development.

Other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Specific references used in the development of this plan are sourced throughout the document as appropriate.

3.3.2 Phase 2: Assess Risks

Planning Steps 4 and 5: Identify the Hazards and Assess the Risks

Amec Foster Wheeler led the HMPC in a data discovery and research effort to identify, document, and profile all the hazards that have, or could have, an impact in the planning area. Data collection worksheets were developed and used in this effort to aid in identifying hazards and vulnerabilities. Geographic Information Systems (GIS) data were used to display, analyze, and quantify hazards and vulnerabilities. The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards.

By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process, methodologies, and results are included in Chapter 4 Risk Assessment.

3.3.3 Phase 3: Develop the Mitigation Plan

Planning Steps 6 and 7: Set Goals and Review Possible Activities

Amec Foster Wheeler facilitated brainstorming and discussion sessions with the HMPC that included a description of the purpose and process of developing planning goals, as well as discussion of a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. Additional details of the process to update goals and actions is included in Chapter 5 Mitigation Strategy. Additional documentation on the process the HMPC used to develop the goals and strategy is in Appendix A.

Planning Step 8: Draft an Action Plan

Based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7, Amec Foster Wheeler produced a complete first draft of the plan. This complete draft was distributed electronically to the HMPC for review and comment. Other agencies were invited to comment on this draft as well. Comments were integrated into a public review draft, which was advertised and distributed to collect public input. Amec Foster Wheeler integrated comments and issues from the public, as appropriate, along with additional internal review comments and produced a final draft for the NMDHSEM and FEMA Region VI to review and approve prior to final adoption by the Santa Fe County Commissioners.

3.3.4 Phase 4: Implement the Plan and Monitor Progress

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was adopted by the Santa Fe County Commissioners using the sample resolution contained in Appendix C.

3.4 Planning Step 10: Implement, Evaluate, and Revise the Plan

The true worth of any mitigation plan is in the effectiveness of its implementation. In the previous steps of the plan update process the HMPC's efforts have been directed at researching data, gathering updated information for the plan, and developing appropriate mitigation actions. Each recommended action includes key descriptors, such as a lead entity and possible funding sources, to help initiate implementation. An overall implementation strategy is described in Chapter 7 Plan Implementation and Maintenance.

Finally, there are numerous organizations within the Santa Fe County Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is key to the ongoing success of this plan and mitigation in Santa Fe County and is addressed further in Chapter 7. A plan update and maintenance schedule and a strategy for continued public involvement are also included in Chapter 7.

4.0 RISK ASSESSMENT

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

As defined by the Federal Emergency Management Agency (FEMA), risk is a combination of hazard, vulnerability, and exposure. It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of the County's potential risk to natural hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events.

This risk assessment builds upon the methodology described in the 2013 FEMA *Local Mitigation Planning Handbook,* which recommends a four-step process for conducting a risk assessment:

1) Describe Hazards
2) Identify Community Assets
3) Analyze Risks
4) Summarize Vulnerability

Data collected through this process has been incorporated into the following sections of this chapter:

Section 4.1: Hazard Identification - identifies the natural hazards that threaten the Planning Area and describes why some hazards have been omitted from further consideration.

Section 4.2: Asset Summary - describes the methodology for determining vulnerability of the planning area to the identified hazards.

Section 4.3: Hazard Analysis and Risk Assessment - discusses the threat to the Planning Area and describes previous occurrences of hazard events and the likelihood of future occurrences (2013 FEMA Local Mitigation Planning Handbook Risk Assessment Step 1). It also includes an assessment of the Planning Areas' exposure to natural hazards; considering assets at risk, critical facilities, and future development trends (2013 FEMA Local Mitigation Planning Handbook Risk Assessment Steps 2, 3 and 4).

Section 4.4: Capability Assessment - inventories existing mitigation activities and policies, regulations, and plans that pertain to mitigation and can affect net vulnerability (2013 FEMA Local Mitigation Planning Handbook Planning Task 4).

This risk assessment covers the entire geographical extent of the Santa Fe County Planning Area (Planning Area), including the county and the unincorporated communities of Santa Fe. Where feasible, risk is differentiated between the unincorporated areas the municipalities of Santa Fe, Edgewood, Espanola, and four Pueblos who were stakeholders but not participating jurisdictions in this plan.

4.1 Hazard Identification

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.

The Santa Fe County HMPC conducted a hazard identification process to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of hazards that could affect Santa Fe County. Hazards data from the New Mexico Department of Homeland Security and Emergency Management (DHSEM), FEMA, the National Oceanic and Atmospheric Administration (NOAA), the Santa Fe County Threat and Hazard Identification and Risk Assessment (THIRA), and many other sources were examined to assess the significance of these hazards to the Planning Area. Significance of each identified hazard was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries as well as property and economic damage. The natural hazards evaluated as part of this plan include those that have occurred historically or have the potential to cause significant human and/or monetary losses in the future. In general, this plan goes into greater detail, depth, and analysis.

The following hazards were identified and investigated for the plan development. As a starting point, the updated 2013 New Mexico State Hazard Mitigation Plan was consulted to evaluate the applicability of hazards of concern to the State to the Planning Area. The Santa Fe Plan includes all hazards profiled in the State plan, plus one additional hazard considered to be a concern to Santa Fe County based on local geography, geology, climatology and hazard history.

The threat posed by abandoned mines in Santa Fe County were identified by the Hazard Mitigation Planning Committee as a hazard for analysis. Upon further assessment, the HMPC decided that the county doesn't have jurisdiction over abandoned mines, making mitigation difficult. There is a history of issues with abandoned mines compounding impacts from flooding; these impacts are included in the Flood/Flash Flood section. Table 4.1 below was completed by the County with input from the HMPC to identify, profile, and rate the significance of identified hazards. All hazards are analyzed further in the Hazard Analysis and Risk Assessment section.

Table 4.1: Santa Fe County Hazard Identification Worksheet

Hazard	Spatial Extent	Probability of Future Occurrences	Magnitude/ Severity	Overall Significance
Agriculture Disease	Significant	Occasional	Critical	Med
Dam Failure	Significant	Unlikely	Catastrophic	High
Drought	Extensive	Likely	Limited	Medium
Earthquake	Extensive	Occasional	Critical	Medium
Expansive Soils	Limited	Unlikely	Negligible	Low
Extreme Temperatures (Heat and Cold)	Extensive	Likely	Limited	Medium
Flood/Flash Flood	Extensive	Highly Likely	Critical	High
HazMat Incident (includes Radiological and Nuclear)	Limited	Likely	Critical	High
High Wind	Extensive	Likely	Negligible	Low
Landslide (includes Mudslide and Rockfall)	Negligible	Likely	Negligible	Low
Land Subsidence	Limited	Unlikely	Negligible	Low
Severe Winter Storm	Extensive	Likely	Limited	Medium
Severe Thunderstorm (includes Hail and Lightning)	Significant	Highly Likely	Negligible	Low
Tornado	Limited	Highly Likely	Limited	Medium
Volcano	Extensive	Unlikely	Catastrophic	Low
Wildfire	Extensive	Highly Likely	Critical	High

Geographic Extent
Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity
Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Probability of Future Occurrences
Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance
Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

Source: Amec Foster Wheeler Data Collection Guide, Santa Fe County

4.1.1 Disaster Declaration History

One method to identify hazards based upon past occurrence is to look at what events triggered federal disaster declarations within the Planning Area. Disaster declarations are granted when the severity and magnitude of the event's impact surpass the ability of the local government to respond and recover. Disaster assistance is supplemental and sequential. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government's capacity is exceeded, a federal disaster declaration may be issued allowing for the provision of federal disaster assistance.

Santa Fe County has experienced five federal disaster declarations, four emergency declarations and one fire management declaration since 1950. All of the disaster declarations were associated with flood events. Of the emergency declarations, two were for wildfire, one was for the evacuation from Hurricane Katrina, and one was for drought. A summary of federal declarations is shown in Table 4.2.

Table 4.2: Santa Fe County Federal Disaster Declaration History

Disaster Declaration	Hazard Type	Incident Period	Declaration Date	Declaring Agency
DR-4199	Severe Storms and Flooding	09/15/2014 - 09/26/2014	10/29/2014	Federal
DR-4197	Severe Storms and Flooding	07/27/2014 - 08/05/2014	10//6/2014	Federal
DR-4152	Severe Storms, Flooding, Mudslides	09/09/2013 - 09/22/2013	10/29/2013	Federal
EM-3229	Hurricane Katrina Evacuation	08/29/2005 - 10/01/2005	9/7/2005	Federal
FM-2408	New Mexico Borrego Fire	05/22/2002 - 06/10/2002	5/23/2002	Federal
EM-3154	New Mexico Wildfire	05/05/2000 - 07/07/2000	5/10/2000	Federal
EM-3128	New Mexico Extreme Fire Hazard	06/29/1998 - 10/15/1998	7/2/1998	Federal
DR-589	Severe Storms, Snowmelt, Flooding	06/23/1979	06/23/19798	Federal
EM-3034	New Mexico Drought	03/02/1977	3/2/1977	Federal
DR-380	Severe Storms, Snowmelt, Flooding	05/11/1973	05/11/1973	Federal

Source: FEMA

4.2 Asset Summary

4.2.1 Assets Exposure

As a starting point for analyzing the Planning Area's vulnerability to identified hazards, the HMPC used a variety of data to define a baseline against which all disaster impacts could be compared. If a catastrophic disaster was to occur in the Planning Area, this section describes significant assets exposed or at risk in the Planning Area. Data used in this baseline assessment included:

- Total assets at risk;
- Critical facility inventory;
- Cultural, historical, and natural resources; and
- Population growth and land use/development trends.

Total Assets at Risk

Parcel data was provided by the Santa Fe County Assessor's Office, and is current to November 2015. This data presents an inventory of the total exposure of developed properties within the county. It is important to note that depending on the nature and type of hazard event or disaster, it is generally the value of the infrastructure or improvements to the land that is of concern or at risk. Generally, the land itself is not a total loss, but may see a reduction in value. Thus the parcel analysis excludes land value.

Parcel Exposure and Preparations for Analysis

Building counts and valuations in this plan are based on data from the County Assessor's Office and County Growth Management Department GIS Division. A structure layer representing structure point locations throughout Santa Fe County was provided in GIS. This layer was used in conjunction with the parcel layer to obtain a structure count for each parcel, and to identify those parcels that have improvements on them. Table 4.3 shows a summary of the total property inventory from the Assessor's Office for the County, including jurisdictions that did not participate in the plan. All jurisdictions were included to differentiate the exposure in the unincorporated vs incorporated or pueblo areas. Table 4.4 summarizes the property inventory for the unincorporated County with detail by property type.

Note that this table includes a total of all parcels and 'improved' parcels. For the purposes of this plan improved includes parcels that have an improvement value greater than zero or includes at least one structure point represented in the GIS structure layer. In some cases, exempt properties such as government-owned parcels have no structure value. Thus the building value is likely understated as a whole, which is a noted limitation. Building value is based on 2014 full market value. Agriculture value was included because of the analysis of agricultural diseases in this plan.

Table 4.3: Santa Fe County Total Exposure by Jurisdictions and Pueblos

Jurisdiction	Parcel Count	Building Count	Improved Value	Agriculture Value	Content Value	Total Value
Cochiti Pueblo	33	25	$909,838	$7,670	$536,494	$1,454,002
Edgewood	2,813	2,252	$218,015,430	$75,900	$131,905,840	$349,997,170
Espanola	380	387	$22,482,609	$1,580	$12,204,530	$34,688,719
Espanola City/Santa Clara Pueblo	905	981	$60,710,021	$20,270	$37,820,330	$98,550,621
Nambe Pueblo	641	1,275	$63,011,501	$45,160	$31,634,975	$94,691,636
Pojoaque Pueblo	1,125	2,025	$111,226,857	$89,170	$59,970,974	$171,287,001
San Ildefonso Pueblo	586	1,038	$45,188,050	$29,720	$22,906,790	$68,124,560
Santa Clara Pueblo	206	231	$14,855,241	$3,220	$9,000,156	$23,858,617
Santa Fe	37,658	48,613	$7,784,370,579	$5,060	$4,829,399,641	$12,613,775,280
Santo Domingo Pueblo	1	1	$0	$0	$0	$0
Tesuque Pueblo	85	315	$19,031,825	$1,550	$9,575,228	$28,608,603
Unincorporated	31,984	29,337	$4,621,182,961	$2,744,090	$2,428,490,038	$7,052,417,089
Total	**76,417**	**86,480**	**$12,960,984,912**	**$3,023,390**	**$7,573,444,993**	**$20,537,453,295**

Table 4.4: Santa Fe County Unincorporated Area - Total Exposure by Property Type

Property Type	Parcel Count	Building Count	Improved Value	Agriculture Value	Content Value	Total Value
Commercial	372	699	$219,362,761	$46,670	$219,362,761	$438,772,192
Exempt	371	444	$18,450,983	$3,280	$18,450,983	$36,905,246
Exempt County	99	88	$0	$0	$0	$0
Exempt Federal	54	9	$0	$0	$0	$0
Exempt State	80	17	$0	$0	$0	$0
Open Space	431	37	$0	$0	$0	$0
Other	428	173	$0	$0	$0	$0
Park	71	7	$0	$0	$0	$0
Residential Condominium	145	148	$51,535,039	$0	$25,767,520	$77,302,559
Residential Mobile Home	949	1,290	$7,609,816	$10,870	$3,804,908	$11,425,594
Residential Multi Family	19	437	$8,455,581	$660	$4,227,791	$12,684,032
Residential Single Family	18,407	24,078	$4,313,752,151	$1,227,400	$2,156,876,076	$6,471,855,627
Vacant	10,558	1,910	$2,016,630	$1,455,210	$0	$3,471,840
Total	**31,984**	**29,337**	**$4,621,182,961**	**$2,744,090**	**$2,428,490,038**	**$7,052,417,089**

Critical Facility Inventory

For the purposes of this plan, a critical facility is defined as one that is essential in providing utility or direction either during the response to an emergency or during the recovery operation. FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets:

- *Essential facilities* are those that if damaged would have devastating impacts on disaster response and/or recovery;
- *High potential loss facilities* are those that would have a high loss or impact on the community;
- *Transportation and lifeline facilities* are a third category of critical assets, consisting of transportation systems and utilities.

Examples of each are provided in Table 4.5.

Table 4.5: Critical Facilities Types and Examples

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline Facilities
Hospitals and medical facilities	Power Plants	Highways, Bridges, Tunnels
Police Stations	Dams and Levees	Railroads and Facilities
Fire Stations	Military Installations	Airports
Emergency Operations Centers	Hazardous Materials Sites	Water Treatment Facilities
	Schools	Natural Gas, Oil Facilities and Pipelines
	Shelters	Communications Facilities (including 911 and Repeater sites)
	Day Care Centers	
	Nursing Homes	
	Main Government Buildings	

A summary of critical facilities in the planning area can be found in Table 4.6.

Table 4.6: Santa Fe County Critical Facilities Summary Table

Category	Critical Facility	Facility Count
Essential Facilities	Fire Station	33
	Government	4
	Hospital	3
	Law Enforcement	15
	Local EOC	6
	Office for Bombing Prevention	6
	State EOC	1
	Urgent Care	4
	Total	**72**
High Potential Loss Facilities	Dam	11
	Government	1
	Hazmat	11
	Nursing Homes	6
	Public Health	2
	School	78
	Shelter	12
	Total	**121**
Transportation and Lifelines	Airport	6
	Bridge	241
	Communication	297
	Potable Water	7
	Propane	3
	Solar Field	1
	Train Station	1
	Waste Water	1
	Total	**557**
	Grand Total	**750**

Source: Amec Foster Wheeler based on HSIP Freedom 2015, Hazus-MH 3.0, Santa Fe County

Cultural, Historical, and Natural Resources

Assessing Santa Fe County's vulnerability to disaster also involves inventorying the natural, historical, and cultural assets of the area. This step is important for the following reasons:

- The community may decide that these types of resources warrant a greater degree of protection due to their unique and irreplaceable nature and contribution to the overall economy.
- In the event of a disaster, an accurate inventory of natural, historical and cultural resources allows for more prudent care in the disaster's immediate aftermath when the potential for additional impacts is higher.
- The rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.
- Natural resources can have beneficial functions that reduce the impacts of natural hazards, for example, wetlands and riparian habitat which help absorb and attenuate floodwaters and thus support overall mitigation objectives.

Cultural and Historical Resources

Santa Fe County has a large stock of historically significant homes, public buildings, and landmarks. To inventory these resources, the HMPC collected information from a number of sources. The New Mexico Historic Preservation Division (NMHPD) was the primary source of information. The Office of Historic Preservation (OHP) is responsible for the administration of federally and state mandated historic preservation programs to further the identification, evaluation, registration, and protection of New Mexico's irreplaceable archaeological and historical resources. NMHPD administers the National Register of Historic Places and the State Register of Cultural Properties. Each program has different eligibility criteria and procedural requirements.

- The **National Register of Historic Places** is the nation's official list of cultural resources worthy of preservation. The National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. Properties listed include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior. Properties listed on this database in Santa Fe County (exclusive of properties located in the City of Santa Fe) are included in Table 4.7.
- **New Mexico State Register of Cultural Properties** are sites, buildings, features, or events that are of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Properties listed on this database in Santa Fe County (exclusive of properties located in the City of Santa Fe) are included in Table 4.8.

Table 4.7: Santa Fe County Historical Resources, National Register

Resource Name	Location	Date Listed
Nuestra Senora de Luz Church and Cemetery	Canoncito	1995/12/14
Santa Fe Trail--Canada de los Alamos Site	Canoncito at Apache Canyon	2013/09/25
San Marcos Pueblo	Capitan	1982/03/26
Plaza del Cerro	Chimayo	1972/07/17
El Santuario de Chimayo	Chimayo	1970/04/15
San Ildefonso Pueblo	Espanola	1974/06/20
La Iglesia de Santa Cruz and Site of the Plaza of Santa Cruz de la Canada	Espanola	1973/08/17
San Jose Hall	Galisteo	2015/05/26
Roybal, Ignacio, House	Jacona	1986/02/13
Lujan--Ortiz House	Jaconita	2000/01/14
La Bajada Mesa Agricultural Site	La Bajada	1983/12/15
Route 66 and National Old Trails Road Historic District at La Bajada	La Bajada Village	2005/06/30
La Cieneguilla South Section--El Camino Real de Tierra Adento	La Cienega	2013/09/25
Apache Canyon Railroad Bridge	Lamy	1979/04/27
Pflueger General Merchandise Store and Annex Saloon	Lamy	1987/06/23
Madrid Historic District	Madrid	1977/11/09
Bouquet, Jean, Historic/Archeological District	Pojoaque	1983/01/05
Otowi Suspension Bridge	San Ildefonso	1997/07/15
Camino Real--Alamitos Section	Santo Domingo Pueblo	2011/04/08
Schmidt, Albert, House and Studio	Tesuque	2003/07/25
Navawi	White Rock	1982/12/08
Nuestra Senora de Luz Church and Cemetery	Canoncito	1995/12/14
Santa Fe Trail--Canada de los Alamos Site	Canoncito at Apache Canyon	2013/09/25
San Marcos Pueblo	Capitan	1982/03/26
Plaza del Cerro	Chimayo	1972/07/17
El Santuario de Chimayo	Chimayo	1970/04/15
San Ildefonso Pueblo	Espanola	1974/06/20
La Iglesia de Santa Cruz and Site of the Plaza of Santa Cruz de la Canada	Espanola	1973/08/17
San Jose Hall	Galisteo	2015/05/26
Roybal, Ignacio, House	Jacona	1986/02/13

Source: http://www.nps.gov/nr

Table 4.8: Santa Fe County Historical Resources, State Register

Resource Name	Location	Date Listed
Cerrillos Opera House	Cerrillos	3/29/1974
Los Cerrillos Mining District	Cerrillos	2/9/1973
Mount Chalchihuitl Turquoise Mine	Cerrillos	1/20/1978
Waldo Coke Ovens	Cerrillos	8/24/1979
Oratorio de San Buenaventura	Chimayo	5/23/1969
Santa Cruz Dam	Chimayo	1/20/1978
Cundiyo	Cundiyo	6/26/1970
Galisteo Historic District	Galisteo	10/17/1969
Pueblo Blanco (LA 40)	Galisteo	4/3/1981
Pueblo Colorado (North)	Galisteo	9/12/1969
Pigeon's Ranch	Glorieta	5/22/1970
Santa Fe Trail: Apache Canyon Bridge Site	Glorieta	4/13/2012
La Bajada Ruin (LA 7)	La Bajada	6/20/1975
Cienega Village Museum, Old	La Cienega	8/24/1979
Cieneguilla Pueblo (LA 16) (aka Tzeguma)	La Cienega	8/10/1970
Colina Verde Ruin	Lamy	9/12/1969
Galisteo, Pueblo of	Lamy	9/12/1969
Pueblo Largo	Lamy	9/12/1969
San Cristobal, Pueblo of, Archeological District	Lamy	9/12/1969
She, Pueblo of	Lamy	9/12/1969
The Mission Chapel of Our Lady of Light	Lamy	9/12/1969
Madrid Boarding House	Madrid	7/30/1976
Camino Real - Los Alamitas Section	Multiple	12/10/2010
Nambe Archeological District	Nambe Pueblo	5/17/1974
Bouquet Ranch	Pojoaque	5/21/1971
Trujillo, Jose Raphael, House	Rio Chiquito	9/9/1988
Black Mesa (Tunyo)	San Ildefonso Pueblo	9/27/1974
West Otto Site	Stanley	3/13/1972
Schmidt, Albert, Residence and Studio	Tesuque	12/6/2002
Tesuque, Pueblo of (Tatunge)	Tesuque Pueblo	11/22/1971

Source: New Mexico Historic Preservation Division

It should be noted that these lists change periodically, and they may not include those currently in the nomination process and not yet listed. Additionally, as defined by the National Environmental Policy Act (NEPA), any property over 50 years of age is considered a historic resource and is potentially eligible for the National Register. Thus, in the event that the property is to be altered, or has been altered, as the result of a major federal action, the property must be evaluated under the guidelines set forth by NEPA. Structural mitigation projects are considered alterations for the purpose of this regulation.

Many cultural and historical resources in the County are vulnerable to several hazards due to the nature of their construction. One of the biggest risks is earthquakes or high winds damaging historic buildings.

Natural Resources

Natural resources are important to include in benefit/cost analyses for future projects and may be used to leverage additional funding for mitigation projects that also contribute to community goals for protecting sensitive natural resources. Awareness of natural assets can lead to opportunities for meeting multiple objectives. For instance, protecting wetlands areas protects sensitive habitat as well as reducing the force of and storing floodwaters.

Natural and Beneficial Functions

Floodplains can have natural and beneficial functions. Wetlands function as natural sponges that trap and slowly release surface water, rain, snowmelt, groundwater and flood waters. Trees, root mats, and other wetland vegetation also slow the speed of floodwaters and distribute them more slowly over the floodplain. This combined water storage and braking action lowers flood heights and reduces erosion. Wetlands within and downstream of urban areas are particularly valuable, counteracting the greatly increased rate and volume of surface water runoff from pavement and buildings. The holding capacity of wetlands helps control floods and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can often provide the level of flood control otherwise provided by expensive dredge operations and levees.

Special Status Species

To further understand natural resources that may be particularly vulnerable to a hazard event, as well as those that need consideration when implementing mitigation activities, it is important to identify at-risk species (i.e., endangered species) in the Planning Area. The US Fish and Wildlife Service maintains a list of threatened and endangered species in New Mexico. State and federal laws protect the habitat of these species through the environmental review process. Several additional species are of special concern or candidates to make the protected list.

Table 4.9 summarizes Santa Fe County's special status animal species in the Fish and Wildlife Service database. A search for Santa Fe County's special status plant species in the Fish and Wildlife Service database yielded no results.

Table 4.9: Threatened and Endangered Animals in Santa Fe County

Name	Scientific Name	Status
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered

Source: US Fish and Wildlife Service

Population, Growth and Development Trends

As part of the planning process, the HMPC looked at changes in growth and development, both past and future, and examined these changes in the context of hazard-prone areas, and how the changes in growth and development affect loss estimates and vulnerability. Information from the US Census Bureau forms the basis of this discussion.

Current Status and Past Development

The US Census Bureau estimated population of Santa Fe County for July 1, 2014 was 148,164, representing a 2.8% increase in population since 2010 (estimated at 144,171).

Table 4.10 illustrates the pace of population growth in Santa Fe County dating back to 1995. Table 4.11 shows more recent population trends for each municipality and the unincorporated areas of the county.

Table 4.10: Historical Population of Santa Fe County

	1995	2000	2005	2010	2014 (Estimate)
Population	115,111	129,160	136,664	144,546	148,164
Change	–	+12.2%	+5.8%	+5.8%	+2.5%

Source: US Census Bureau

Table 4.11: Population Growth for Santa Fe County from 2000-2014

	2000	2010	2014 (Estimate)	Population Growth 2000-2014
Edgewood	3,371	3,746	3,777	+12%
Espanola	10,201	10,250	10,130	-0.69%
Santa Fe	65,381	68,153	70,297	+7.5%
Unincorporated Area	50,207	62,397	63,960	+21.5%
Countywide	**129,160**	**144,546**	**148,164**	**+14.7%**

Source: US Census Bureau

Future Population Growth

The University of New Mexico Bureau of Business and Economic Research tracks future population growth for cities and counties in the State of New Mexico. Future population projections for Santa Fe County are shown in Table 4.12. Overall, while the growth rate slows as time passes, the population of Santa Fe County is expected to experience growth through 2040.

Table 4.12: Santa Fe County Population Projections

Projections	2015	2020	2025	2030	2035	2040
Santa Fe County	154,756	164,006	171,905	178,124	182,410	184,832

Source: University of New Mexico Bureau of Business and Economic Research

Land Use/Zoning

Existing land use in the county is driven by 2 major factors: open space and transportation infrastructure. The northern half of the county is primarily made up of US Forest Service lands and tribal lands with the urbanized area of Santa near the edge of the Santa Fe National Forest at the confluence of Interstate 25 and US 285. The southern half of the County is primarily very low density residential (large, single family lots and ranches) with some agricultural uses. There are some small communities (Madrid, Galisteo and Cerillos) along the state highways where residential uses are clustered. The urban area in the southwestern part of the County (near the Town of Edgewood) also has some medium and higher density residential areas.

The 2015 Sustainable Land Development Code (SLDC) is the land use ordinance that contains the regulations a property owner must follow when building or remodeling a structure. It also explains the process by which land use and development can occur. The SLDC codifies the vision, goals, objectives and policies that are outlined in the County's Sustainable Growth Management Plan (SGMP).

Future Growth Areas

Future land use and growth management strategies in Santa Fe County aim to facilitate the responsible growth of the county while balancing environmental, economic and community priorities[1]. The Santa Fe County Sustainable Growth Management Plan is a community planning framework document that outlines the "*tools and techniques used to ensure that as the population* [of the County] *grows, there are services available to meet those demands.*"

The SGMP breaks the County into 4 planning areas (El Norte, El Centro, Galisteo and Estancia) and sets out land use, open space, economic development, recreation, transportation, housing and resource conservation goals and policies to achieve the sustainable growth vision.

In general, the SGMP encourages development around existing urban areas, transportation corridors and gateway communities. Figure 4.1, the Santa Fe County sustainable land development area map, shows this graphically. This map was created based on a GIS land use model that integrates various factors (such as hydrology, habitat value and distance to municipal infrastructure) to determine the most and least suitable areas in the County for future development.

SDA-1 identifies the County's primary growth areas where higher density residential and commercial development is encouraged to take place in the near term.

SDA-2 identifies the areas of the county that are projected to grow in the next 10 to 20 years and may include lower density, suburban development and infill. Some of these areas may not currently have municipal services, but may have these services in the future.

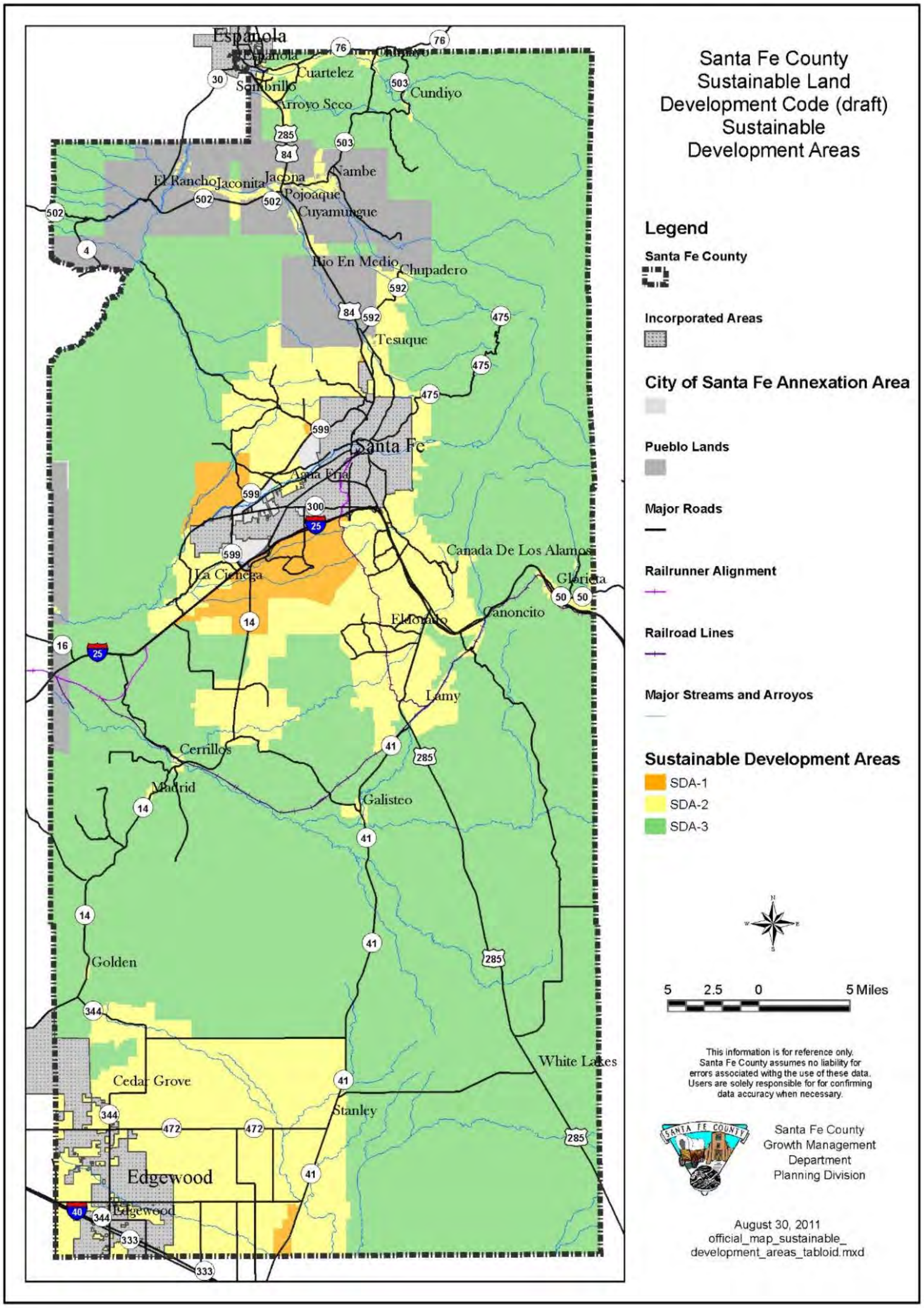
SDA-3 identifies the areas of the County where there are no plans to extend services or utilities. As such, residential and commercial development in these areas should be limited.

Hazards that should be taken into consideration when developing these areas include:

- SDA-1 - Flood, hazardous materials
- SDA-2 - Flood, drought, dam failure, wildfire, expansive soils, land subsidence, hazardous materials
- SDA-3 - Flood, dam failure, wildfire, expansive soils, land subsidence, landslide/rockfall/debris flow

[1] Santa Fe County Sustainable Growth Management Plan (SGMP) 2010, P. 15

Figure 4.1: Santa Fe County Sustainable Development Areas



amec foster wheeler

4.3 Hazard Analysis and Risk Assessment

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The hazards identified in Section 4.1, are profiled and assessed individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources. This section also includes the identified vulnerability to each of the priority hazards, describing the impact that each hazard would have on the county. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to hazards and estimates potential losses. Each hazard is assessed in the following areas:

- **Hazard/Problem Description**: A description of the hazard and associated issues; where known, this includes general information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.
- **Location:** The geographic areas within the planning area that could be affected by the hazard. The entire planning area could be uniformly affected by some hazards.
- **Extent:** The strength or magnitude of the hazard. Different hazards may have different measures of extent.
- **Previous Occurrences**: A record of historical incidents, including impacts where known. Available hazard data and historical incident worksheets were used to capture information from the HMPC on previous occurrences.

- **Probability of Future Occurrence**: The frequency of past events is used in this section to gauge the likelihood of future occurrences. Where possible, frequency was calculated based on existing data. This was determined by dividing the number of events observed by the number of years on record and multiplying by 100. This gives the percent chance of the event happening in any given year.

Vulnerability Assessment: The vulnerability of the planning area to a specific hazard is assessed through the study of potential impacts to specific sectors:

- People
- Economy
- Built Environment
- Natural Environment
- Future Development

Risk Summary: A summary of key risks, based on threat, vulnerability and consequence to the planning area from the specific hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data);
- Statewide GIS datasets to support mitigation planning;
- US Forest Service GIS datasets;
- FEMA's HAZUS-MH GIS-based inventory data
- Written descriptions of inventory and risks provided by the County;
- Online data sources (cited where applicable)
- Data and information from existing plans and studies; and
- Input from planning team members and staff from the County and local, state, and federal agencies.

4.3.1 Drought

Hazard/Problem Description

Drought is different than many of the other natural hazards in that it is not a distinct event and usually has a slow onset. Drought can severely impact a region both physically and economically. Drought affects different sectors in different ways and with varying intensities. Adequate water is the most critical issue for agricultural, manufacturing, tourism, recreation, and commercial and domestic use. As the population in the area continues to grow, so too will the demand for water.

Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multi-year period, and it is often not obvious or easy to quantify when a drought begins and ends.

Drought is a complex issue involving many factors. It occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can be defined regionally based on its effects:

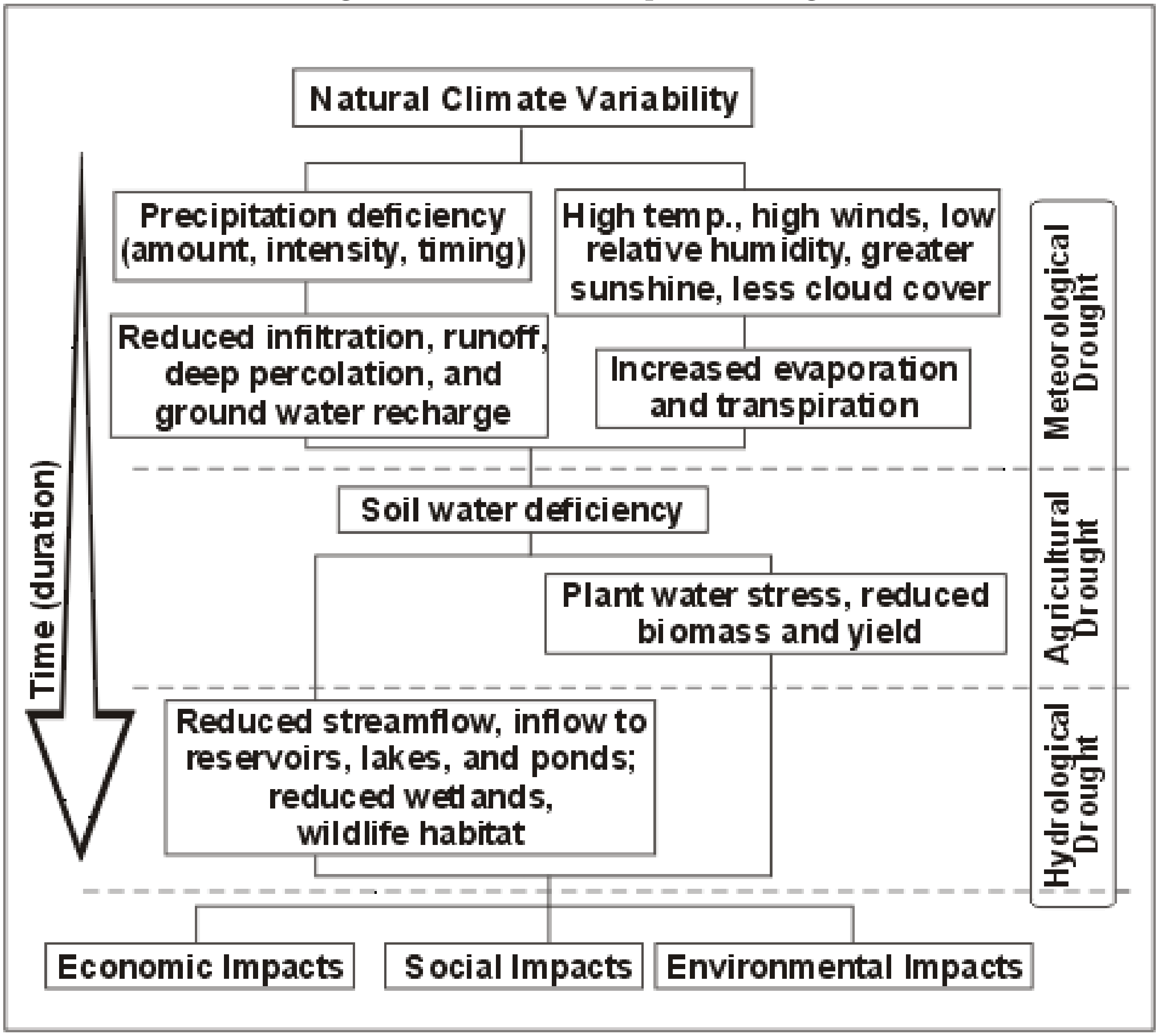
Meteorological drought - The first stage of drought is known as a meteorological drought. The conditions at this stage include any precipitation shortfall of 75% of normal for three months or longer. This criterion can be misleading if all the precipitation falls in a very short time period resulting in floods.

Agricultural drought - The second stage is known as agricultural drought. Soil moisture is deficient to the point where plants are stressed and biomass (yield) is reduced.

Hydrological drought - Defined as deficiencies in surface and subsurface water supplies. It is generally measured as streamflow, snowpack, and as lake, reservoir, and groundwater levels.

Socioeconomic drought - Occurs when a drought impacts health, well-being, and quality of life, or when a drought starts to have an adverse economic impact on a region.

Figure 4.2: Causes and Impact of Drought



Source: National Drought Mitigation Center

Location

Drought is a regional hazard, and at its worst can affect the entire state of New Mexico with varying levels of dryness and drought activity. It is safe to assume that unless the drought is at its very beginning or very end, if any area of Santa Fe County is affected by any level of drought, the other areas of the county are experiencing varying effects as well.

Extent

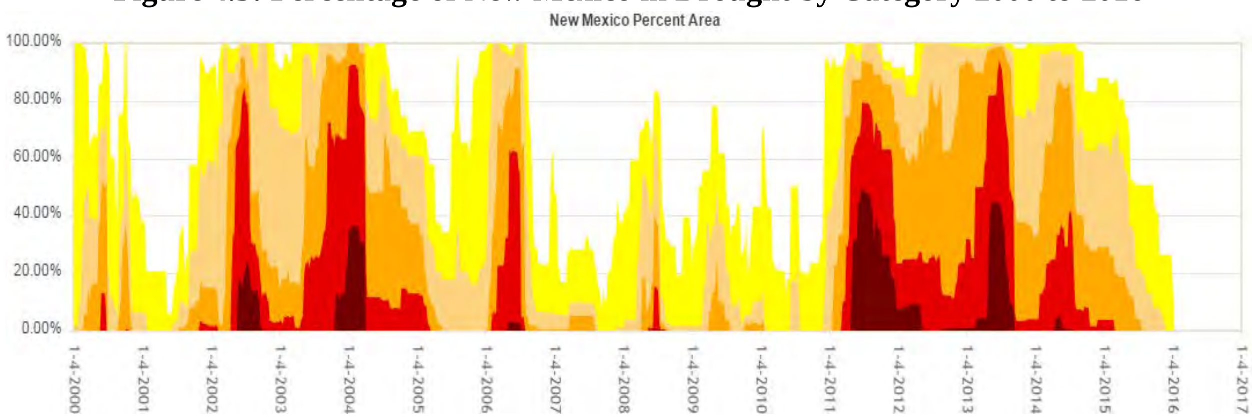
The United States Drought Monitor measures drought in five categories, from "abnormally dry" to "exceptional drought." Each condition is defined in Figure 4.4; Santa Fe County is vulnerable to all levels of drought. Droughts are subject to global climate and precipitation trends, and wet and dry periods can persist for years.

Previous Occurrences

Based on historical information, the occurrence of drought in New Mexico, including Santa Fe County, is cyclical, driven by weather patterns. Drought has occurred in the past and will occur in the future. Periods of actual drought with adverse impacts can vary in duration, and the period between droughts is often extended. Although an area may be under an extended dry period, determining when it becomes a drought is based on impacts to individual water users. The vulnerability of Santa Fe County to drought is countywide, but impacts may vary and include reduction in water supply and an increase in dry fuels.

Figure 4.3 from the National Drought Monitor shows the cyclical nature of drought conditions across the state.

Figure 4.3: Percentage of New Mexico in Drought by Category 2000 to 2016



According to this data, New Mexico has experienced 4 periods where more than 10% of the state is classified under D4 (exceptional drought) since 2000, with the most severe period taking place early 2011 and lasting until the middle of 2013.

The State of New Mexico received a federal emergency declaration for drought in 1977. The NCDC database shows only records from the drought that has persisted since 2011, though it's interesting to note that Santa Fe County had an NCDC-recorded drought event for every month between March 2011 and November 2014. The 2013 State of New Mexico Hazard Mitigation Plan noted the following for Preparedness Area 3 (Santa Fe County falls in Area 3):

In the summer of 2008, the agriculture community was in a panic as the state was dealing with the endangered silvery minnow. Farmers were faced with a low snowpack that feeds irrigation reservoirs in northern New Mexico and low rainfall with forecasted continuing dry conditions cut irrigation supplies dramatically. Compounding issues more, legal issues were being considered ordering farmers to share the river supply to save the silvery minnow. This impacts financial capabilities in the agricultural community and decreases agricultural supply.

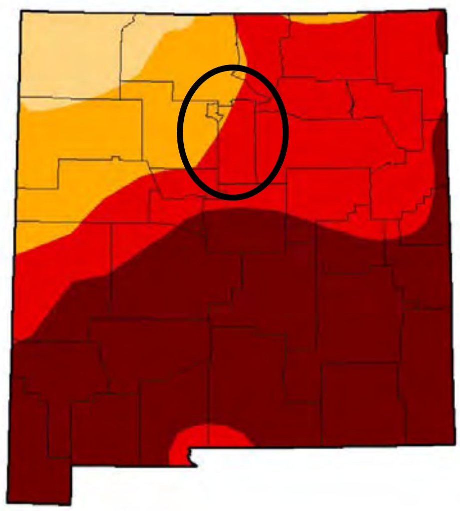
According to the New Mexico Office of the State Engineer, droughts occur on average every 10 years within the state. New Mexico experienced some of its worst drought conditions during the 1950's. The year 2000 was one of the hottest and driest on record for the state. Another severe drought year occurred two years later in 2002, followed by another multi-year drought that began in 2011 and continued into 2014.

Heavy precipitation in the spring of 2015 brought relief to the eastern half of the state. Table 4.13 shows the percentage and severity drought of conditions statewide between the most severe week of drought in New Mexico since 2000, and current drought conditions in November 2015, based on the U.S. Drought Monitor. From this comparison, it is reasonable to assume that Santa Fe County is vulnerable to any level of drought, from no drought conditions to exceptional drought conditions, as defined by the U.S. Drought Monitor.

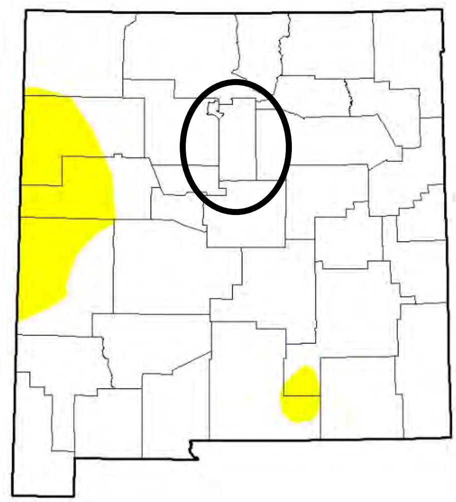
During New Mexico's worst single recorded week of drought during the 2011-2014 period, Santa Fe County was considered in Extreme Drought.

Figure 4.4: Drought History Comparison June 2011 and November 2015

June 28, 2011



January 12, 2016

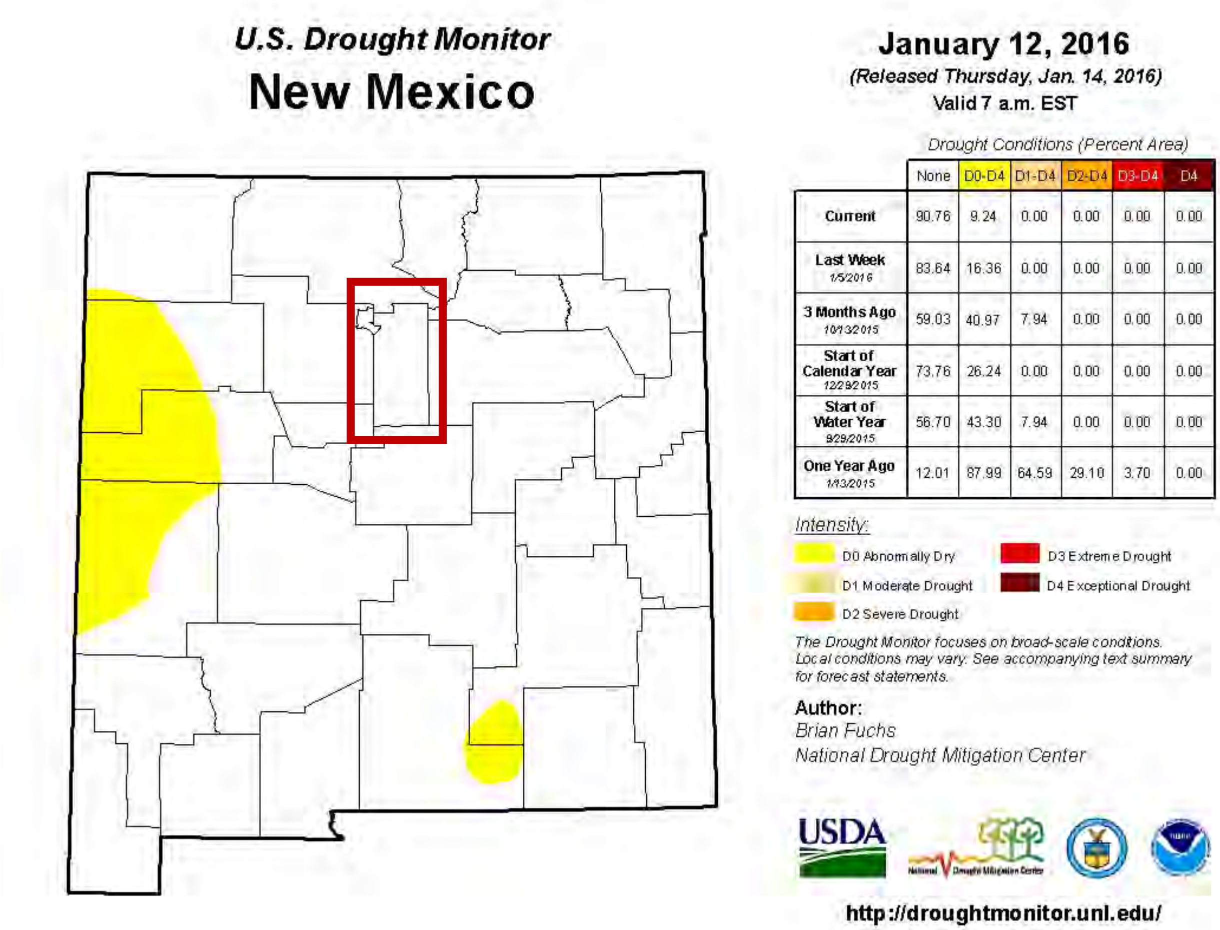


Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	Standardized Precipitation Index (SPI)
D0	Abnormally Dry	Going into drought: - Short-term dryness slowing planting, growth of crops or pastures Coming out of drought: - Some lingering water deficits - Pastures or crops not fully recovered	-1.0 to -1.9	-0.5 to -0.7
D1	Moderate Drought	- Some damage to crops, pastures - Streams, reservoirs or wells low, some water - Shortages developing or imminent - Voluntary water-use restrictions requested	-2.0 to -2.9	-0.8 to -1.2
D2	Severe Drought	- Crop or pasture losses likely - Water shortages common - Water restrictions imposed	-3.0 to -3.9	-1.3 to -1.5
D3	Extreme Drought	- Major crop/pasture losses - Widespread water shortages or restrictions	-4.0 to -4.9	-1.6 to -1.9
D4	Exceptional Drought	- Exceptional and widespread crop/pasture losses - Shortages of water in reservoirs, streams and wells creating water emergencies	-5.0 or less	-2.0 or less

Source: United States Drought Monitor

A snapshot of the drought conditions in New Mexico as of January 12, 2016 can be found in Figure 4.5.

Figure 4.5: Current Drought Status in Santa Fe County



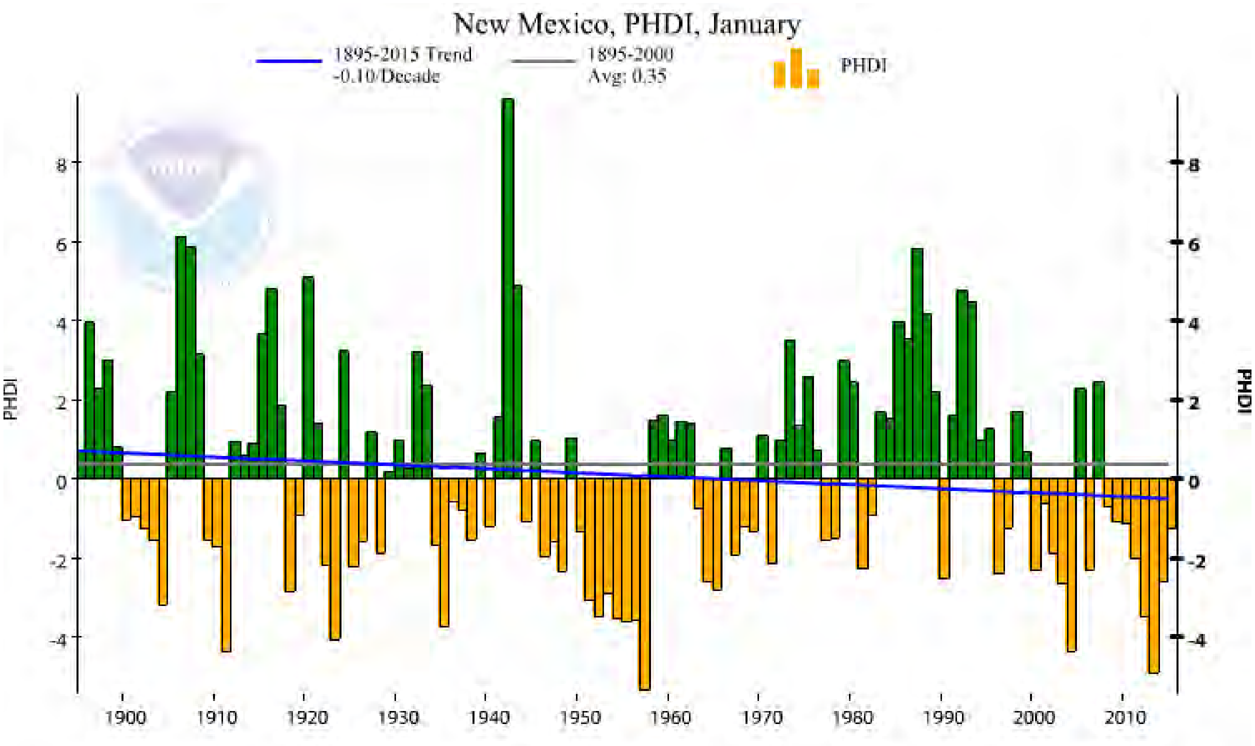
* Santa Fe County highlighted by red rectangle
Source: US Drought Monitor

As of January 12th, 2016 approximately 9.2% of the State of New Mexico qualifies as 'Abnormally Dry' (D0 or yellow) with no other drought categories being recorded. As of this same timeframe, there were no drought conditions in Santa Fe County

Probability of Future Occurrences

According to over 100 years of precipitation data from the National Climate Data Center, the State of New Mexico experiences negative Palmer Hydrological Drought Index years an average of 5 years per decade and, in some decades (like 1950 through 1960 and 2000 to 2010), negative years outnumber positive years. See Figure 4.6 below.

Figure 4.6: New Mexico PHDI 1895 to 2014



The average PHDI in New Mexico from 1895-2000 was calculated at 0.35, or slightly wetter than normal conditions (the grey trend line above). However, when adding in the years 2000 to 2015 to the average, the PHDI is shown to be decreasing at a rate of 0.1 PHDI points per decade (the blue trend line above). This indicates the possibility of dryer conditions in the future for the state. The PHDI Scale is included for reference (Figure 4.7) below.

Figure 4.7: Palmer Drought Index Scale

4.00 to 6.00	3.00 to 3.99	2.00 to 2.99	1.00 to 1.99	0.50 to 0.99
Extremely wet	**Very wet**	**Moderately wet**	**Slightly wet**	**Incipient wet spell**
0.49 to -0.49				
Near normal				
-0.50 to -0.99	-1.00 to 1.99	-2.00 to -2.99	-3.00 to 3.99	-4.00 to -6.00
Incipient dry spell	Mild drought	Moderate drought	Severe drought	Extreme drought

Vulnerability Assessment

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. The most significant impacts associated with drought in the Planning Area are those related to water intensive activities such as agriculture, wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Also, during a drought, allocations go down, which results in reduced water availability. Voluntary conservation measures are typically implemented during extended droughts. A reduction of electric power generation and water quality deterioration are also potential problems. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding. Drought in the United States is monitored by the National Integrated Drought Information System (NIDIS); a major component of this portal is the U.S. Drought Monitor. The Drought Monitor concept was developed jointly by the NOAA's Climate Prediction Center, the NDMC, and the USDA's Joint Agricultural Weather Facility in the late 1990s as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state, and academic scientists who are intimately familiar with the conditions in their respective regions.

According to the NDMC Drought Impact Reporter, Santa Fe County recorded a total of 323 impacts to drought in the survey period between 11/18/2000 and 12/18/2015. Of these, the majority (135) of the impacts were associated with agriculture, which is typical as this industry is generally used as a proxy for drought impacts. See Table 4.13.

Table 4.13: Santa Fe County Drought Impacts 12/18/2000 through 12/18/2015

Category	Number of Recorded Impacts*
Agriculture	135
Business and Industry	20
Energy	4
Fire	71
Plants & Wildlife	52
Relief, Response, and Restrictions	109
Society and Public Health	73
Tourism and recreation	9
Water Supply and Quality	66
Total	**323**

*Impacts may overlap across sectors
Source: National Drought Mitigation Center

Using the NDMC Drought Impact Reporter impacts to determine relative exposure/vulnerability to drought has limitations because the methodology can double-count impacts that are recorded at the state level, then counted again for each county within that state. Rather, the NDMC data should be used to develop an ongoing record of drought impacts to sector assets that relate the specific impacts to different intensity and duration droughts at a location. Over time a detailed impact profile could be developed for vulnerable sectors so that the impact of future drought vulnerability could be better defined based on historic impacts[2].

People

The most significant qualitative impacts associated with drought in the Planning Area are those related to water intensive activities such as wildfire protection, municipal usage, commerce, tourism, recreation, and wildlife preservation. Mandatory conservation measures are typically implemented during extended droughts, which can affect people.

Drought may cause health problems related to low water flows and poor water quality; it may also cause health problems due to dust. Generally, drought may require conservation of water resources, which could mean that water use is restricted to critical uses; this could impact how people use water on a daily basis.

Economy

Drought could have a devastating impact on Santa Fe County's economy. As water resources become impacted, effects may be felt by any industry that uses large amounts of water, including agriculture and manufacturing. Prolonged drought would intensify these issues.

Agricultural data is generally used as a way to measure the negative economic impacts due to drought, however this model has limitations because it does not take into account the potential dollar losses caused by wildfires due to drought or losses in tourism revenue. In addition, there are limitations in determining agricultural losses. Factors to be considered are:

- USDA Agricultural Survey Statistics rely entirely on the willingness and availability of producers within a county to respond to quarterly surveys. Participation can be unreliable.
- Federal crop disaster declarations are most often multi-county, multi-hazard declarations, covering a variety of events in any given year (i.e., grasshoppers, hail, drought, etc.) thus these agencies cannot provide drought-attributed losses directly to each county.
- Policies have changed drastically regarding requirements by the USDA. Producers are now required to carry some level of crop disaster coverage in order to be eligible for future federal disaster dollars.

The following analysis illustrates the relationship between agricultural production (both livestock

[2] Drought Reporter at the University of Nebraska Lincoln http://droughtreporter.unl.edu/

and crop) and drought conditions by benchmarking non-drought agricultural output to drought condition crop output. All data for used for this analysis is from http://quickstats.nass.usda.gov and the U.S. Agricultural Census.

Crops

Crop sales (mostly corn) account for the largest proportion of Santa Fe County's agricultural base. In the last agricultural census (2012) the county produced $9.597M in total crop sales.

Years for which data are available in Santa Fe County for this crops are: 1997, 2002, 2007 and 2012.

If total sales for positive PHDI years are averaged and compared against total sales for negative PHDI years, an estimate of the reduction of output due to drought for this commodity can be ascertained. Data for this analysis are provided below in Table 4.14.

Table 4.14: Crop Sales Output Santa Fe County

Year	PHDI Index	PHDI Indicator	Real Production Output	Adjusted Production Output (2015 Dollars)
2012	-4.73	Extreme Drought	$9,597,000	$9,907,280.00
2007	1.07	Slightly Wet	$8,591,000	$9,820,552.00
2002	-3.20	Severe Drought	$8,727,000	$11,497,761.00
1997	0.91	Incipient Wet Spell	$8,507,000	$12,562,639.00

Source: US Census of Agriculture

The average sales for 1997 and 2007 (non-drought years) equals $11.19M whereas the average sales for 2002 and 2012 equal $10.702M, representing a reduction in output of 4.3%.

Cattle and Calves

Cattle ranching is the biggest livestock commodity contributing to Santa Fe County's agricultural base. In the last agricultural census (2007) the county produced $3.9M in sales for this product.

Years for which data are available in Santa Fe County for this commodity are 1997, 2002, 2007 and 2012. If total sales for positive PHDI years are averaged and compared against total sales for negative PHDI years, an estimate of the reduction of output due to drought for this commodity can be ascertained. Data for this analysis are provided below in Table 4.15.

Table 4.15: Cattle and Calf Output Santa Fe County

Year	PHDI Index	PHDI Indicator	Real Production Output	Adjusted Production Output (2015 Dollars)
2012	-4.73	Extreme Drought	$3,179,000	$3,286,197.13
2007	1.07	Slightly Wet	$4,023,000	$4,604,965.36
2002	-3.20	Severe Drought	$3,056,000	$4,031,677.69
1997	0.91	Incipient Wet Spell	$6,289,000	$9,299,726.50

Source: US Census of Agriculture

The average sales for 1997 and 2007 (non-drought years) equals $6.9M whereas the average sales for 2002 and 2012 equal $3.6M, representing a reduction in output of 47.3%.

As mentioned previously, there are limitations when using agricultural production as a proxy to measure impacts due to drought, however the data illustrate a strong relationship between the two and the County should be aware of the potential losses in this sector.

Crop sales account for the majority of agricultural output in the County. Data from the last two agricultural census (2007 and 2012) indicate that crop sales account for 71% of the total agricultural output, whereas total livestock sales account for the remaining 28.5%.

Recreation and tourism can also be negatively impacted by drought or drought-enhanced wildfires. Potential impacts include reduced snow for skiing and restrictions on water based recreation. During the second HMPC meeting, the HMPC discussed the impact of drought on recreation and tourism. While the group agreed that drought does have an impact, they don't have any hard data quantifying those impacts.

Built Environment

Direct structural damage from drought is rare, though it can happen. Drought can affect soil shrinking and swelling cycles, and can result in cracked foundations and infrastructure damage.

Impacts to Critical Infrastructure

Because of their long-lasting nature, the biggest impact of drought is on the water supply. Because of this, critical facilities that rely on a steady supply of water could see the greatest impacts if a long-term drought occurred. Examples of these facilities include power plants and hospital and medical facilities. Drought can also directly impact water storage, treatment and distribution systems.

Natural Environment

Severe, prolonged drought can impact the natural environment. Wildlife and natural habitats can be affected, including the shrinkage of habitat, dwindling of food supplies and the migration of wildlife to more palatable areas. Prolonged drought can cause poor soil quality, loss of wetlands, and increased soil erosion. One of the prevailing impacts of drought to the natural environment is the increased risk of wildfires that burn larger and more intensely during dry conditions. Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

Future Development

The Santa Fe County Sustainable Growth Management Plan cites the 40 Year Water Development Plan (2002) which is a long-range planning document whose primary purpose is to assess future water needs in relationship to the supply of water rights owned by the County and the County administered water utility. Santa Fe County has either purchased or contracted to purchase water rights for use in the Santa Fe County Water Utility and the Pojoaque Valley Regional Water System. Santa Fe County's portfolio of water rights includes San Juan Chama Project Water, declared Rio Grande Surface Water, adjudicated and permitted Rio Grande Basin Groundwater, adjudicated La Cienega and Santa Cruz Surface Water and several domestic wells. As of the publication of this Plan, the water service area (WSA) of the utility included the areas within the SDA-1 region with possible limited expansion into the SDA-2 region in the future[3].

Areas where water supplies are not managed by a public utility are sometimes managed by an *acequia* association, which are generally community based. Acequias are gravity chutes, similar in concept to flumes, and are used to convey water for irrigation or domestic uses. Some acequias are constructed of piping or concrete ditches, the majority, however, are simple open ditches with dirt banks. Many areas of Santa Fe County are receive their water under an acequia association regime like the Río Pojoaque Acequia and Water Well Association which services areas of the communities in the City of Santa Fe, La Cienega and La Bajada. The US Department of the Interior, Bureau of Reclamation is preparing an Environmental Impact Statement (EIS) for the proposed design and construction of the Pojoaque Basin Regional Water System (RWS) which is related to the Aamodt Litigation Settlement Act. The proposed system would serve the Pueblos of Nambé, Pojoaque, San Ildefonso, and Tesuque, and county residents within the Pojoaque Basin using a system of pipes and pumps from the Rio Grande.

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[3] Santa Fe County Sustainable Growth Management Plan (SGMP) 2010

Risk Summary

- Drought has a cyclical occurrence in Santa Fe County and typically every decade has multiple years of drought;
- Drought has had significant impacts on the agricultural economy in the County. Total crop sales were down an average of 4.3% in drought years (representing a loss of $488,000 adjusted 2015 dollars) whereas livestock sales (cattle and calves) were also down an average of 47.3% in drought years (representing a loss of $3.3M in adjusted 2015 dollars).
- The recreation and tourism industry is also vulnerable to drought induced snowpack shortages, water-based recreation, and forest closures due to wildfires or elevated wildfire risk;
- Santa Fe County received a disaster declaration for drought in 1977.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Likely	Limited	Medium

4.3.2 Earthquake

Hazard/Problem Description

An earthquake is caused by a sudden slip on a fault. Stresses in the earth's outer layer push the sides of the fault together. Stress builds up, and the rocks slip suddenly, releasing energy in waves that travel through the earth's crust and cause the shaking that is felt during an earthquake.

The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties typically result from falling objects and debris, or from forces that damage or demolish buildings and other structures. Disruption of communications, electrical power supplies, and gas, sewer, and water lines should be expected in a large earthquake. Earthquakes can trigger widespread fires, dam failures, landslides, or releases of hazardous material, compounding their hazards.

Faults

A fault is defined as "a fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another." For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting that future displacement may be expected. Inactive faults show no evidence of movement in recent geologic time, suggesting that these faults are dormant.

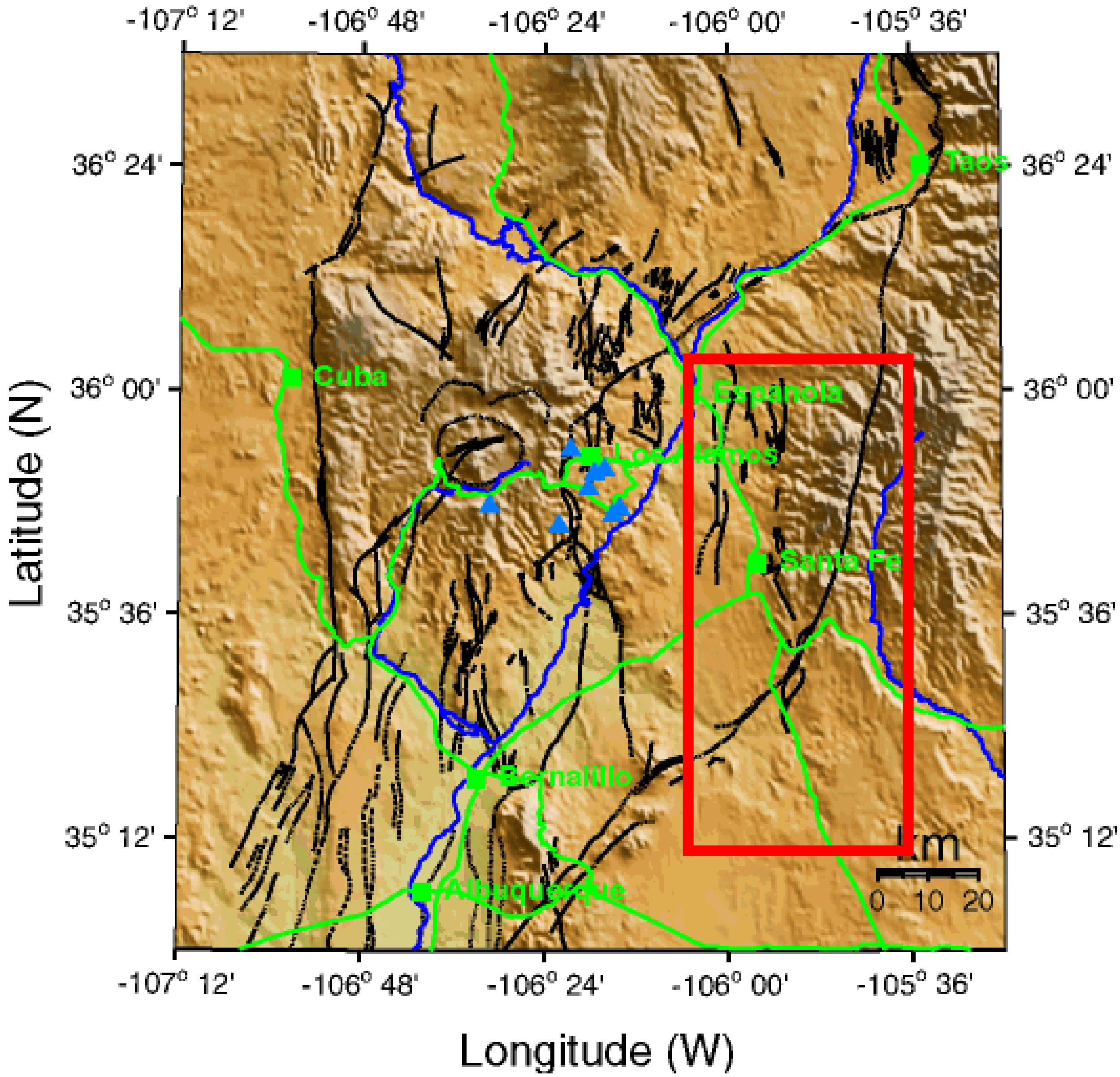
Two types of fault movement represent possible hazards to structures in the immediate vicinity of the fault: fault creep and sudden fault displacement. Fault creep, a slow movement of one side of a fault relative to the other, can cause cracking and buckling of sidewalks and foundations even without perceptible ground shaking. Sudden fault displacement occurs during an earthquake event and may result in the collapse of buildings or other structures that are found along the fault zone when fault displacement exceeds an inch or two. The only protection against damage caused directly by fault displacement is to prohibit construction in the fault zone.

Location

Santa Fe County lies near several major boundary faults of the Rio Grande Rift in north central New Mexico. The margin of the Rio Grande Rift in Santa Fe County area is locally defined by the Pajarito fault system. The Pajarito Fault extends some 50 kilometers, oriented north-south from near Bland Canyon nearly to Santa Clara Canyon. Two other faults in the area include the Guaje Mountain Fault and the Rendija Canyon that transect the plateau. Data from the Los Alamos National Labs (LANL) suggests that a magnitude 7.0 earthquake occurred along the Guaje Mountain Fault between 4,000 and 6,000 years ago. A quake of similar magnitude apparently occurred on the Rendija Canyon Fault either 8,000 or 22,000 years ago (a discrepancy due to different age results of two different materials: charcoal deposits, which yielded the more recent date, and soil.) The magnitude of the earthquakes along the Guaje Mountain Fault and Rendija Canyon Fault were based on documented displacements of one and a half to two meters. However, according to researchers at LANL, this information is being updated. There is new evidence of three surface rupturing earthquakes suspected to be caused by magnitude 6.0 or larger; probably closer to magnitude 7.0, in the last 10,000 years. The most recent of these earthquakes was about 2,000 years ago.

Figure 4.8 shows the fault areas in or near the County. The red rectangle approximates the area of the County.

Figure 4.8: Faults in or Near Santa Fe County

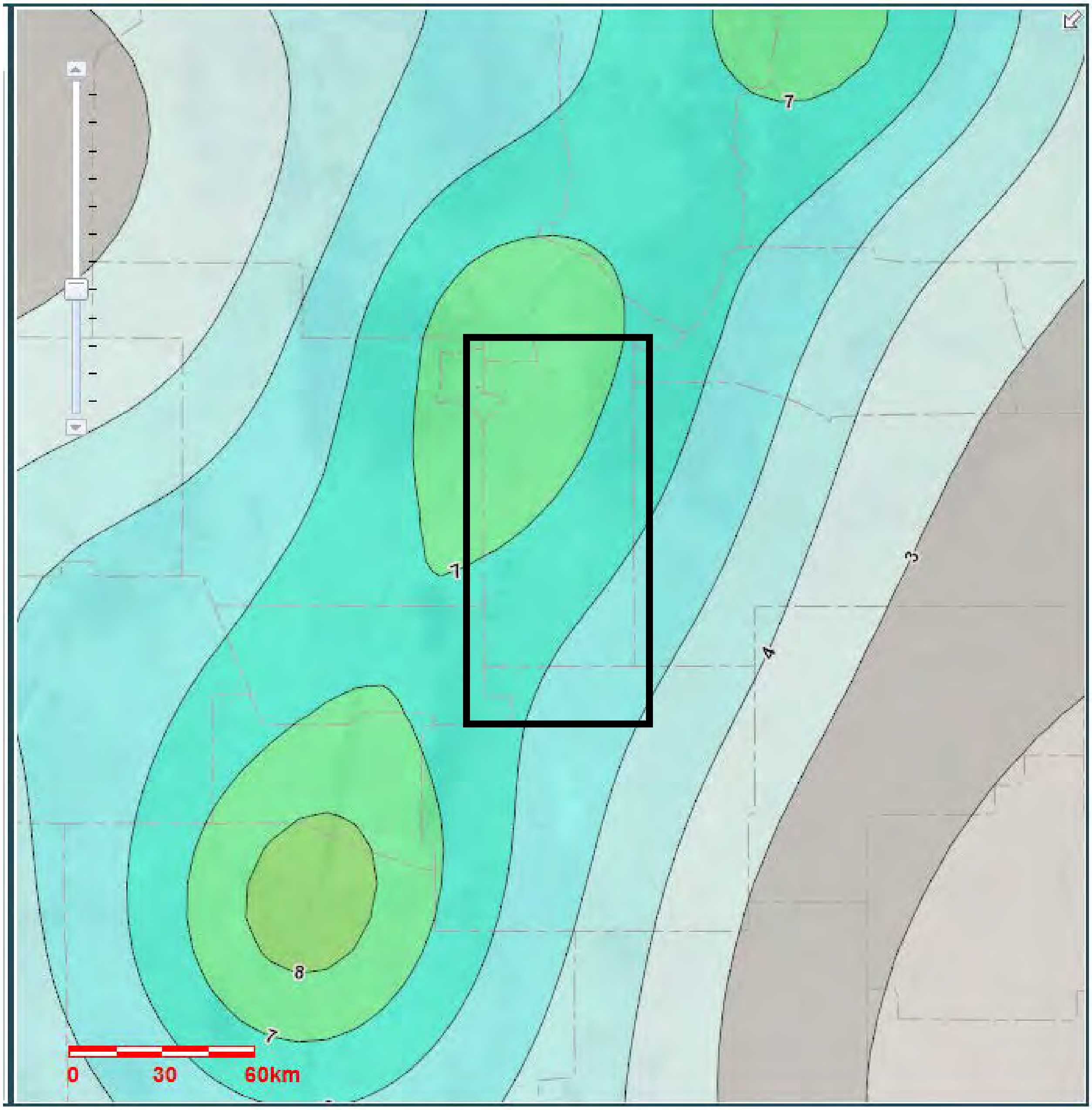


*Santa Fe County noted by red rectangle
Source: Los Alamos Seismic Network

Ground Shaking

The U.S. Geological Survey (USGS) issues National Seismic Hazard Maps as reports every few years. These maps provide various acceleration and probabilities for time periods. Figure 4.9 depicts the peak horizontal acceleration (%g) with 10% probability of exceedance in 50 years for the planning region. The figure demonstrates that the County falls in the 5 to 7%g area. This data indicates that the expected severity of the more frequent earthquakes in the region is somewhat limited.

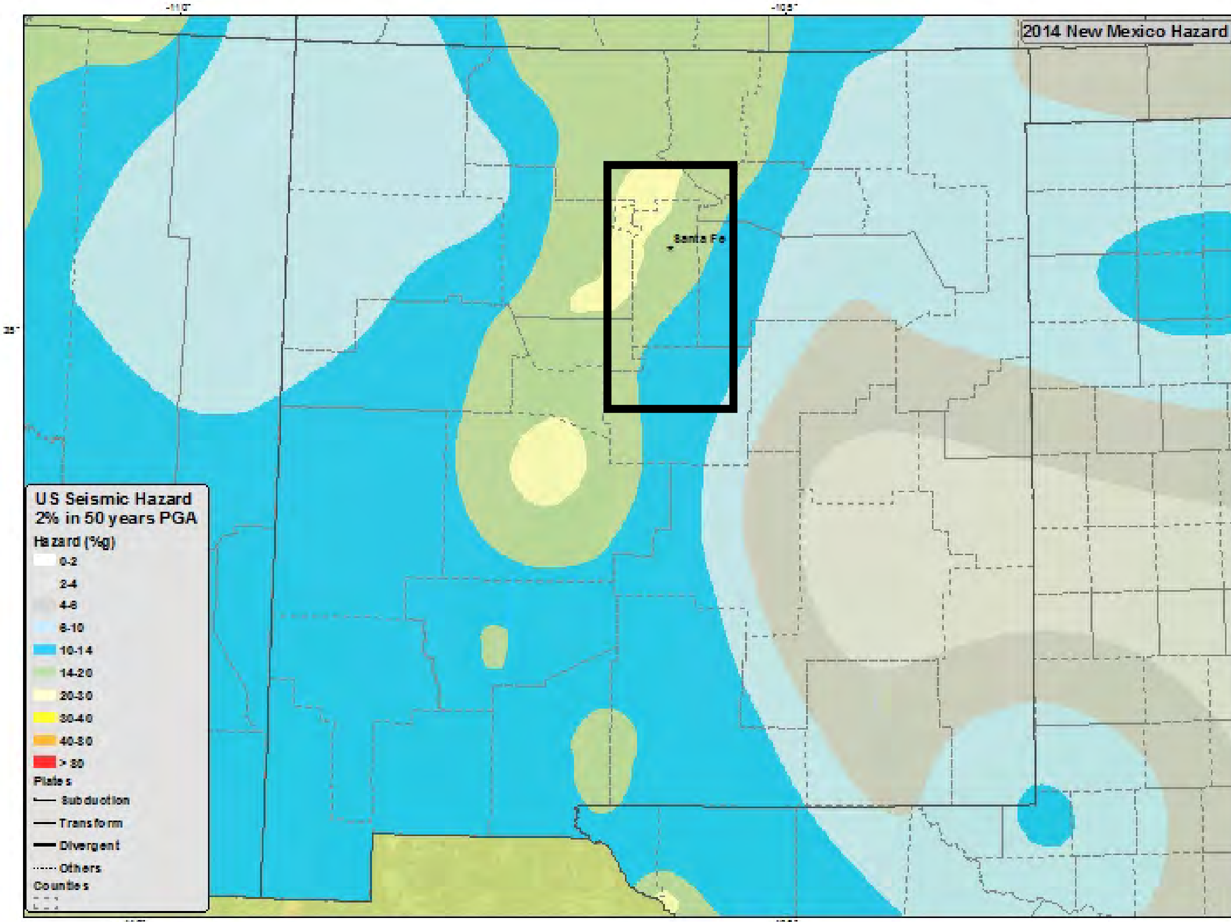
Figure 4.9: Peak Horizontal Acceleration with 10% Probability of Occurrence in 50 Years



*Santa Fe County highlighted by black rectangle
Source: USGS National Seismic Hazard Maps - 2008 Interactive Tool. Available online at http://gldims.cr.usgs.gov/nshmp2008/viewer.htm

Figure 4.10 depicts the peak horizontal acceleration (%g) with 2% probability of exceedance in 50 years for the County. The figure demonstrates that most of the County falls in the 14-20%g area, with areas in the northwestern County in the 20-30%g range. This data indicates that the expected severity of less frequent earthquakes in the region could be potentially damaging.

Figure 4.10: Peak Horizontal Acceleration with 2% Probability of Occurrence in 50 Years



*Santa Fe County highlighted by black rectangle
Source: USGS National Seismic Hazard Maps

Liquefaction

Liquefaction is a process whereby certain soils behave similar to quicksand during intense and prolonged ground shaking. Liquefaction occurs in saturated sandy and silty soils, that is, soils in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influence how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with each other. When liquefaction occurs, the strength of the soil decreases and the ability of soil to support foundations for buildings is reduced. Typically liquefaction occurs in alluvial soils along rivers and wetland areas. There were no available maps of liquefaction hazards; the likely areas prone to liquefaction would be limited within the County based on the geology of the region, and likely concentrated along floodplains.

Extent

The amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. Seismologists have developed several magnitude scales; one of the first was the Richter Scale, developed in 1932 by the late Dr. Charles F. Richter of the California Institute of Technology. The Richter Magnitude Scale (shown in Table 4.16) is used to quantify the magnitude or strength of the seismic energy released by an earthquake.

Table 4.16: Richter Scale

Magnitude	Mercalli Intensity	Effects	Frequency
Less than 2.0	I	Microearthquakes, not felt or rarely felt; recorded by seismographs.	Continual
2.0-2.9	I	Felt slightly by some people; damages to buildings.	Over 1M per year
3.0-3.9	II to III	Often felt by people; rarely causes damage; shaking of indoor objects noticeable.	Over 100,000 per year
4.0-4.9	IV to V	Noticeable shaking of indoor objects and rattling noises; felt by most people in the affected area; slightly felt outside; generally no to minimal damage.	10K to 15K per year
5.0-5.9	VI to VII	Can cause damage of varying severity to poorly constructed buildings; at most, none to slight damage to all other buildings. Felt by everyone.	1K to 1,500 per year
6.0-6.9	VII to IX	Damage to a moderate number of well-built structures in populated areas; earthquake-resistant structures survive with slight to moderate damage; poorly designed structures receive moderate to severe damage; felt in wider areas; up to hundreds of miles/kilometers from the epicenter; strong to violent shaking in epicentral area.	100 to 150 per year
7.0-7.9	VIII or higher	Causes damage to most buildings, some to partially or completely collapse or receive severe damage; well-designed structures are likely to receive damage; felt across great distances with major damage mostly limited to 250 km from epicenter.	10 to 20 per year
8.0-8.9	VIII or higher	Major damage to buildings, structures likely to be destroyed; will cause moderate to heavy damage to sturdy or earthquake-resistant buildings; damaging in large areas; felt in extremely large regions.	One per year

9.0 and Greater	VIII or higher	At or near total destruction - severe damage or collapse to all buildings; heavy damage and shaking extends to distant locations; permanent changes in ground topography.	One per 10-50 years

Another measure of earthquake severity is Intensity (Table 4.17). Intensity is an expression of the amount of shaking at any given location on the ground surface based on felt or observed effects. Seismic shaking is typically the greatest cause of losses to structures during earthquakes. Intensity is measured with the Modified Mercalli Intensity Scale.

Table 4.17: Modified Mercalli Intensity (MMI) Scale

MMI	Felt Intensity
I	Not felt except by a very few people under special conditions. Detected mostly by instruments.
II	Felt by a few people, especially those on upper floors of buildings. Suspended objects may swing.
III	Felt noticeably indoors. Standing automobiles may rock slightly.
IV	Felt by many people indoors; by a few outdoors. At night, some people are awakened. Dishes, windows, and doors rattle.
V	Felt by nearly everyone. Many people are awakened. Some dishes and windows are broken. Unstable objects are overturned.
VI	Felt by everyone. Many people become frightened and run outdoors. Some heavy furniture is moved. Some plaster falls.
VII	Most people are alarmed and run outside. Damage is negligible in buildings of good construction, considerable in buildings of poor construction.
VIII	Damage is slight in specially designed structures, considerable in ordinary buildings, and great in poorly built structures. Heavy furniture is overturned.
IX	Damage is considerable in specially designed buildings. Buildings shift from their foundations and partly collapse. Underground pipes are broken.
X	Some well-built wooden structures are destroyed. Most masonry structures are destroyed. The ground is badly cracked. Considerable landslides occur on steep slopes.
XI	Few, if any, masonry structures remain standing. Rails are bent. Broad fissures appear in the ground.
XII	Virtually total destruction. Waves are seen on the ground surface. Objects are thrown in the air.

Source: Multi-Hazard Identification and Risk Assessment, FEMA 1997

The highest extent earthquake that impacted Santa Fe County was estimated as MM Intensity VII-VIII, in 1918. While this provides a real-world example of the potential impacts an earthquake could have on Santa Fe County, the county is potentially susceptible to earthquakes of greater Intensity.

Previous Occurrences

Most of New Mexico's historical seismicity has been concentrated in the Rio Grande Valley between Socorro and Albuquerque. About half of the earthquakes of Modified Mercalli (MM) intensity VI or greater that occurred in the State between 1868 and 1973 were centered in this region.

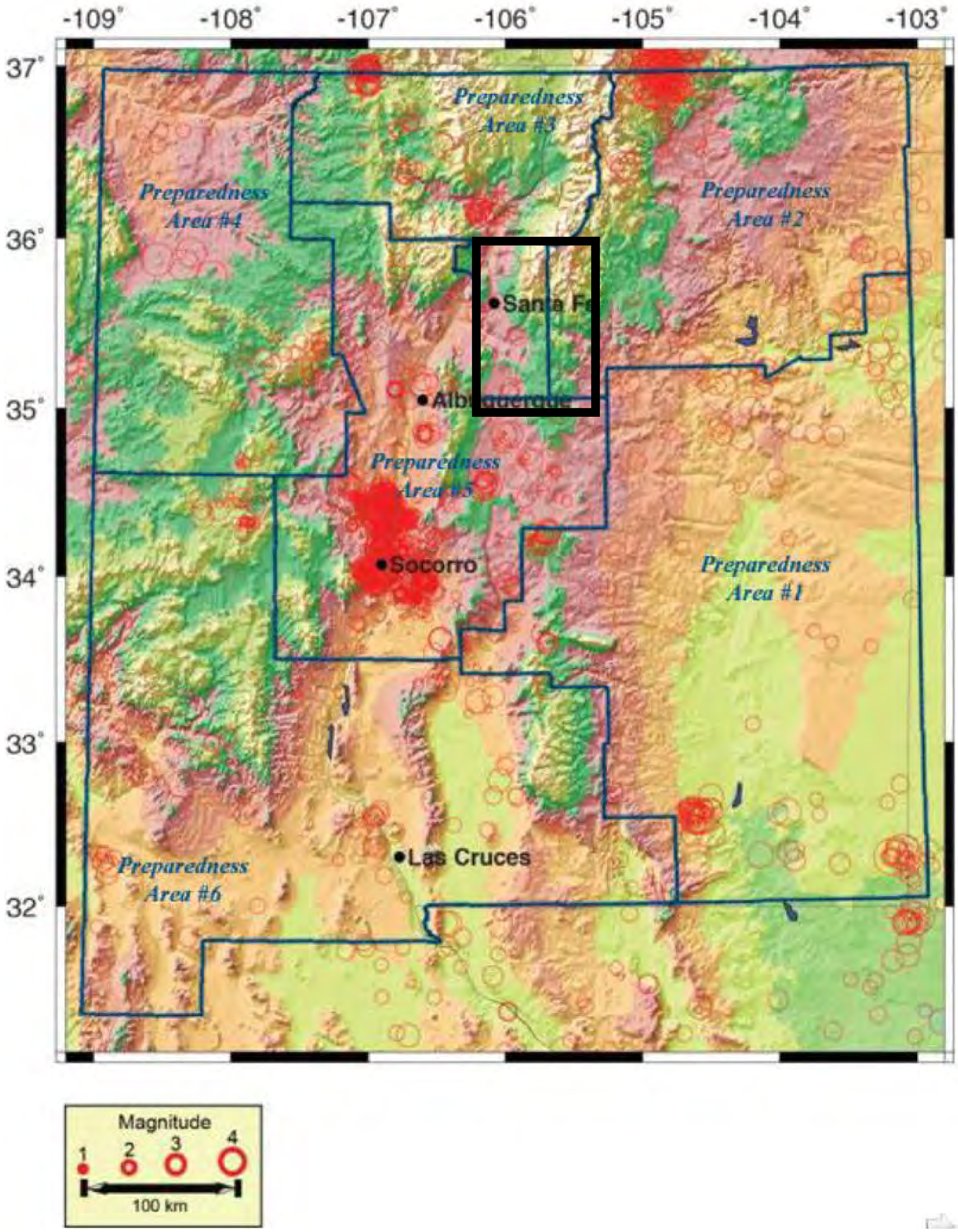
This earliest documented M 6.0+ earthquake in New Mexico was in the Socorro area, in 1906; it was estimated as a MM Intensity VII. Four rebuilt chimneys were shaken off the Socorro County Courthouse, and two others were cracked severely. Plaster fell at the courthouse, and a cornice on the northwest corner of the two-story adobe Masonic Temple was thrown onto its first floor. Several bricks fell from the front gable on one house. Plaster was shaken from walls in Santa Fe, about 200 kilometers from the epicenter. The earthquake was felt over most of New Mexico and in parts of Arizona and Texas.

According to historical records of the U.S. Geological Survey, an earthquake with strong local effects was reported in 1918 in Santa Fe County, where people in the village of Cerrillos were thrown off their feet and fallen plaster was reported (intensity VII - VIII). On October 17th, 2011, a 3.5 magnitude earthquake occurred between Santa Fe and Espanola, with an epicenter east of Interstate 25.

The Los Alamos Seismic Network (LASN)—The Los Alamos Seismic Network is located in north-central New Mexico, approximately 50 miles west of Santa Fe. This network has been operated by Los Alamos National Laboratory since September, 1973. For the first 10-15 years (to 1985), stations were located throughout Northern New Mexico. It now has a more limited geographic extent, but is continually being upgraded and expanded.

Figure 4.11 is from the 2013 New Mexico State Hazard Mitigation Plan and shows a broad picture of earthquakes in both the Planning Area and the State.

Figure 4.11: Earthquakes in New Mexico 1962-2012

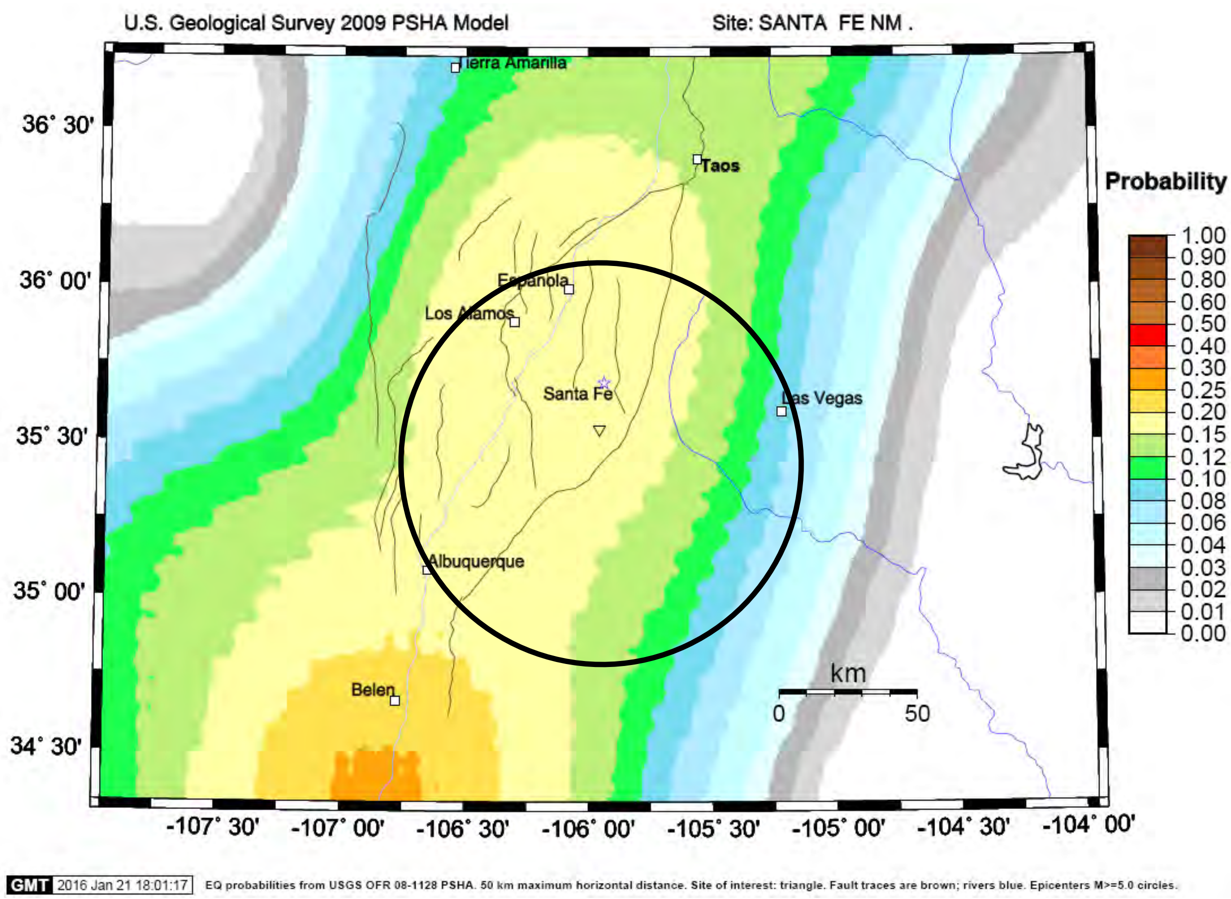


*Santa Fe County highlighted by black rectangle
Source: 2013 New Mexico State Hazard Mitigation Plan

Probability of Future Occurrences

Occasional – No major earthquakes have been recorded within the County; although the County has felt ground shaking from earthquakes with epicenters located elsewhere. In 2009, the United States Geological Survey (USGS) released probability maps that are computed from the source model of the 2008 USGS-National Seismic Hazard Mapping Project (NSHMP) update. The low rate of historic seismicity in New Mexico does not reflect the earthquake potential for the state or Santa Fe County. LANL, located in nearby Los Alamos County, has prepared seismic hazard assessments for the purposes of critical and lifeline facility risk assessments. Based on these studies the seismic hazard for the region including Santa Fe County is significantly higher than what is presented in the USGS National Map. The USGS map is shown in Figure 4.12 and indicates that northern Santa Fe County has a 0.15-0.2 annual chance of earthquakes of at least a magnitude 5.0 occurrence; risk diminishes further south in the county.

Figure 4.12: Probability of M>5.0 Earthquake Magnitudes Occurring in 30 Year Time Frame and 50 km



*Santa Fe County surrounded by black oval
Source: United States Geological Survey 2009 Earthquake Probability Mapping

Vulnerability Assessment

FEMA's Hazus software provides an excellent system for determining vulnerability of specific areas to earthquakes. Hazus is a regional earthquake loss estimation model that was developed by FEMA and the National Institute of Building Sciences. The primary purpose is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

For the purposes of this hazard, a hypothetical 2,500 year, 7 magnitude earthquake event was used. The study area was the unincorporated census tracts in Santa Fe County. The geographical size of the region is 1,869 square miles, and it contains 23 census tracts. A second analysis that is inclusive of the entire county including the City of Santa Fe was also completed and in some areas below the expanded damages and impacts are noted.

People

According to the study, there are over 26,000 households in the region, with a total population of 64,285 people (based on 2010 Census Bureau data). Casualty estimates are provided for three times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum, and 5:00 PM represents peak commute time.

Table 4.18: HAZUS-MH Earthquake Loss Estimation Scenario Results - People

Type of Impact	Impacts to County
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 46 Requiring hospitalization: 7 Life threatening: 1 Fatalities: 2
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 91 Requiring hospitalization: 17 Life threatening: 2 Fatalities: 4
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 72 Requiring hospitalization: 15 Life threatening: 5 Fatalities: 3
Displaced Households	110
Shelter Requirements	71 (of 64,285 total population)

Source: HAZUS-MH

Hazus estimates that 71 people in the studied area will seek temporary shelter in public shelters following the earthquake. The inclusion of the City of Santa Fe increases the number this number to 341, with 539 displaced households.

Economy

Hazus estimated economic loss for the studied area, including long-term economic impacts to the region for 15 years after the earthquake. The total economic loss estimated for the modeled earthquake is approximately $418 million, which includes building and lifeline losses based on the region's available inventory. Inclusive of the City of Santa Fe the total loss is $973 million.

The model quantifies this information in terms of income and employment changes within the region. Economic loss based on infrastructure impacts include $6.7 million in economic loss based on transportation system impacts and $53.44 million in economic loss based on utility system impacts.

Built Environment

According to Hazus data, there are an estimated 31 thousand buildings in the region, with a total building replacement value (excluding contents) of $7.45 billion. Approximately 95% of the buildings (and 90% of the building value) are associated with residential housing.

Hazus estimates that about 6,118 buildings will be at least moderately damaged. This is over 19% of the buildings in the region. There are an estimated 122 buildings that will be damaged beyond repair. The total building-related losses were $357.94 million; 15 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 81 % of the total loss. Including the City of Santa Fe, the total number of buildings at least moderately damaged is 12,827.

The replacement value of the transportation and utility lifeline systems is estimated to be $3.4 billion and $395 million, respectively. The total value of the lifeline inventory is over $3.8 billion; the inventory includes over 304 miles of highways, 109 bridges, and 3,843 miles of pipeline. All transportation systems were projected to see damage in locations and segments, but were expected to return to 50% or higher functionality on Day 1 after the earthquake.

The scenario also identified damages to essential facilities, defined as hospitals, schools, emergency operations centers, police stations and fire stations; the unincorporated area of Santa Fe County does not have a hospital. All facilities were projected to return to 50% or higher functionality on Day 1 after the earthquake.

Hazus estimates the amount of debris that will be generated by the earthquake. It estimates a total of 150,000 tons of debris, of which 33% is brick or wood, and the remainder being reinforced concrete and steel. The model estimates 5,800 truckloads (at 25 tons/truck) to remove the debris generated by the earthquake.

The HMPC noted their concerns about the risks to the high hazard dams in the northern part of the county from a large earthquake.

Critical Infrastructure. The Hazus model also estimates the damage to critical facilities. Table 4.19 shows the potential numbers of impacted facilities, along with rates of functionality after the incident. The data shows that all facilities would return with at least 50% of functionality within one day of the incident.

Table 4.19: HAZUS-MH Earthquake Loss Estimation Scenario Results – Critical Infrastructure

Classification	Total	Number of Facilities		
		At Least Moderate Damage > 50%	Complete Damage >50%	With Functionality > 50% on Day 1
Hospitals	0	0	0	0
Schools	20	0	0	19
EOCs	1	0	0	1
Police Stations	3	0	0	3
Fire Stations	9	0	0	9

In 2012, New Mexico Tech conducted a project related to the Seismic Preparedness of New Mexico. The Federal Emergency Management Agency's (FEMA) Rapid Visual Screening (RVS) Method was used as the primary method to assess the seismic vulnerability of essential structures in eight counties, including Santa Fe County. Structures thought to be seismically hazardous are identified and prioritized. The assessment included 10 facilities in the County including 6 fire stations, 2 hospitals, one law enforcement, and an EOC. The report concluded that all but one structure that requires additional attention to reduce earthquake losses and that additional attention from a structural specialist might be warranted.

Natural Environment

Generally, hazard specific impacts to the natural environment from an earthquake would be quickly absorbed by the surrounding area. An earthquake could cause cascading effects, including dam failure or rockslide that would impact the natural environment in different ways, depending on the scope of the cascading hazard. Other types of ground deformation could result.

Future Development

Building codes substantially reduce the costs of damage to future structures from earthquakes. Future facilities should be built to account for potential earth shaking and earthquake impacts.

Risk Summary

- Earthquakes in New Mexico are infrequent, but the potential for an M 6 to 7 earthquake exists along faults associated with the Rio Grande Rift Zone. The northwestern portion of the County has the potential for the highest ground shaking levels, also in an area where the most high hazard dams exist;
- According to the HAZUS loss estimation model earthquake losses could total $418M for the unincorporated county. Hazus estimates that about 12,827 buildings will be at least moderately damaged. This is over 19% of the buildings in the region. There are an estimated 122 buildings that will be damaged beyond repair.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Occasional	Critical	Medium

4.3.3 Expansive Soils

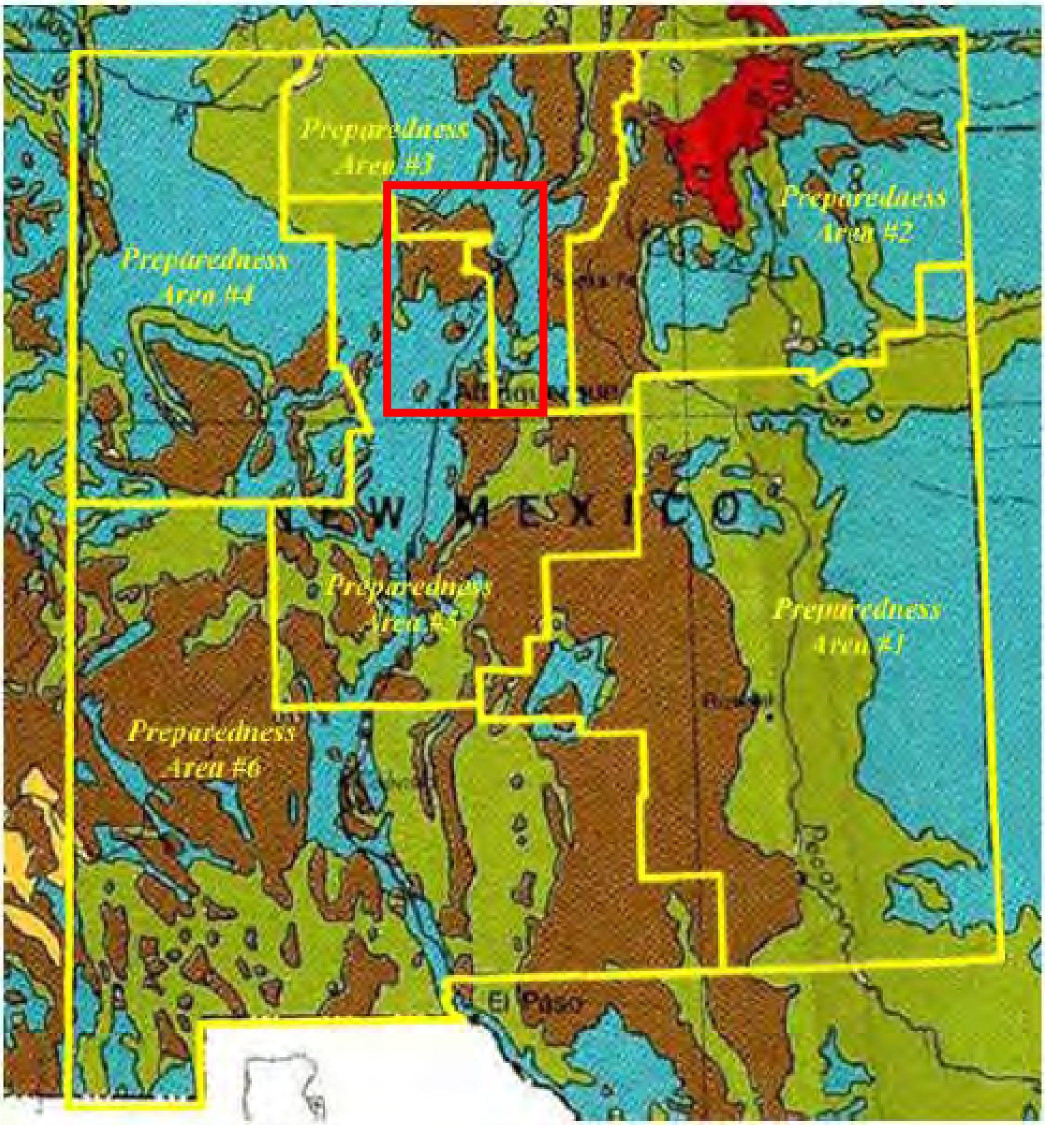
Hazard/Problem Description

Expansive soils, also locally called adobe or clay, are fine-grained soils generally found in areas that historically were a floodplain or lake areas. Expansive soils swell when wet and shrink when dry. They contain abundant expandable clay that generally accumulates in low-energy areas. Expansive soil is subject to swelling and shrinkage, varying in proportion to the amount of moisture present in the soil. As water is absorbed into the soil (by rainfall or watering), expansion takes place. If dried out, the soil contracts, often leaving small fissures or cracks. Excessive drying and wetting of the soil can progressively deteriorate "slab on grade" foundations over the years.

Location

Figure 4.13 shows the areas of expansive soils in New Mexico. The red areas in the northeast portion of the state around Taos and Colfax Counties are areas that contain abundant clay with high swelling potential. The blue areas generally have less than 50% clay and also have high swelling potential. The orange area, of which there is only a very small portion on the Arizona border, indicates areas with abundant clay having slight to moderate swelling potential. The green areas generally have less than 50% clay, with slight to moderate swelling potential and the brown areas have little or no swelling clay. According to the New Mexico Bureau of Geology the Rio Grande floodplain could have the majority of issues.

Figure 4.13: New Mexico Expansive Soils and Preparedness Areas



	Unit contains abundant clay having high swelling potential
	Part of unit (generally less than 50%) consists of clay having high swelling potential
	Unit contains abundant clay having slight to moderate swelling potential
	Part of unit (generally less than 50%) consists of clay having slight to moderate swelling potential
	Unit contains little or no swelling clay
	Data insufficient to indicate clay content of unit and/or swelling potential of clay (Shown in westernmost of state only)

Extent

In areas of high swelling soils damage to foundations can lead to buildings being condemned. No evidence of this extent level has been recorded.

Previous Occurrences

According to the 2013 State of New Mexico Hazard Mitigation Plan, there have been no previous occurrences of expansive soil incidents in Santa Fe County, or the State of New Mexico. While damages due to expansive soils are occurring in New Mexico, the fact that the onset takes a very long time, damages are cumulative rather than instantaneous. There may be instances of damages due to expansive soils that go unreported.

Probability of Future Occurrences

Due to the absence of reportable damages from expansive soils, this hazard is rated as **unlikely** to occur, but damage may go unreported. Issues are more likely to occur during prolonged dry or wet periods.

Vulnerability Assessment

People

No impacts anticipated.

Economy

No extensive economic impacts anticipated.

Built Environment

While damages are slow to accumulate, costly damages to roads and other infrastructure could occur. The majority of the hazard's significance is drawn from the exposure of existing development to this hazard. Older construction may not be resistant to the swelling soil conditions and, therefore, may experience expensive and potentially extensive damages. This includes heaving sidewalks, structural damage to walls and basements, the need to replace windows and doors, or dangers and damages caused by ruptured pipelines. Newer construction may have included mitigation techniques to avoid most damage from the hazard, but the dangers continue if mitigation actions are not supported by homeowners. For example, the maintenance of grading away from foundations and the use of appropriate landscaping near structures must be continued to prevent an overabundance of water in vulnerable soils near structures. While continued public education efforts may help increase compliance for landscaping and interior finishing mitigation actions, physical reconstruction of foundations is probably not feasible in all but the most heavily impacted of existing development. Therefore, damages may be expected into the future for existing structures.

As identified in the hazard profile and noted above, Santa Fe County has very limited exposure to this hazard. According to the benchmark USGS survey of swelling soils in the United States, the majority of the planning area's soils contain no clays with swelling potential[4].

Critical Infrastructure. Due to the limited nature of this hazard in the County and lack of available mapping a more specific risk assessment was not conducted for this plan, but it is anticipated any impacts would be minor.

Natural Environment

Expansive soils are a natural part of overall environmental processes. No long-term impacts are anticipated to the environment from this hazard.

Future Development

Modern building practices and building codes incorporate mitigation techniques, provided proper geotechnical testing is employed to identify expansive soils. If areas prone to expansive soils are identified, future areas for development will need to take this hazard into account.

Risk Summary

- Research indicates Santa Fe County has limited exposure to this hazard, but a lack of detailed mapping makes it difficult to truly assess the potential impact of this hazard
- The Rio Grande floodplain is likely to have the highest concentration of expansive soils.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Negligible	Unlikely	Negligible	Low

4.3.4 Extreme Temperatures

Hazard/Problem Description

Santa Fe County experiences a wide range of temperatures in any given year. According to the Western Regional Climate Center (WRCC), average maximum temperatures in the county range from a high of 86.5 degrees in July, to a low of 18.4 in December. The WRCC offers historical climate data by weather station in New Mexico. Table 4.20 shows the average minimum and maximum temperatures by month for the Santa Fe County Municipal Airport Weather Station, for the time period between 1941 and 2015 (it should be noted that there is a lack of data for this

[4] "Swelling Clays Map of the Conterminous United States" W. Olive, A. Chleborad, C. Frahme, J. Shlocker, R. Schneider and R. Schuster. 1989

station between 1959 and 1997; this was true for different intervals for all stations present in Santa Fe County). This station was chosen because of its range of available dates for data.

Table 4.20: Average Temperatures by Month, Santa Fe Count Municipal Airport Station, 05/27/1941 through 01/20/2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Maximum Temperature	42.7	48.0	53.9	64.5	72.6	83.6	86.5	84.4	78.7	67.7	52.5	43.3
Average Minimum Temperature	18.7	22.3	26.5	34.5	43.2	51.9	57.9	56.4	49.2	38.9	24.9	18.4

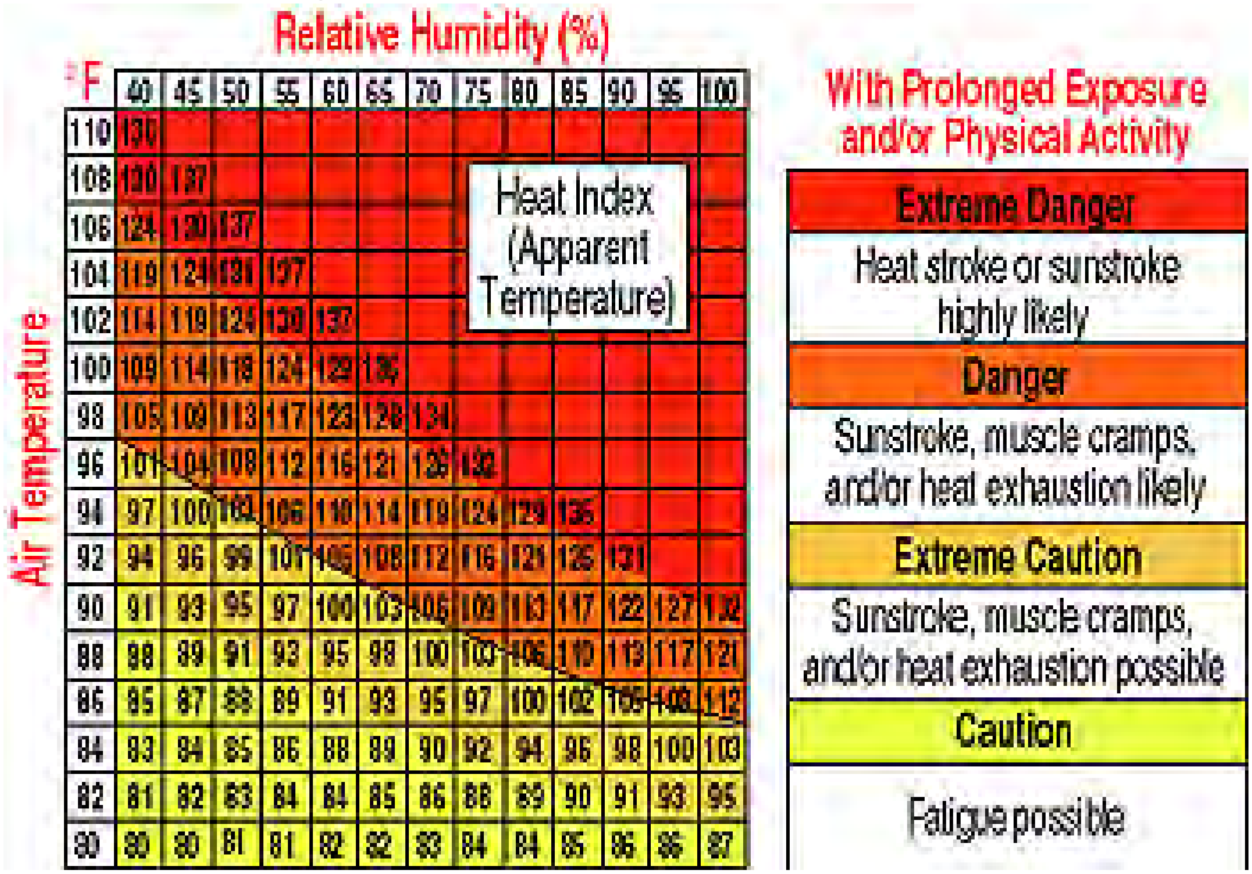
Source: Western Regional Climate Center

Extreme Heat

According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Heat kills by taxing the human body beyond its abilities; in a normal year, about 175 Americans succumb to the demands of summer heat. According to the National Weather Service (NWS), among natural hazards, only the cold of winter—not lightning, hurricanes, tornadoes, floods, or earthquakes—takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the heat wave of 1980, more than 1,250 people died.

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Elderly persons, small children, those with chronic illnesses, those on certain medications or drugs, and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where moderate climate usually prevails. Figure 4.14 illustrates the relationship of temperature and humidity to heat disorders.

Figure 4.14: National Weather Service Heat Index



°F	40	45	50	55	60	65	70	75	80	85	90	95	100
110	136												
108	130	137											
106	124	130	137										
104	119	124	131	137									
102	114	119	124	130	137								
100	109	114	118	124	129	136							
98	105	109	113	117	123	128	134						
96	101	104	108	112	116	121	126	132					
94	97	100	103	106	110	114	119	124	129	135			
92	94	96	99	101	105	108	112	116	121	126	131		
90	91	93	95	97	100	103	106	109	113	117	122	127	132
88	88	89	91	93	95	98	100	103	106	110	113	117	121
86	85	87	88	89	91	93	95	97	100	102	105	108	112
84	83	84	85	86	88	89	90	92	94	96	98	100	103
82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	80	81	81	82	82	83	84	84	85	86	86	87

Source: National Weather Service

Heat Index values were devised for shady, light wind conditions. Exposure to full sunshine can increase values by up to 15°F. Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

The NWS has in place a system to initiate advisories or warnings when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime high is expected to equal or exceed 105°F and a nighttime minimum high of 80°F or above is expected for two or more consecutive days.

Severe Cold

Extreme cold can occur on its own, but often accompanies a winter storm, or is left in its wake. It is most likely to occur in the winter months of December, January, and February. Prolonged exposure to the cold can cause frostbite or hypothermia, and can be life-threatening; infants and the elderly are most susceptible. Pipes may freeze and burst in homes or buildings that are poorly insulated or without heat. Extreme cold can disrupt or impair communications facilities.

In 2001, the NWS implemented an updated Wind Chill Temperature index, which is provided in Figure 4.15. This index was developed to describe the relative discomfort/danger resulting from the combination of wind and temperature. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature.

Figure 4.15: Wind Chill Temperature Chart

Temperature (°F)

Wind (mph) / Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes; 10 minutes; 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: National Weather Service

Location

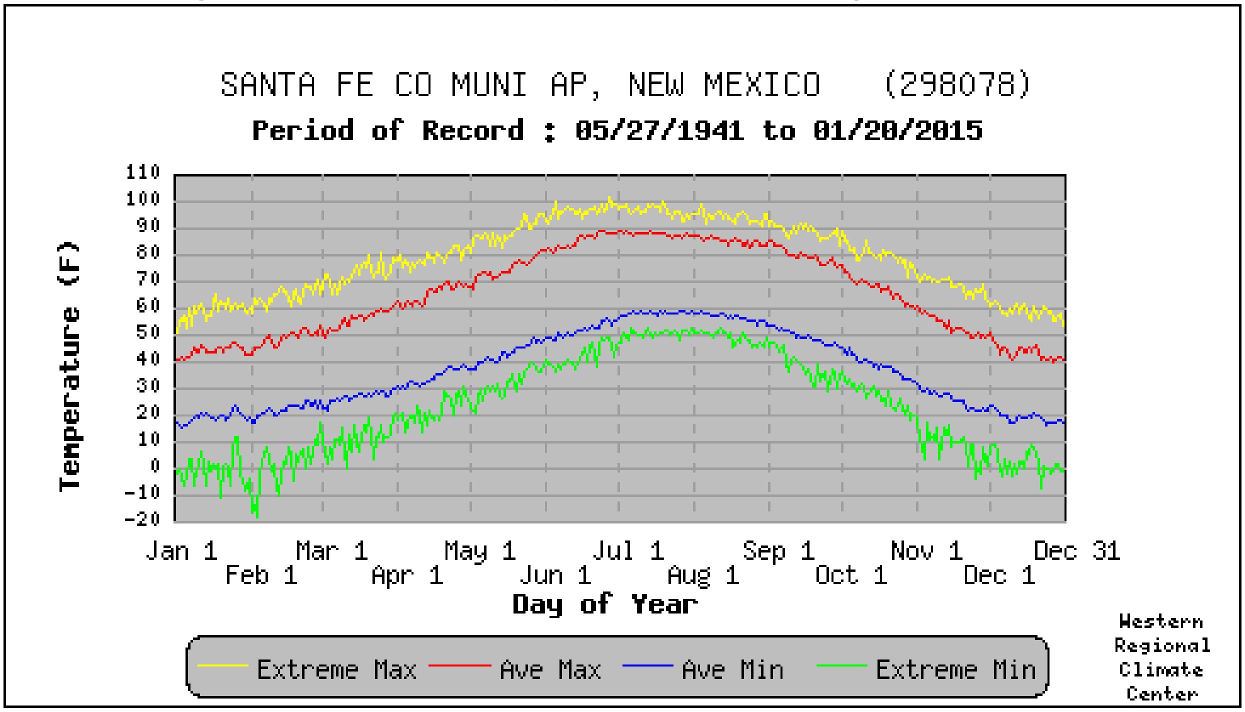
Extreme temperatures can occur anywhere in the county. Extreme temperature incidents tend to be regional; while specific degrees may vary, the entire county tends to be affected during an event. Pockets of cold air can settle into valleys and landscape depressions, which make these areas slightly more susceptible.

Extent

Santa Fe County Municipal Airport Station - Period of Record 5/27/1941 to 1/20/2015

In Santa Fe County, monthly average minimum temperatures from November through March range from the upper 10s to the upper 20s. Average maximum temperatures range from the low 40s to the upper 80s. The highest recorded daily temperature extreme was 99 degrees on June 24, 2012. The lowest recorded daily extreme for this station was -18°F on February 3, 2011. Extreme temperature minimums and maximums for Santa Fe County are shown in Figure 4.16. This range of temperatures gives an approximation of the highs and lows Santa Fe County could expect to experience; current climate trends could cause temperatures higher or lower than this range in the future. Because of the county's elevation, extreme cold is a much more prevalent issue in Santa Fe County than extreme heat.

Figure 4.16: Santa Fe County Temperature Averages and Extremes



Source: Western Regional Climate Center

Previous Occurrences

The NCDC database did not record any incidents related to extreme heat in Santa Fe County; this could be because of the county's high elevations. There were two total recorded incidents related to extreme cold and wind chill in 2011 and 2013; these incidents caused no fatalities or injuries, nor was there any recorded property damage recorded by the NCDC.

A secondary impact of extreme cold is the increased usage of natural gas for heating purposes. This has caused natural gas shortages across the state, most recently in January/February of 2011 when the Governor declared a state of emergency, closing all non-necessary state offices and encouraging schools to close. While some counties in the State (including nearby Taos and Rio Arriba Counties) were granted a Presidential Disaster Declaration for the incident, Santa Fe was not included in the list of declared counties. Impacts in Santa Fe County from this storm include citizens reporting up to six days without heat in their homes, lost revenue for businesses, frozen and broken pipes, and infrastructure repair costs as the temperatures reached a new low record of -18 degrees on February 3rd, 2011. According to the HMPC, the severity of the 2011 event was due to an almost “perfect storm” of factors, and they noted that the oil and gas industry has implemented extensive efforts to mitigate these types of impacts in the future.

Probability of Future Occurrences

Generally, Santa Fe County is more susceptible to extreme cold incidents than extreme heat incidents. The County can expect an extreme cold event every few years; extreme heat events are rarer. The HMPC rated probability as likely.

Vulnerability Assessment

People

Traditionally, the very young and very old are considered at higher risk to the effects of extreme temperatures, but any populations outdoors in the weather are exposed, including otherwise young and healthy adults and homeless populations. While everyone is vulnerable to extreme temperature incidents, some populations are more vulnerable than others. Extreme temperatures pose the greatest danger to outdoor laborers, such as highway crews, police and fire personnel, and construction. The elderly, children, people in poor physical health, and the homeless are also vulnerable to exposure. Arguably, the young-and-otherwise-healthy demographic may experience a higher vulnerability of exposure, due to the increased likelihood that they will be out in the extreme temperatures, whether due to commuting for work or school, conducting property maintenance such as snow removal or lawn care, or for recreational reasons.

It is difficult to isolate the County’s specific vulnerability to this hazard, as the impacts from extreme temperatures can be spread across an entire state or region. In general, all of the population of the County can be considered at-risk to this hazard.

Economy

Both extreme heat and extreme cold can have impacts on Santa Fe County’s economy. Short term impacts can include direct or indirect interruptions in commerce as the public stays sheltered to avoid the temperatures. Short term impacts can also include elevated demand for energy sources.

Long-term effects include impacts to agriculture and energy usage. While the 2011 event was an anomaly, it resulted in lost revenue for businesses and infrastructure repair costs.

Built Environment

Recent research indicates that the impact of extreme temperatures, particularly on populations, has been historically under-represented. The risks of extreme temperatures are often profiled as part of larger hazards, such as severe winter storms or drought. However, as temperature variances may occur outside of larger hazards or outside of the expected seasons but still incur large costs, it is important to examine them as stand-alone hazards. Extreme heat may overload demands for electricity to run air conditioners in homes and businesses during prolonged periods of exposure and presents health concerns to individuals outside in the temperatures. Extreme heat may also be a secondary effect of droughts, or may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist. Extreme heat can cause infrastructure damage to roads. Extreme cold impacts structures when pipes or water mains freeze and burst, causing damage.

Extreme cold may also lead to higher electricity and natural gas demands to maintain appropriate indoor heating levels combined with damages caused to the delivery infrastructure such as frozen lines and pipes. Cold may impact transportation as well. Exposed populations may be at risk while waiting for public transportation, particularly when combined with wind-chill, and some vehicles may not start which impacts the commute of the workforce and, in worst case scenarios, the movement of emergency services personnel.

Critical Infrastructure. Extreme temperatures can impact pipe (extreme cold) and road infrastructure (extreme heat), but direct impacts to critical infrastructure is expected to be minimal. Critical infrastructure that relies on public utility systems that could be overloaded may see impacts during extreme temperature events (e.g. 2011 extreme cold event).

Natural Environment

Extreme heat may cause temporary drought-like conditions. For example, several weeks of extreme heat increases evapotranspiration and reduces moisture content in vegetation, leading to higher wildfire vulnerability for that time period even if the rest of the season is relatively moist. Extreme cold has the same impacts on exposed wildlife as it does on exposed people.

Changing heating and cooling patterns globally can have destructive secondary impacts, intensifying a variety of weather-related disasters that directly impact jurisdictions.

Future Development

Since structures are not usually directly impacted by severe temperature fluctuations, continued development is less impacted by this hazard than others in the plan. However, pre-emptive cautions such as construction of green buildings that require less energy to heat and cool, use of good insulation on pipes and electric wirings, and smart construction of walkways, parking structures, and pedestrian zones that minimize exposures to severe temperatures may help increase the overall durability of the buildings and the community to the variations. Continued development also implies continued population growth, which raises the number of individuals potentially exposed to variations. Public education efforts should continue to help the population understand the risks and vulnerabilities of outdoor activities, property maintenance, and regular exposures during periods of extreme heat and cold.

Risk Summary

- Because of the county's elevation, extreme cold is a much more prevalent issue in Santa Fe County than extreme heat;
- A secondary impact of extreme cold is the increased usage of natural gas for heating purposes. This has caused natural gas shortages across the state, most recently in January/February of 2011 when the Governor declared a state of emergency, closing all non-necessary state offices and encouraging schools to close.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Likely	Limited	Medium

4.3.5 Flood/Flash Flood

Hazard/Problem Description

Flooding is the rising and overflowing of a body of water onto normally dry land. Floods are among the most costly natural disasters in terms of human hardship and economic loss nationwide. Floods can cause substantial damage to structures, landscapes, and utilities, as well as causing life safety issues. Floods can be extremely dangerous; six inches of moving water can knock over a person given a strong current. A car will float in less than two feet of moving water and can be swept downstream into deeper waters. This is one reason floods kill more people trapped in vehicles than anywhere else. During a flood, people can also suffer heart attacks or electrocution due to electrical equipment short outs. Floodwaters can transport large objects downstream, which can damage or remove stationary structures. Ground saturation can result in instability, collapse, or other damage. Objects can also be buried or destroyed through sediment deposition. Floodwaters can break utilities lines and interrupt services. Standing water can cause damage to crops, road, foundations, and electrical equipment.

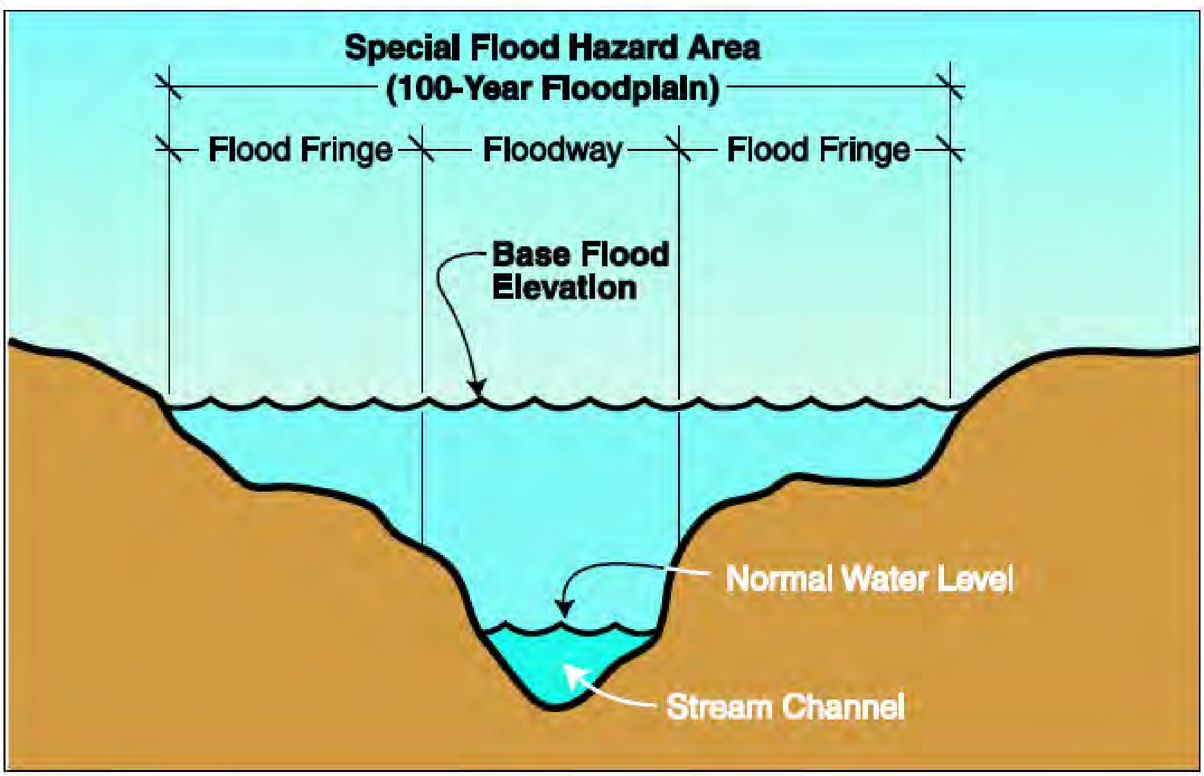
Direct impacts, such as drowning, can be limited with adequate warning and public education about what to do during floods. Where flooding occurs in populated areas, warning and evacuation will be of critical importance to reduce life and safety impacts from any type of flooding.

100-/500-year Flooding

Floodplains

The area adjacent to a channel is the floodplain (see Figure 4.17). Floodplains are illustrated on inundation maps, which show areas of potential flooding and water depths. In its common usage, the floodplain most often refers to the area that is inundated by the 100-year flood, the flood that has a one percent chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Figure 4.17: Floodplain Definitions



Source: 2013 New Mexico State Hazard Mitigation Plan

According to the Flood Insurance Study for Santa Fe County, the storms that produce large amounts of runoff occur during the Monsoon season. Monsoon season in Santa Fe County starts in June and lasts through October. It is characterized by heavy to severe downpours, lasting anywhere from five minutes to an hour. Such downpours can create flash floods.

The Santa Fe County Planning Area is susceptible to various types of flood events: riverine, flash, and localized stormwater flooding. The area is also at risk to flooding resulting from dam failures (discussed separately in Dam Failure). Regardless of the type of flood, the cause is often the result of severe weather and excessive rainfall, either in the flood area or upstream reach.

- Riverine flooding – Riverine flooding, defined as when a watercourse exceeds its "bank-full" capacity, generally occurs as a result of prolonged rainfall, or rainfall that is combined with snowmelt and/or already saturated soils from previous rain events. This type of flood occurs in river systems whose tributaries may drain large geographic areas and include one or more independent river basins. Riverine flooding is rare in Santa Fe County.
- Flash flooding – Flash floods are intense, short-duration floods. Usually they abate within an hour, but can last as long as 24 hours. They occur throughout the southwest, and generally start high up on a mountain or in a canyon. Rain torrents follow the path of least resistance, initially canyons and arroyos. But along the way they pick up speed and debris. They can roll boulders, destroy footbridges, and uproot cottonwoods and piñons. This is the most prevalent type of flooding in Santa Fe County.
- Localized flooding – Localized, stormwater flooding problems are often caused by flash flooding, severe weather, or an unusual amount of rainfall. Flooding from these intense weather events usually occurs in areas experiencing an increase in runoff from impervious surfaces associated with development and urbanization as well as inadequate storm drainage systems.

In addition the often-dry arroyos in the County are prone to erosion and channel migration caused by high waters. This can cause shifting and meandering water channels that can erode sediment and cause damage to adjacent infrastructure and property, including property not mapped in a floodplain.

Location - Major Sources of Flooding

Santa Fe County encompasses multiple rivers, streams, creeks, and arroyos. Flood hazards associated with these drainages are shown on the following map. During most of the year, these watercourses are often dry. Damaging floods in Santa Fe County occur when they impact the developed areas of the County. Flood flows generally follow defined stream channels, drainages, and watersheds.

Most historical information on past floods in Santa Fe County center around the Santa Fe River. Arroyo Hondo and Arroyo de Los Chamisos are subject to the same flood conditions as the Santa Fe River and can be expected to behave in a similar manner. Major floods of record occurred on the Santa Fe River on August 24, 1957, and July 25, 1968.

Floods are often exacerbated by wildfires in the County. Normally, vegetation absorbs rainfall, reducing runoff. However, wildfires leave the ground charred, barren, and unable to absorb water, creating conditions ripe for flash flooding and mudflow. Flood risk remains significantly higher until vegetation is restored—up to five years after a wildfire. Wildfire is discussed in more detail in Section 4.3.13.

Flood Maps

As part of the County's ongoing efforts to identify and manage their flood prone areas, Santa Fe County generally relies on FEMA mapping efforts. What follows is a brief description of FEMA mapping efforts covering the Santa Fe County Planning Area.

FEMA Floodplain Mapping

FEMA established standards for floodplain mapping studies as part of the National Flood Insurance Program (NFIP). The NFIP makes flood insurance available to property owners in participating communities adopting FEMA-approved local floodplain studies, maps, and regulations. Floodplain studies that may be approved by FEMA include federally funded studies; studies developed by state, city, and regional public agencies; and technical studies generated by private interests as part of property annexation and land development efforts. Such studies may include entire stream reaches or limited stream sections depending on the nature and scope of a study. A general overview of floodplain mapping and associated products is provided in the following paragraphs.

Flood Insurance Study (FIS)

The FIS develops flood-risk data for various areas of the community that will be used to establish flood insurance rates and to assist the community in its efforts to promote sound floodplain management. The current Santa Fe County FIS is dated December 4, 2012. This study covers the entire County and incorporated areas.

Flood Insurance Rate Map (FIRM)

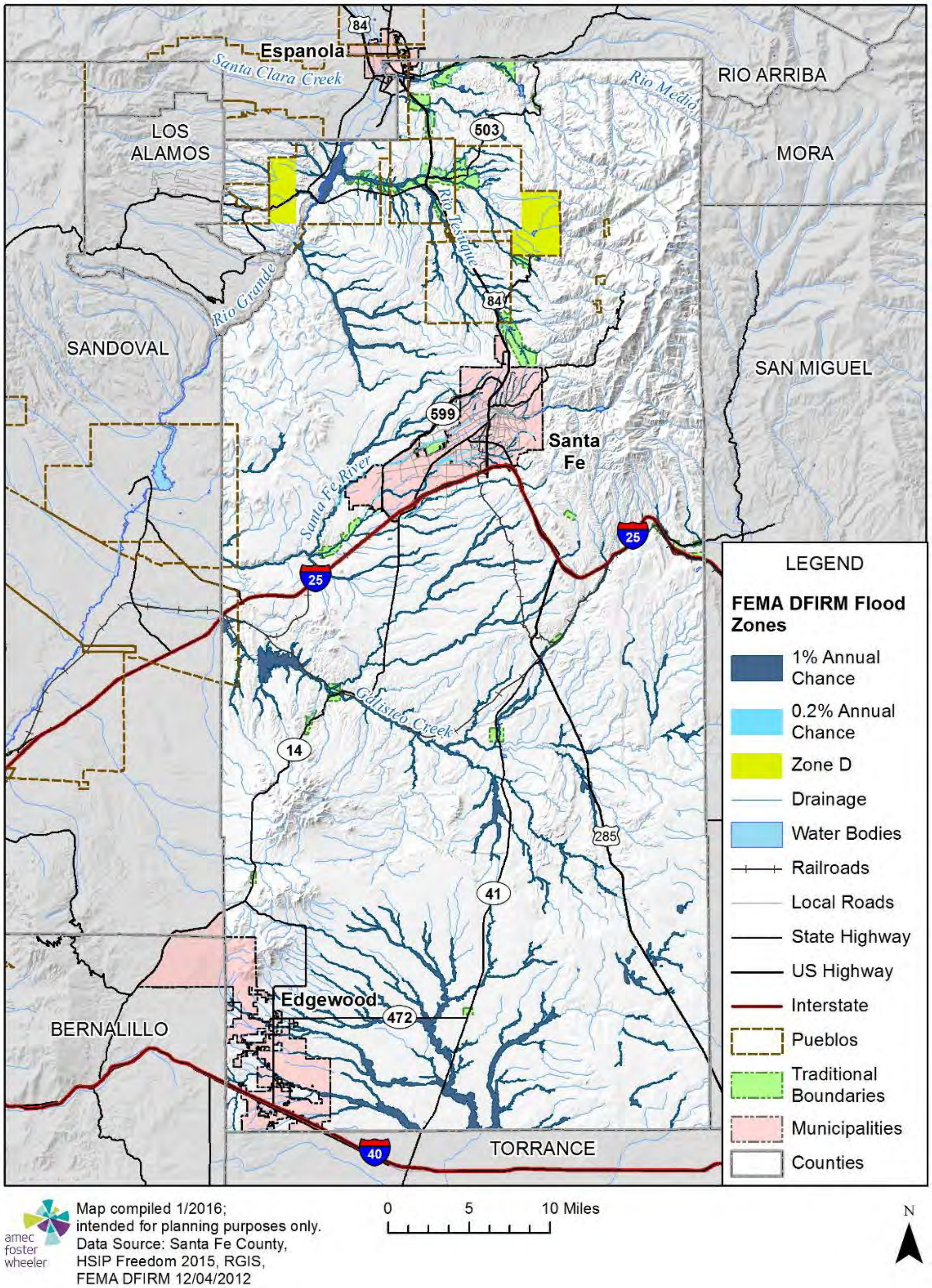
The FIRM is designed for flood insurance and floodplain management applications. For flood insurance, the FIRM designates flood insurance rate zones to assign premium rates for flood insurance policies. For floodplain management, the FIRM delineates 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analysis and local floodplain regulations. The County FIRMs have recently been replaced by new digital flood insurance rate maps (DFIRMs) as part of FEMA's Map Modernization program.

These digital maps:

- Incorporate the latest updates (LOMRs and LOMAs);
- Utilize community supplied data;
- Verify the currency of the floodplains and refit them to community supplied base maps;
- Upgrade the FIRMs to a GIS database format to set the stage for future updates and to enable support for GIS analyses and other digital applications; and
- Solicit community participation.

DFIRMs, dated December 2012 for Santa Fe County were released and are used for this plan's flood hazard analysis. This map can be found in Figure 4.18.

Figure 4.18: Santa Fe County FEMA DFIRM Flood Hazards



Localized Stormwater/Flash Flooding

Localized, stormwater flooding also occurs throughout the County that may not be shown on FEMA flood maps. Urban storm drainpipes and pump stations have a finite capacity. When rainfall exceeds this capacity, or the system is clogged, water accumulates in the street until it reaches a level of overland release. This type of flooding may occur when intense storms move over areas of development or wildfire burn areas.

Previous Occurrences

Historically, portions of Santa Fe County have always been at risk to flooding because of monsoon rainfall, topography, and the location of development adjacent to flood-prone areas. Flooding events generally occur countywide, and have caused significant damage in the populated areas of the County. Flooding has occurred both within mapped floodplains and in other localized areas.

Most of the storms that produce large amounts of runoff occur in the months of June through October. Over 70 percent of the average precipitation is received during this time. Summer rainfall is usually a result of thunderstorm activity with maximum rainfall occurring in July. Flood stages sometimes occur in these months when moist tropical air moves north out of the Gulf of Mexico forming intense thunderstorms across the hot New Mexico land. Runoff occurring from these storms is generally termed flash flooding due to the large volumes of water that surge down the normally dry arroyo channels with high velocities.

According to the 2011 Santa Fe Flood Insurance Study, major floods have been recorded in the area in 1872, 1904, 1914, 1921, 1929, 1957 and 1968. Since 1996 flooding in Santa Fe County has caused $2 million in property damage, and over $10,000 in damage to crops, according to NCDC data (1996 limit of flood history in NCDC). Flash flooding has also caused 3 fatalities, and one direct injury. New Mexico experienced widespread flooding in September 2013. Santa Fe County was not as impacted as other counties such as nearby Los Alamos, but the HMPC noted damage to acequia infrastructure and some road and bridge damage. The community of Madrid suffered mudslide, debris flow and flooding during this event. Floodwaters were mixed with runoff and sediment from nearby abandoned mines, compounding damage and cleanup efforts.

Past events from the NCDC database are found in Table 4.21.

Table 4.21: Flood Events in Santa Fe County 1996 to August 2015

Date	Incident Type	Deaths	Injuries	Property Damage	Crop Damage
7/7/1996	Flash Flood	0	0	$ -	$ -
7/9/1996	Flash Flood	0	0	$ 60,000	$ 10,000
8/25/1996	Flash Flood	0	0	$ 90,000	$ -
6/7/1997	Flash Flood	0	0	$ 200,000	$ -
7/30/1997	Flash Flood	0	0	$ -	$ -
7/31/1997	Flash Flood	0	0	$ -	$ -
8/6/1997	Flash Flood	0	0	$ 250,000	$ -
7/23/1998	Flash Flood	0	1	$ -	$ -
8/8/1999	Flash Flood	0	0	$ -	$ -
7/16/2000	Flash Flood	0	0	$ -	$ -
8/5/2004	Flash Flood	0	0	$ -	$ -
8/15/2004	Flash Flood	0	0	$ 50,000	$ -
6/21/2005	Flash Flood	0	0	$ -	$ -
7/18/2005	Flash Flood	0	0	$ -	$ -
7/18/2005	Flash Flood	0	0	$ -	$ -
8/12/2005	Flash Flood	0	0	$ -	$ -
7/19/2007	Flash Flood	0	0	$ 70,000	$ -
7/21/2007	Flash Flood	0	0	$ 5,000	$ -
5/28/2008	Flash Flood	0	0	$ -	$ -
6/29/2008	Flash Flood	0	0	$ 5,000	$ -
6/30/2008	Flash Flood	0	0	$ 5,000	$ -
7/14/2008	Flash Flood	1	0	$ 25,000	$ -
7/15/2008	Flash Flood	0	0	$ 10,000	$ -
8/4/2008	Flash Flood	0	0	$ 1,000	$ -
8/9/2008	Flash Flood	0	0	$ 2,000	$ -
7/4/2009	Flash Flood	0	0	$ 2,000	$ -
7/1/2010	Flash Flood	0	0	$ 1,000	$ -
7/3/2010	Flash Flood	0	0	$ -	$ -
7/3/2010	Flash Flood	0	0	$ -	$ -
7/3/2010	Flash Flood	0	0	$ 5,000	$ -
7/31/2010	Flash Flood	0	0	$ 500	$ -
7/31/2010	Flash Flood	0	0	$ 5,000	$ -
8/15/2010	Flash Flood	0	0	$ 5,000	$ -
8/19/2011	Flash Flood	0	0	$ -	$ -
8/21/2011	Flash Flood	0	0	$ 50,000	$ -
9/1/2011	Flash Flood	0	0	$ 2,500	$ 100
7/26/2012	Flash Flood	0	0	$ 10,000	$ -

Date	Incident Type	Deaths	Injuries	Property Damage	Crop Damage
8/12/2012	Flash Flood	0	0	$ -	$ -
8/16/2012	Flash Flood	0	0	$ -	$ -
8/26/2012	Flash Flood	0	0	$ -	$ -
7/6/2013	Flash Flood	0	0	$ -	$ -
7/8/2013	Flash Flood	1	0	$ -	$ -
7/19/2013	Flash Flood	0	0	$ -	$ -
7/19/2013	Flash Flood	0	0	$ 1,000	$ -
8/19/2013	Flash Flood	0	0	$ -	$ -
8/19/2013	Flash Flood	0	0	$ -	$ -
9/1/2013	Flash Flood	0	0	$ -	$ -
9/1/2013	Flash Flood	0	0	$ 5,000	$ -
9/13/2013	Flood	0	0	$ 5,000	$ -
9/13/2013	Flood	0	0	$ 50,000	$ -
9/15/2013	Flash Flood	0	0	$ 500,000	$ -
9/15/2013	Flood	0	0	$ -	$ -
7/15/2014	Flash Flood	0	0	$ 15,000	$ -
7/15/2014	Flash Flood	0	0	$ -	$ -
7/15/2014	Flash Flood	0	0	$ 500,000	$ -
7/27/2014	Flash Flood	0	0	$ 5,000	$ -
8/2/2014	Flash Flood	0	0	$ 50,000	$ -
8/26/2014	Flash Flood	0	0	$ -	$ -
9/22/2014	Flash Flood	0	0	$ 20,000	$ -
9/22/2014	Flash Flood	1	0	$ -	$ -
7/8/2015	Flash Flood	0	0	$ 1,000	$ -
7/30/2015	Flood	0	0	$ -	$ -
7/31/2015	Flash Flood	0	0	$ 5,000	$ -
8/1/2015	Flash Flood	0	0	$ 5,000	$ -
8/10/2015	Flood	0	0	$ -	$ -

Source: NCDC

Flood Insurance Coverage and Claims

According to the NFIP as of January 2016 the County has 218 policies with $56.8M in coverage; there have been 21 claims totaling $223,000 since 1978. There are no repetitive loss properties (properties defined by the NFIP as having 2 or more claims of $1,000 or more in a 10 year period) in Santa Fe County.

Probability of Future Occurrences

100-Year Flood

A "100-year flood" is the flood elevation (or depth) that has a 1- percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time.

500-Year Flood

The 500-year flood is the flood elevation or depth that has a 0.2 percent chance of being equaled or exceeded each year.

Localized Stormwater/Flash Flooding

Based on historical data, flooding events less severe than a 100-year flood and those outside of the 100-year floodplain occur frequently during periods of heavy rains. The State Hazard Mitigation plan made efforts to determine a probability of occurrence for flash flooding. Santa Fe County falls in Preparedness Area 3, which the State determined had a 29% chance of flash flooding occurring in a given year.

While based on a relatively small sample size, Santa Fe County has experienced five recorded flooding events since 2013, or an average of two incidents every three years. The county has also experienced 61 recorded flash flooding events since 1996; the county averages 3 flash floods per year. Overall, the HMPC rated the likelihood of some level of flood incident as **Likely**.

Vulnerability Assessment

People

Drowning is a major concern during flooding, and Santa Fe County has a history of drowning fatalities. Rising waters can quickly envelop people in vulnerable areas. Based on a GIS analysis of residential structures in flood hazard areas (using the count of structures multiplied by the U.S. Census Bureau average household size of 2.34 for the county) there are approximately 600 persons in the 1% annual chance zone and 49 additional in the 0.2% annual chance zone for the unincorporated, non-Pueblo areas.

People can also be trapped by floodwaters and need rescuing; as an example, three people were rescued from 2 vehicles in an arroyo in La Puebla on July 15, 2014. There are a number of typically dry, low water crossings on roads in the County that can become hazardous when flooded.

Certain health hazards are also common to flood events. While such problems are often not reported, there are general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where cattle and hogs are kept or their wastes are stored can contribute polluted waters to the receiving streams.

Floodwaters saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as E. coli and other disease causing agents.

Stagnant pools of floodwater can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants.

Flooding can also impact drinking water quality. If a water system loses pressure, a boil order may be issued to protect people and animals from contaminated water.

Another hazard is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Economy

Flooding can have a major economic impact on the economy. Based on the flood loss analysis, there are 19 commercial structures worth an estimated $32.8 M in total value directly at risk to flooding in the 1% annual chance zone, and 4 additional in the 0.2% annual chance zone. Based on the loss analysis (described further below) this could result in approximately $8.2M in direct losses. This does not account for other indirect losses such as business interruption, lost wages and other downtime costs.

Built Environment

Floods can have devastating impacts on the built environment. Historically, Santa Fe County has seen high levels of damage caused by road and bridge washouts, property washouts, building flooding, road closures, major street flooding and mud deposits. Flood recovery can take years for affected communities to be rebuilt, depending on the severity of the flood. Historical damages in Santa Fe County include road and bridge washouts, building and business flooding, infrastructure and utility damage, and debris damage and cleanup.

A flood vulnerability assessment was performed for Santa Fe County using GIS. The county's parcel layer and associated assessor's building improvement valuation data were provided by the county and were used as the basis for the value of improvements. Santa Fe County's effective DFIRM was used as the hazard layer. DFIRM is FEMA's flood risk data that depicts the 1% annual chance (100-year) and the 0.2% annual chance (500-year) flood events. Santa Fe County's effective FEMA DFIRM, dated December 4, 2012, was determined to be the best available floodplain data.

GIS was used to intersect the parcel boundaries with a structure location layer to obtain the number of structures and count of improved parcels within flood hazard areas. The DFIRM flood zones were overlaid in GIS on the structure data to identify structures that would likely be inundated during a 1% annual chance and 0.2% annual chance flood event. Structure improvement and agriculture values and counts for those points were extracted from the parcel/assessor's data and summarized for the unincorporated county, jurisdictions and Pueblos. The location of properties at risk to flooding is shown in Figure 4.19; close-up of properties in the county are shown in Figure 4.20, Figure 4.21 and Figure 4.22. The maps shows flood risk throughout the county, with a greater concentration in the northern half. Notable areas of risk include the Chimayo Valley along the northern border of the County (Chimayo and La Puebla), Galisteo Creek and its tributaries (Cerrillos), and drainages adjacent to the I-25 corridor on the eastern central portion of the County near Glorieta. There is also considerable risk along the Rio Tesuque, Pojoaque River, and Rio Grande valleys, though the majority of the risk is on Pueblo land. There are also areas of risk on the outskirts of the City of Santa Fe, notably on the north and south west along the Santa Fe River and its tributaries (La Cienega, Auga Fria, Tesuque and Chupadero). Pockets of risk also exist near Edgewood in the southwestern county.

Figure 4.19: Santa Fe County FEMA DFIRM Flood Hazards and At-Risk Properties

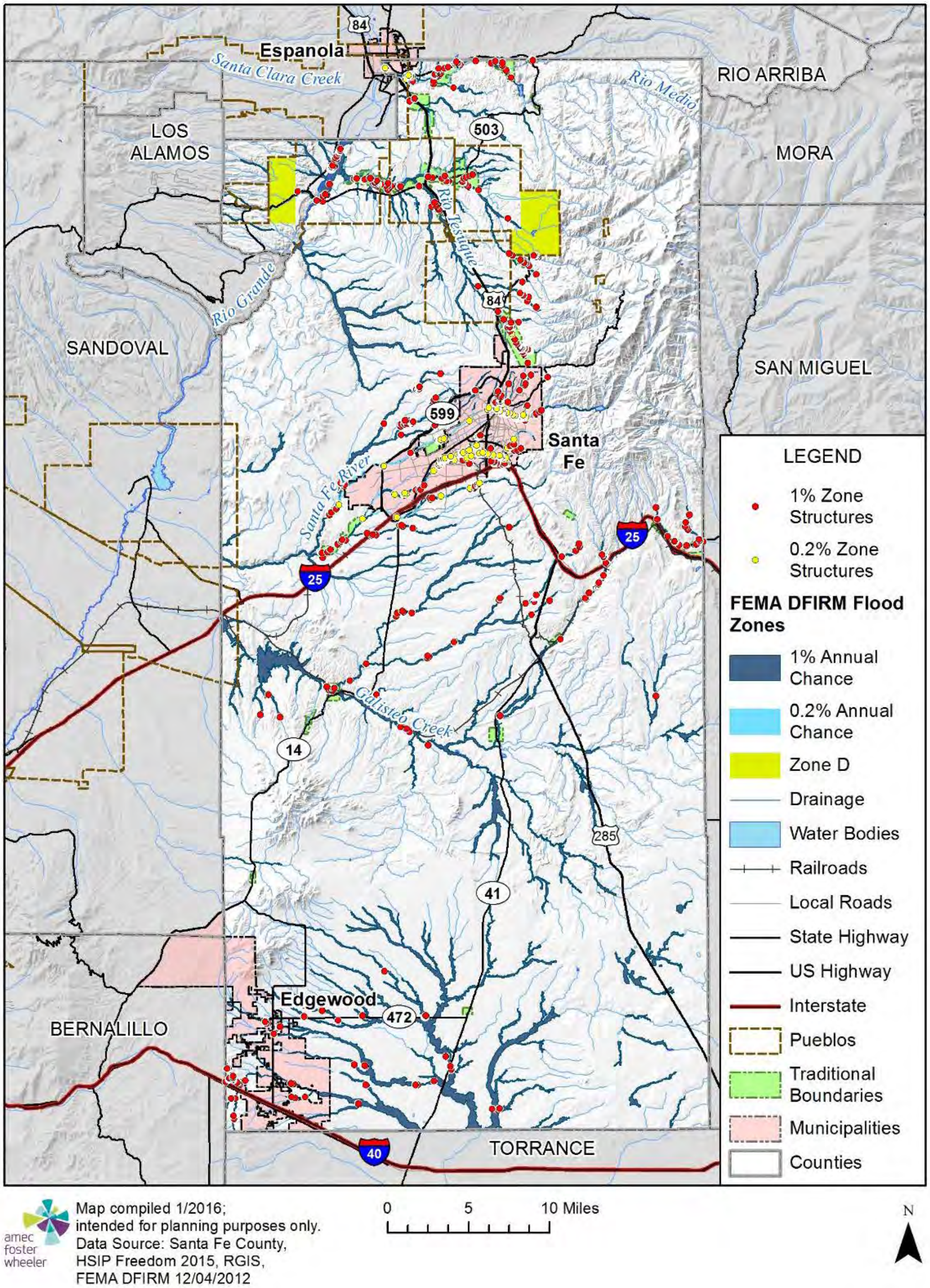


Figure 4.20: Northern Santa Fe County Flood Hazards

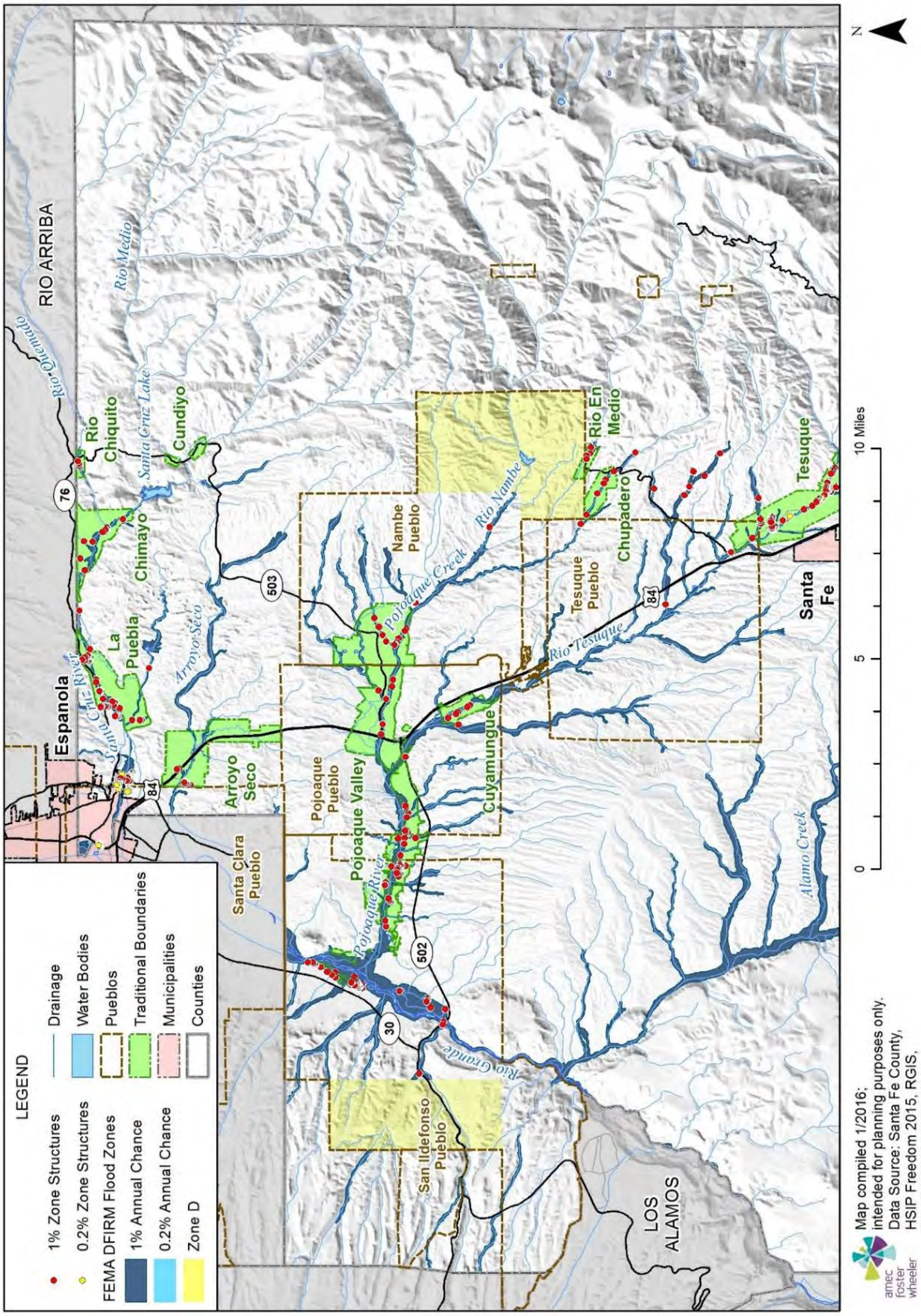


Figure 4.21: Central Santa Fe County Flood Hazards

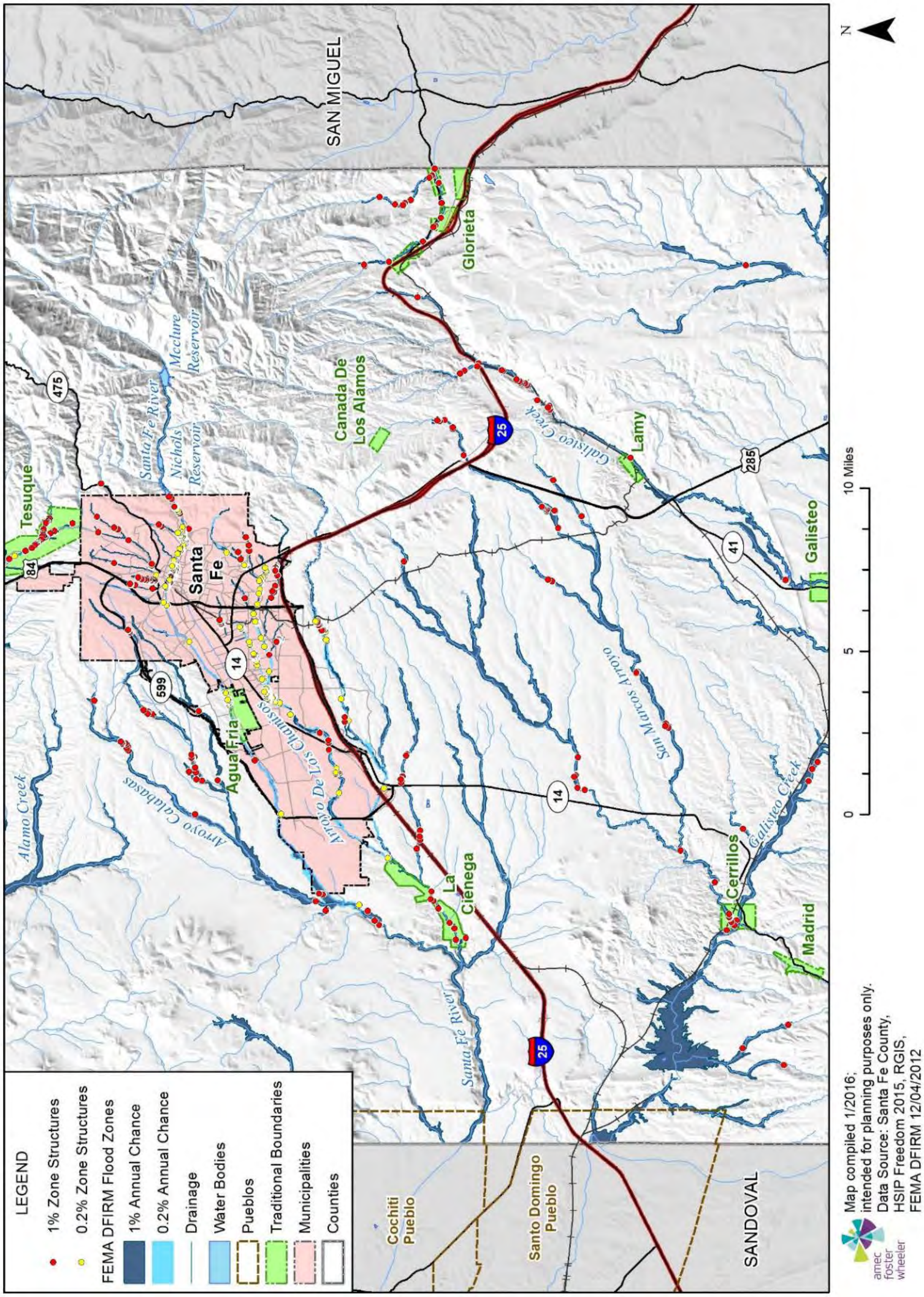
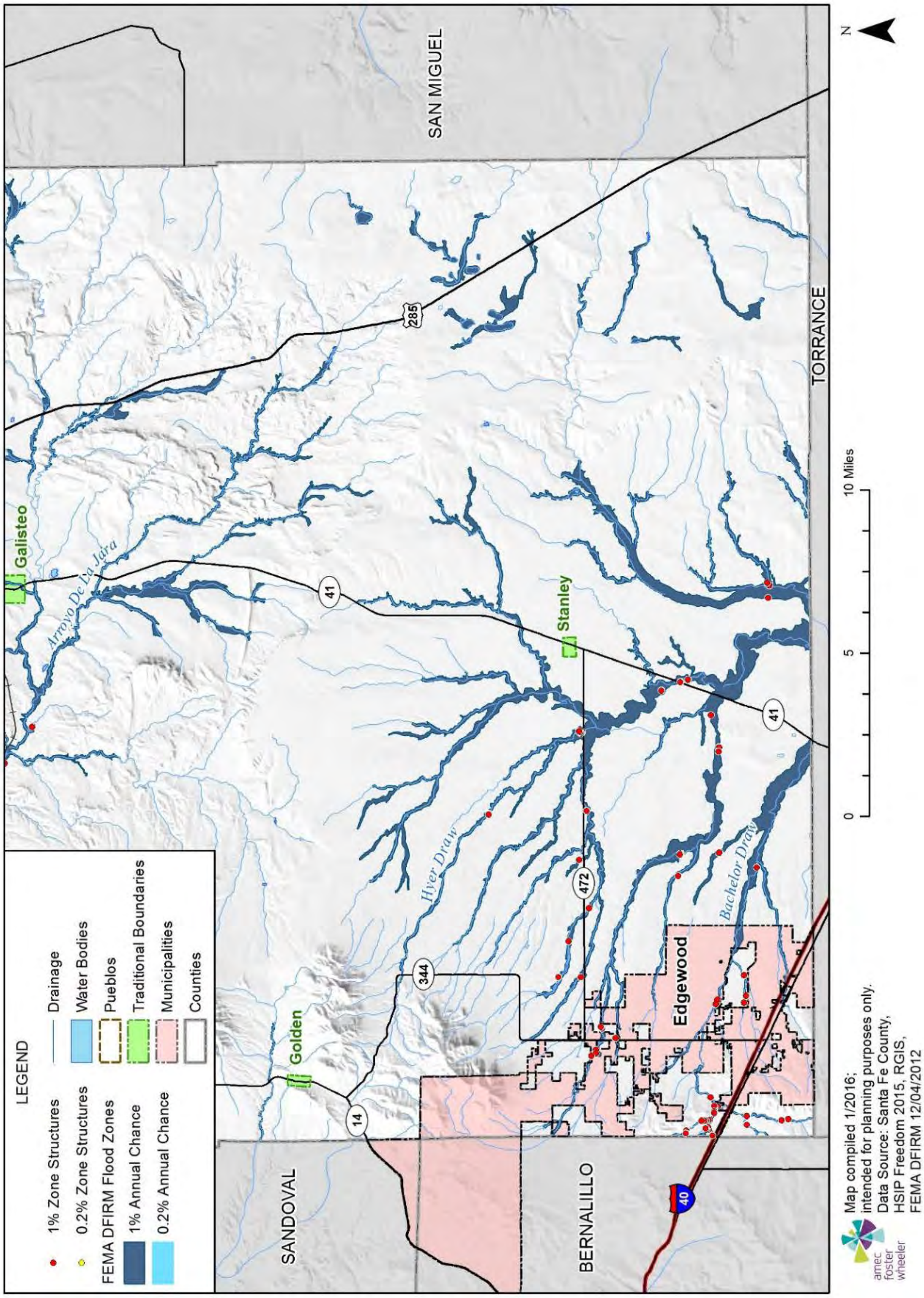


Figure 4.22: Southern Santa Fe County Flood Hazards



Tabular results of the overlay analysis are area shown in Table 4.22 and Table 4.23, and are sorted by flood zone, the parcel's property type, and jurisdiction. Additional tables were created to represent unincorporated (non-Pueblo) counts and values at risk to flooding. Property type refers to the land use of the parcel and includes commercial, exempt (county, federal, state), open space, other, park, residential (condominium, mobile home, single family) and vacant. Contents values were estimated as a percentage of building value based on their property type, using FEMA/HAZUS estimated content replacement values. This includes 100% of the structure value for commercial, exempt, open space, other and park structures, 50% for residential structures and 0% for vacant structures. Improved, agriculture and contents values were summed to obtain a total exposure value. A loss estimate analysis was also performed based on flood depth-damage relationships developed by the Corp of Engineers. An average depth-damage of 25% was applied to the total value to estimate flood loss. This is generally equivalent to the damage associated when buildings are inundated with a two foot deep flood.

Table 4.22: Jurisdictions and Pueblos Unincorporated 1% Annual Chance Flood Hazard

Jurisdiction - Pueblo	Parcel Count	Flooded Structures	Improved Value	Agriculture Value	Content Value	Total Value	Loss Estimate
Edgewood	3	4	$0	$0	$0	$0	$0
Espanola	5	7	$487,711	$0	$322,496	$810,207	$202,552
Nambe Pueblo	11	14	$721,595	$720	$360,798	$1,083,113	$270,778
Pojoaque Pueblo	26	28	$6,195,878	$440	$4,701,759	$10,898,077	$2,724,519
San Ildefonso Pueblo	48	70	$4,788,182	$990	$2,546,801	$7,335,973	$1,833,993
Santa Fe	143	182	$89,558,673	$0	$76,704,051	$166,262,724	$41,565,681
Tesuque Pueblo	3	4	$844,416	$0	$422,208	$1,266,624	$316,656
Unincorporated	323	440	$59,909,038	$22,360	$38,153,094	$98,084,492	$24,521,123
Total	**562**	**749**	**$162,505,493**	**$24,510**	**$123,211,206**	**$285,741,209**	**$71,435,302**

There are 440 structures at risk in the unincorporated County according to this analysis, with an estimated $24M in direct damages that could be lost in a 1% annual chance flood event. Countywide there are 749 structures at risk worth $285M, with a loss estimate of $71M. The table also shows the distribution of structures exposed relative to the jurisdictions in the county. The

Unincorporated area (non-Pueblo) accounts for 59% of the total structures at risk, but 34% of the total losses. Conversely the City of Santa Fe accounts for 24% of the total structures at risk and 58% of the total losses. A 0.2% annual chance flood would add an additional 629 structures to the total at risk to flooding; the majority of these are within the City of Santa Fe, but this could be due to more detailed mapping for the City, whereas many unincorporated areas may not have been studied for 0.2% annual chance flooding. This analysis does not account for flood losses that may occur outside of mapped flood hazard areas. For example the community of Madrid suffered losses in 2013 and is not mapped by the NFIP.

Table 4.23: Jurisdictions and Pueblos Unincorporated 0.2% Annual Chance Flood Hazard

Jurisdiction - Pueblo	Parcel Count	Flooded Structures	Improved Value	Agriculture Value	Content Value	Total Value	Loss Estimate
Espanola	6	9	$511,436	$0	$344,293	$855,729	$213,932
Espanola/Santa Clara Pueblo	10	12	$821,368	$0	$628,689	$1,450,057	$362,514
Santa Clara Pueblo	4	5	$527,661	$0	$263,831	$791,492	$197,873
Santa Fe	301	562	$169,591,267	$0	$137,594,829	$307,186,096	$76,796,524
Unincorporated	28	41	$5,534,248	$0	$3,722,513	$9,256,761	$2,314,190
Total	**349**	**629**	**$176,985,980**	**$0**	**$142,554,154**	**$319,540,134**	**$79,885,034**

It is important to note that there could be more than one structure or building on an improved parcel (i.e., condo complex occupies one parcel but might have several structures). All parcels and the value of their improvements were analyzed. The end result is an inventory of the number and types of parcels and buildings subject to the hazards. Results are presented by unincorporated county, incorporated jurisdictions and Pueblos. Table 4.24 below show counts of flood-prone structures and parcels for the unincorporated County with detail on land use type within each flood zone. The table shows that the majority of risk is associated with single family residential structures (334 structures), though 19 commercial structures have a potentially high dollar loss.

Table 4.24: Unincorporated (Non-Pueblo) 1% Annual Chance Flood Hazard

Property Type	Flooded Structures	Improved Parcel Count	Improved Value	Agriculture Value	Content Value	Total Value Exposed	Loss Estimate
Commercial	19	11	$16,411,160	$0	$16,411,160	$32,822,320	$8,205,580
Exempt	10	5	$0	$0	$0	$0	$0
Exempt Federal	2	2	$0	$0	$0	$0	$0
Open Space	1	1	$0	$0	$0	$0	$0
Other	2	2	$0	$0	$0	$0	$0
Park	1	1	$0	$0	$0	$0	$0
Residential Condominium	1	1	$415,203	$0	$207,602	$622,805	$155,701
Residential Mobile Home	17	15	$112,409	$0	$56,205	$168,614	$42,153
Residential Single Family	334	240	$42,956,256	$18,350	$21,478,128	$64,452,734	$16,113,184
Vacant	53	45	$14,010	$4,010	$0	$18,020	$4,505
Total	**440**	**323**	**$59,909,038**	**$22,360**	**$38,153,094**	**$98,084,492**	**$24,521,123**

Table 4.25: Unincorporated (Non-Pueblo) 0.2% Annual Chance Flood Hazard

Property Type	Flooded Structures	Improved Parcel Count	Improved Value	Agriculture Value	Content Value	Total Value Exposed	Loss Estimate
Commercial	4	4	$1,910,778	$0	$1,910,778	$3,821,556	$955,389
Residential Mobile Home	3	2	$12,520	$0	$6,260	$18,780	$4,695
Residential Multi Family	3	1	$63,400	$0	$31,700	$95,100	$23,775
Residential Single Family	27	18	$3,547,550	$0	$1,773,775	$5,321,325	$1,330,331
Vacant	4	3	$0	$0	$0	$0	$0
Total	**41**	**28**	**$5,534,248**	**$0**	**$3,722,513**	**$9,256,761**	**$2,314,190**

This analysis accounts for flood damages only. Additionally, erosion caused by high waters can cause damage to drainage systems, creating shifting and meandering water channels that can move sediment and cause damage to property.

Critical Infrastructure. Analysis of critical facilities in both the 1% and 0.2% annual probability floodplain was conducted for Santa Fe County. Table 4.26 contains the number of critical facilities in the 1% annual chance flood zone; Table 4.27 contains the number of critical facilities in the 0.2% annual chance flood zone. The majority of the structures are bridges which are generally located in floodplains and may or may not be vulnerable without further evaluation. The HMPC identified that the shelter identified in this study is the Glorieta Conference Center and does not operate as a shelter. The Hazmat facility is the Shidoni Foundry (as noted in the EPA TRI).

Table 4.26: Critical Facilities in the 1% Annual Probability Zone

Category	Facility Type	Facility Count
High Potential Loss Facilities	Dam	5
	Hazmat	1
	Shelter	1
	Total	**7**
Transportation and Lifelines	Bridge	60
	Communication	6
	Potable Water	3
	Total	**69**
	Grand Total	**76**

Table 4.27: Critical Facilities in the 0.2% Annual Probability Zone

Category	Facility Type	Facility Count
High Potential Loss Facilities	Nursing Homes	1
	School	1
	Total	**2**
Transportation and Lifelines	Bridge	5
	Total	**5**
	Grand Total	**7**

Natural Environment

Natural resources are generally resistant to flooding except where natural landscapes and soil compositions have been altered for human development or after periods of previous disasters such as drought and fire. Wetlands, for example, exist because of natural flooding incidents. Areas that are no longer wetlands may suffer from oversaturation of water, as will areas that are particularly impacted by drought. Areas recently suffering from wildfire damage may erode because of flooding, which can permanently alter an ecological system. Flood water can also contain contaminants that may adversely affect the environment.

Flooding can be a secondary effect of wildfire. After the Las Conchas fire, the burn scar experienced multiple instances of flash flooding from heavy rains.

Future Development

Future plans to reduce the risk of future development to localized stormwater/flash flooding can be enhanced by accurate recordkeeping of repetitive localized storm activity. Mitigating the root causes of the localized stormwater or choosing not to develop in areas that often are subject to localized flooding will reduce future risks of losses due to stormwater/localized flooding.

Santa Fe County's continued population, housing, and employment growth creates pressure for land use change and the supporting infrastructure improvements. Floodplain management practices implemented through local floodplain management ordinances should mitigate the flood risk to new development in floodplains. Urbanization and increasing impervious surface areas tend to increase both the rate and the volume of stormwater runoff. Thus, the largest issue with future development trends is urbanization and stormwater drainage issues that add to the peak discharge and volume of floodwaters in floodplains.

Risk Summary

- Based on a GIS analysis of mapped flood hazard areas by Amec Foster Wheeler, 749 structures worth approximately $285M are potentially at risk to flooding countywide. 440 structures and $98M are in the unincorporated (non-Pueblo) area;
- According to the NFIP the County has 218 policies with $56.8M in coverage; there have been 21 claims totaling $223,000 since 1978. There are no repetitive loss properties (properties defined by the NFIP as having 2 or more claims of $1,000 or more in a 10 year period) in Santa Fe County.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Likely	Critical	High

4.3.6 High Winds (including Straight Line Winds and Microbursts)

Hazard/Problem Description

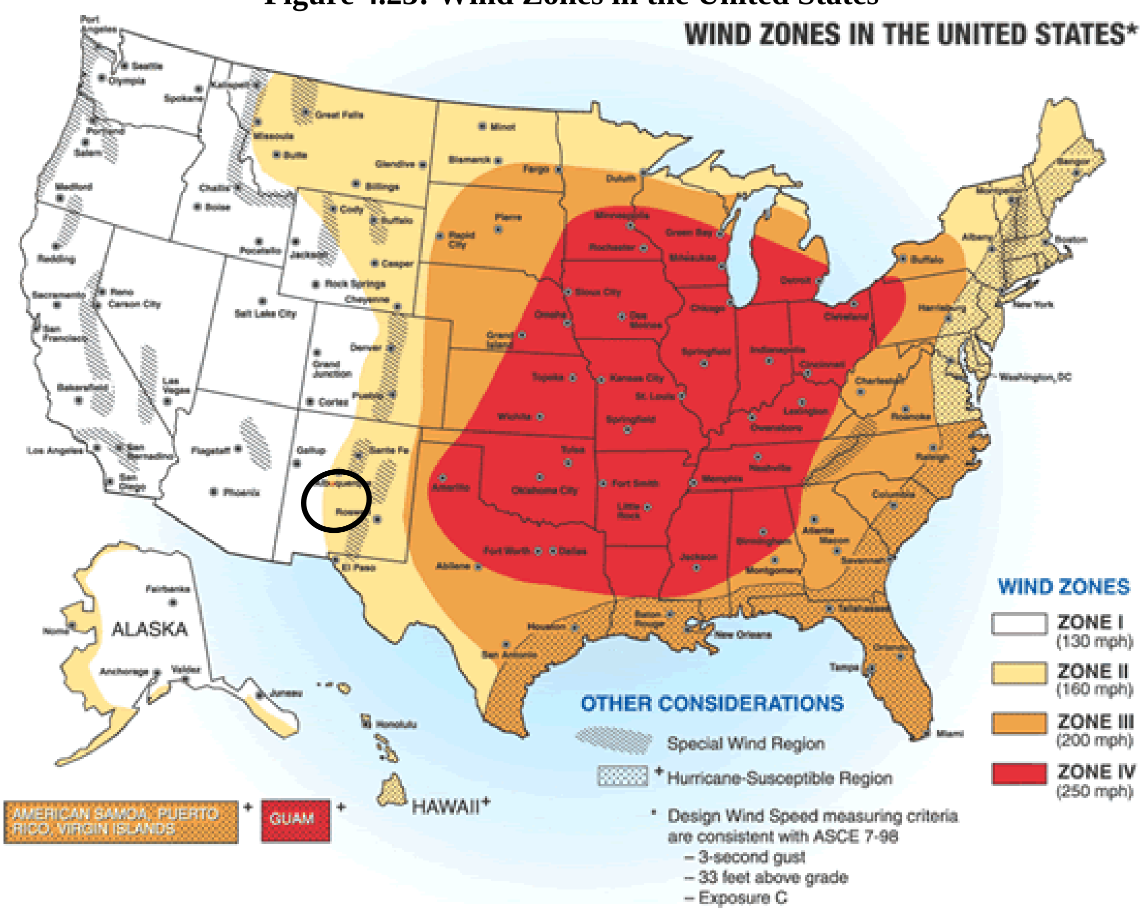
Wind is defined as the motion of air relative to the earth's surface, and the hazard of high wind is commonly associated with severe thunderstorm winds (exceeding 58 mph) as well as tornadoes, hurricanes, and tropical storms. High winds can also occur in the absence of other definable hazard conditions, events often referred to as simply "windstorms." High wind events might occur over large, widespread areas or in a very limited, localized area. They can occur suddenly without warning, at any time of the day or night.

Typically, high winds occur when large air masses of varying temperatures meet. High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss. Rapidly rising warm moist air serves as the "engine" for severe thunderstorms, tornadoes and other windstorm events. These storms can occur singularly, in lines or in clusters. They can move through an area very quickly or linger for several hours. Winds in Santa Fe County are typically straight-line winds, which are generally any thunderstorm wind that is not associated with rotation or tornadic. These winds can overturn mobile homes, tear roofs off of houses, topple trees, snap power lines, shatter windows, and sandblast paint from cars. Other associated hazards include utility outages, arcing power lines, debris blocking streets, dust storms, and an occasional structure fire. While straight line winds are the most common, microbursts and tornadoes may also occur in the County.

Straight-Line Winds

Figure 4.23 depicts wind zones for the United States. The approximate location of Santa Fe County is circled in black. The map denotes that the majority of the Planning Area falls into Zone II, which is characterized by high winds of up to 160 mph. Additionally, most of the County is within a Special Wind Region, meaning that it has an increased potential for strong downslope winds because of its topography.

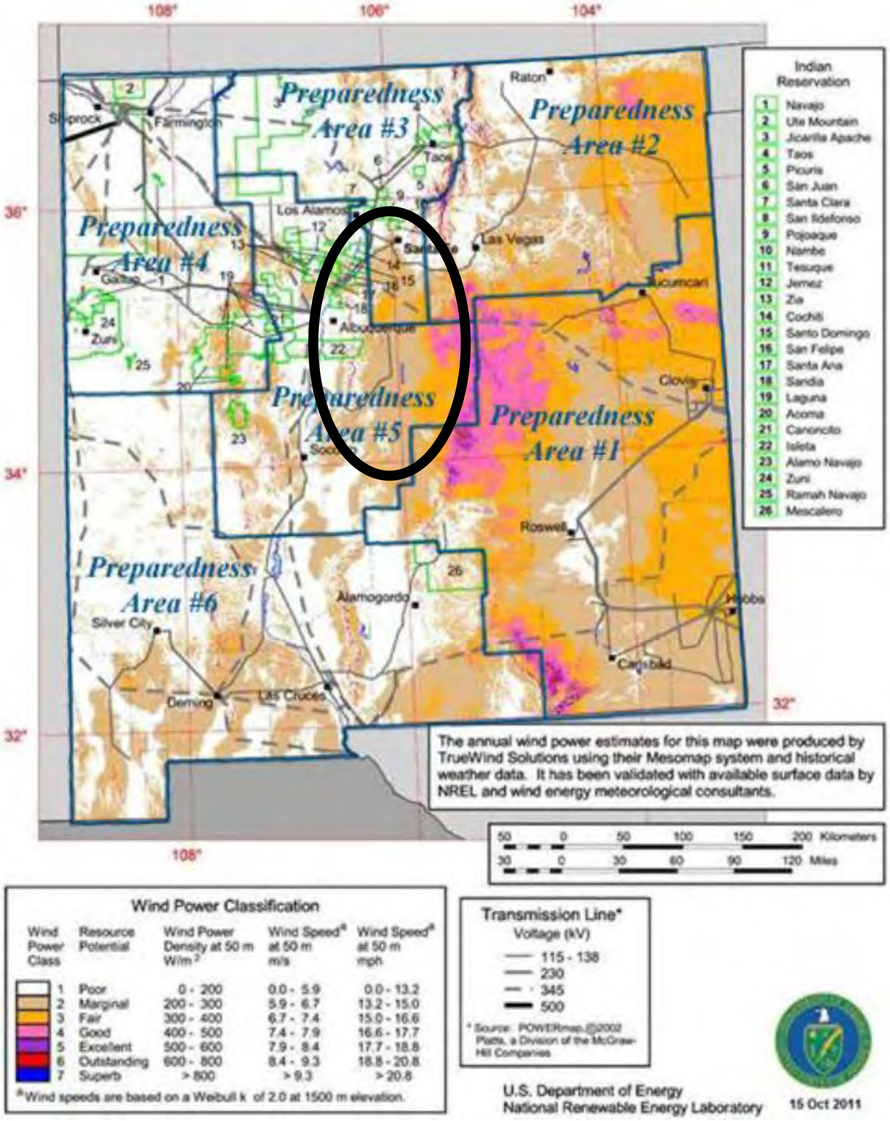
Figure 4.23: Wind Zones in the United States



Source: Federal Emergency Management Agency

The entire State of New Mexico is subject to high wind conditions, but areas most vulnerable include locations where the population is concentrated and buildings are of older design. Figure 4.24 shows average wind speeds in New Mexico as provided by the U.S. Department of Energy's Wind Program and the National Renewable Energy Laboratory, which is excerpted from the New Mexico Hazard Mitigation Plan. This wind resource map shows estimates of wind power density at 50 m above the ground. Santa Fe County, located in NM Preparedness Area 3, is circled in black. Average Wind Speeds by NM Preparedness Area.

Figure 4.24: Average Wind Speeds



* Santa Fe County circled by black oval
Source: New Mexico Hazard Mitigation Plan 2013

Microbursts

Santa Fe County is subject to high winds from microbursts as well. A microburst is a small downburst with an outflow less than 2½ miles (4 kilometers) in horizontal diameter and last for only 2-5 minutes. Despite their small size, microbursts can produce destructive winds up to 168 mph. Also, they create hazardous conditions for pilots and have been responsible for several disasters.

Location

Any area of the county is vulnerable to high winds.

Extent

While scales exist to measure the effects of wind, they can be conflicting or leave gaps in the information. For the purposes of this plan, the Beaufort Wind Scale (Table 4.28) was used because it is specifically adapted to wind effects on land.

Table 4.28: Beaufort Wind Scale

Force	Wind (MPH)	World Meteorological Organization (WMO) Classification	On Land
0	Less than 1	Calm	Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-18	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	19-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-31	Strong Breeze	Larger tree branches moving, whistling in wires
7	32-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Twigs breaking off trees, generally impedes progress
9	47-54	Strong Gale	Slight structural damage occurs.
10	55-63	Storm	Trees broken or uprooted, "considerable structural damage"
11	64-72	Violent Storm	Widespread structural damage.
12	72+	Hurricane	Considerable and widespread damage to structures.

Source: NOAA

All areas of the state can experience all 12 Beaufort categories.

Previous Occurrences

The National Climatic Data Center tracks previous occurrences for a variety of hazards nationally. The NCDC tracks wind incidents that fall under a variety of categories. For the purposes of assessing Santa Fe County's experience with high wind incidents, data was reviewed for the following categories: High Wind, Strong Wind and Thunderstorm Wind. NCDC criteria for recording incidents for each category is outlined below.

High Wind: Any incidents of high winds that are sustained non-convective winds of 40 mph or greater lasting for 1 hour or longer or winds (sustained or gusts) of 58 mph for any duration (or otherwise locally/regionally defined), on a widespread or localized basis. In some mountainous areas, the above numerical values are 50 mph and 75 mph, respectively.

NCDC records for high winds are available from 2009 onward. There have been 138 incidents of high winds meeting the NCDC criteria in this time. The vast majority of these caused no reported damage. The average speed of a high wind gust in Santa Fe was 59 mph, with a maximum reported wind gust clocking in 87 mph on March 8th, 2012; this wind gust didn't cause any recorded impacts. Because of the high number of high wind events, Table 4.29 details records high wind incidents that caused fatalities, injuries, or damage.

Table 4.29: High Wind Incidents 2010-2015

Date	Time	Incident	Magnitude (MPH)	Direct Fatalities	Direct Injuries	Property Damage	Crop Damage
05/10/10	0800	High Wind	64	0	0	$500	$0
10/25/10	1224	High Wind	64	0	0	$1,000	$0
03/18/12	1055	High Wind	65	0	0	$5,000	$500
04/26/12	1500	High Wind	45	0	0	$10,000	$0
04/14/13	1100	High Wind	60	0	0	$500	$0
02/19/14	2100	High Wind	83	0	0	$3,000	$0
			Total:	**0**	**0**	**$20,000**	**$500**

Source: National Climatic Data Center

Strong Wind: Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.

The NCDC records six strong wind incidents since 2010. Average wind speed of these incidents is 49 mph. Table 4.30 includes the entire list of recorded strong wind incidents in Santa Fe County.

Table 4.30: Strong Wind Incidents 2010-2015

Date	Time	Incident	Magnitude (MPH)	Direct Fatalities	Direct Injuries	Property Damage	Crop Damage
04/25/10	1500	Strong Wind	49	0	0	$500	$0
04/29/10	1300	Strong Wind	55	0	0	$1,500	$0
06/12/10	1300	Strong Wind	49	0	0	$2,000	$0
08/05/10	1418	Strong Wind	40	0	0	$100	$0
04/03/11	1500	Strong Wind	52	0	0	$30,000	$0
11/02/14	1000	Strong Wind	52	0	0	$1,000	$0
			Total:	**0**	**0**	**$72,000**	**$0**

Source: National Climatic Data Center

Thunderstorm Wind: Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 57 mph) producing a fatality, injury, or damage.

The NCDC has records of thunderstorm winds in Santa Fe County beginning in 1961; 33 thunderstorm wind incidents are recorded during this timeframe. Table 4.31 highlights those incidents that caused injury, fatalities or damages.

Table 4.31: Thunderstorm Wind Incidents 2010-2015

Date	Time	Incident	Magnitude (MPH)	Direct Fatalities	Direct Injuries	Property Damage	Crop Damage
06/25/90	1530	Thunderstorm Wind	0	0	1	$0	$0
06/10/96	1330	Thunderstorm Wind	-	0	0	$5,000	$0
07/23/98	1600	Thunderstorm Wind	-	0	1	$1,000	$0
06/02/00	1700	Thunderstorm Wind	-	0	0	$30,000	$0
07/16/05	2015	Thunderstorm Wind	56	0	1	$0	$0
12/01/07	500	Thunderstorm Wind	80	0	0	$100,000	$0
05/28/08	1500	Thunderstorm Wind	60	0	0	$1,000	$0
			Total:	**0**	**3**	**$137,000**	**$0**

Source: National Climatic Data Center

According to the NCDC, the average high wind event in Santa Fe County is caused by a 59 mph wind. It rarely causes fatalities, injuries or reportable damage. If it does cause damage, the average damage amount to property is $11,300, and the average damage amount to crops is $500.

The HMPC noted that the available data was inadequate to correctly account for the high winds that occur naturally each spring. Santa Fe County experiences high winds on a regular basis during these months.

Probability of Future Occurrences

Some level of high winds are an annual occurrence in the county. Damaging winds occur less frequently.

Vulnerability Assessment

People

People directly exposed to high winds should seek shelter immediately, as winds can pick up debris and injure the public. According to the NCDC database, no injuries or fatalities have been recorded as a direct result of high winds in Santa Fe County. Between 1996 and 2008, the State of New Mexico saw 8 fatalities and 21 injuries directly caused by high winds. Causes included being struck by debris, automobile accidents and semi rollovers.

Some segments of the population are especially vulnerable to the indirect impacts of damaging wind, particularly the loss of electrical power. The highest risk demographic is to first responders who are dealing with emergency situations resulting from the windstorm. Those working or recreating outdoors can be susceptible to injury from wind borne debris.

As a group, the elderly or disabled, especially those with home health care services rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, Community Based Residential Facilities, or other special needs housing may also be vulnerable if wind-caused electrical outages are prolonged. Without a back-up power source, rural residents and agricultural operations reliant on electricity for heating, cooling, and water supplies are also especially vulnerable to power outages.

Economy

Wind impacts typically don't have long-term impacts on the economy. Wind may impact exposed critical infrastructure such as power lines; depending on the impact and the function, this could cause a short-term economic disruption.

Built Environment

In terms of property losses, the actual damages will depend on the building density in the impacted area. This is highly variable across the County. A severe thunderstorm with high winds in an older residential area with older homes, large trees, and overhead utility lines will have a significantly greater impact with the same storm in a new development with lower building density, modern constructed buildings, small or newly planted trees, and underground power lines.

In terms of crop losses, the actual damages that occur will depend on the type of crop and the growth stage of the plants. A wind storm in a rural area in the early spring when the plants are just emerging will have much less of an impact than a storm of the same intensity occurring later in the growing season when the plants are more susceptible to damage and when there is no time to replant if the crop is a total loss. Overall, vulnerability for general property is medium.

Critical Infrastructure

Because of the unpredictability of high wind paths, most critical infrastructure that is above ground is equally exposed to the hazard. Power lines, communications networks, and other above-ground infrastructure are vulnerable to the effects of windstorms both directly and indirectly. The wind itself may damage the infrastructure, or the wind may damage tree branches and throw other debris into the air, which may cause secondary damage to buildings and critical facilities or capabilities. Emergency response vehicles with high profiles may be more exposed to high winds, which may hinder response times. In addition, wind may exacerbate dangerous conditions, such as fires, making response more difficult and dangerous. These are unlikely events but they are severe in occurrence. Overall, these assets have a medium to high vulnerability to windstorms. Due to the random nature of this hazard, a more specific risk assessment was not conducted for this plan.

Natural Environment

High winds can have many impacts on the environment, including erosion, flattening of trees and plants. Winds can cause wildfire to spread at a faster rate and exacerbate the impacts of winter storms and severe cold.

Future Development

Construction sites are particularly vulnerable to windstorms. Wind-borne construction materials can become hazards to life and property. New development should be able to withstand or at least resist wind damage if properly constructed. Backup power systems in critical facilities could help mitigate impacts from power outages associated with windstorms. Per the SLDC, new critical facilities such as communications towers are required to meet the ANSI/TIA-222-G standards for high winds.

Risk Summary

- Santa Fe County is located in a ‘Special Wind Region’ as defined by FEMA (increased potential for strong downslope winds because of its topography) due to its topography and geographic setting;

- High wind rarely causes fatalities, injuries or reportable damage. If the hazard does cause damage, the average damage amount to property is $11,300;
- According to the NCDC, the average high wind event in Santa Fe County is caused by a 59 mph wind. The highest magnitude wind gust recorded by NCDC was 81 mph on December 1, 2007.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Likely	Negligible	Low

4.3.7 Landslides and Rockfall

Hazard/Problem Description

Landslides. Landslides are the downward and outward movement of loose material on slopes. Landslides include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on and over steepened slopes is the primary reason for a landslide, landslides are often prompted by the occurrence of other disasters such as seismic activity or heavy rain fall. Landslides may be triggered by both natural and human-induced changes in the environment that result in slope instability.

A landslide is the breaking away and gravity-driven downward movement of hill slope materials, which can travel at speeds ranging from fractions of an inch per year to tens of miles per hour depending on the slope steepness and water content of the rock/soil mass. Landslides range from the size of an automobile to a mile or more in length and width and, due to their sheer weight and speed, can cause serious damage and loss of life. Their secondary effects can be far-reaching; such as catastrophic flooding due to the sudden release of river water impounded by landslide debris or slope failure of an earthen dam.

Debris flows are a mixture of rock fragments, soil, vegetation, water and, in some cases, entrained air that flows downhill as a fluid. Debris flows can range in consistency from that of freshly mixed concrete to running water. Debris flows can be further classified as mudflows and earth flows depending on the ratio of water to soil and rock debris. Lahars are a special form of debris flow caused by volcanic eruptions.

Landslide and debris flow problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides and debris flows. Land-use zoning, professional inspections, drainage and erosion control, and proper design can minimize many landslide and debris flow problems.

The susceptibility of an area to landslides depends on many variables including steepness of slope, type of slope material, structure and physical properties of materials, water content, amount of vegetation, and proximity to areas undergoing rapid erosion or changes caused by human activities. These activities include mining, construction, and changes to surface drainage areas.

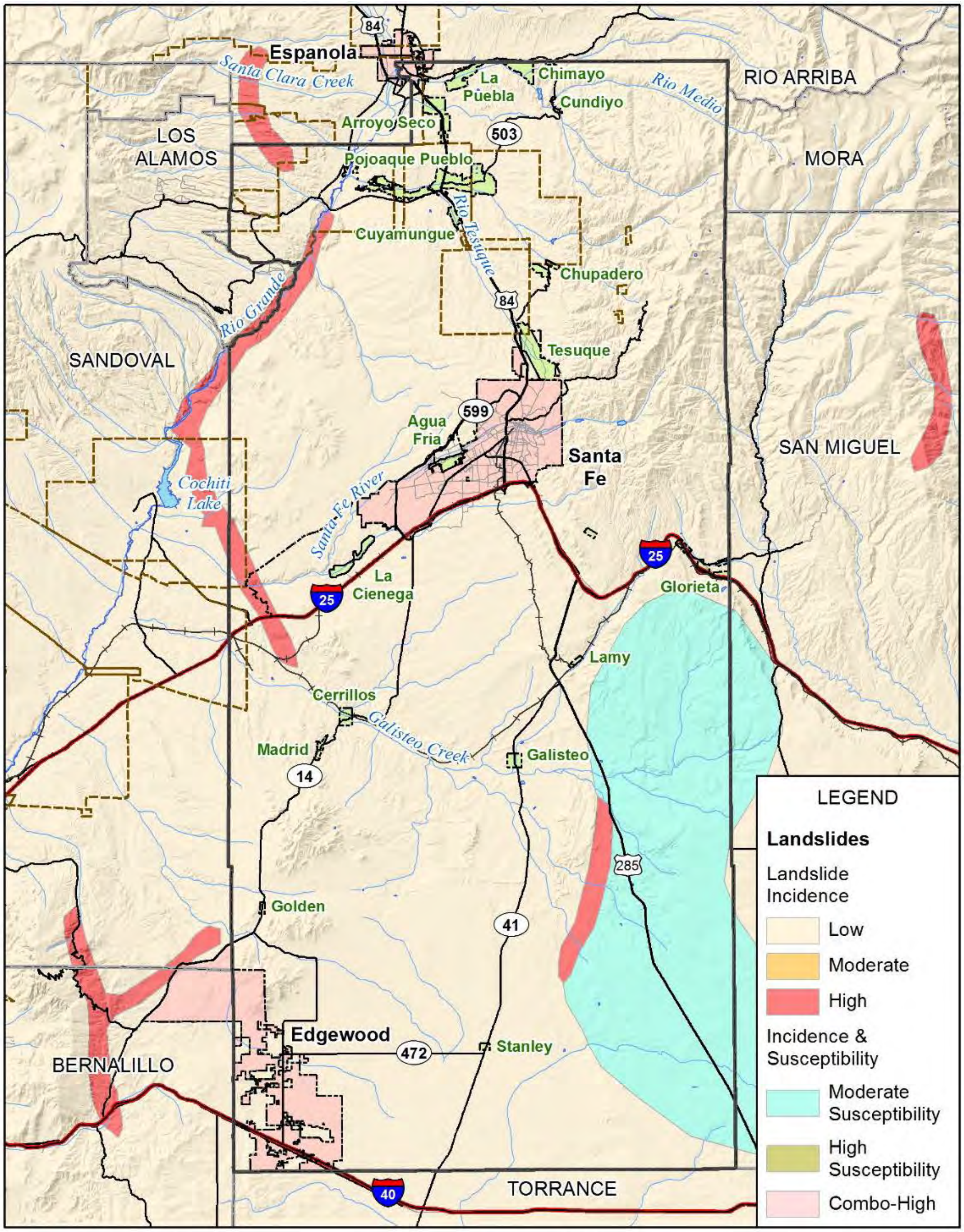
Landslides often accompany other natural hazard events, such as floods, wildfires, or earthquakes. Landslides can occur slowly or very suddenly and can damage and destroy structures, roads, utilities, and forested areas, and can cause injuries and death.

Rockfall. Rockfall is the falling of a detached mass of rock from a cliff or down a very steep slope. Weathering and decomposition of geological materials produce conditions to support rockfall. Rockfalls are caused by the loss of support from underneath through erosion or triggered by ice wedging, root growth, or ground shaking. Changes to an area or slope such as cutting and filling activities can also increase the risk of a rockfall. Rocks in a rockfall can be of any dimension, from the size of baseballs to houses. Rockfall occurs most frequently in mountains or other steep areas during the early spring when there is abundant moisture and repeated freezing and thawing. Rockfalls are a serious geological hazard that can threaten human life, impact transportation corridors and communication systems and result in other property damage.

Location

The USGS National Atlas landslide map is the best available landslide hazard mapping data for the County. Figure 4.25 shows the Rio Grande River as being potentially susceptible to landslides. This area has little or no development. It also shows moderate susceptibility to landslides in the southeastern portion of the county, east of the communities of Glorieta, Lamy, Galisteo and Stanley. This area also has little to no development, though Highway 285 runs through the area and could be adversely impacted by a landslide; secondary roads could also be affected.

Figure 4.25: Landslide Susceptibility in Santa Fe County



Map compiled 1/2016;
intended for planning purposes only.
Data Source: Santa Fe County,
HSIP Freedom 2015, USGS

0 5 10 Miles

N

Landslides directly damage buildings in two general ways: 1) disruption of structural foundations caused by differential movement and deformation of the ground upon which the structure sits; and 2) physical impact of debris moving down slope against structures located in the travel path. In addition to buildings, other types of engineered structures are vulnerable to the impact and ground deformation caused by slope failures, particularly utilities and transportation infrastructure. These belong to a category of structures called lifelines. Transmission lines for land-line telephone, electric power, gas, water, sewage, roadways, etc., are necessary for today's functioning society. They present a particular vulnerability because of their geographic extent and susceptibility to physical distress. Lifelines are generally linear structures that, because of their geographic extent, have a greater opportunity for impact by ground failure.

Extent

Landslides can be classified using the Alexander Scale, shown in Table 4.32. The scale is predicated on landslide debris impacting the built environment.

Table 4.32: Alexander Landslide Scale

Level	Damage	Description
0	None	Building is intact
1	Negligible	Hairline cracks in walls or structural members; no distortion of structure or detachment of external architectural details
2	Light	Buildings continue to be habitable; repair not urgent. Settlement of foundations, distortion of structure, and inclination of walls are not sufficient to compromise overall stability.
3	Moderate	Walls out of perpendicular by one or two degrees, or there has been substantial cracking in structural members, or the foundations have settled during differential subsidence of at least 6 inches; building requires evacuation and rapid attention to ensure its continued life.
4	Serious	Walls out of perpendicular by several degrees; open cracks in walls; fracture of structural members; fragmentation of masonry; differential settlement of at least 10 inches compromising foundations; floors may be inclined by one or two degrees or ruined by heave. Internal partition walls will need to be replaced; door and window frames are too distorted to use; occupants must be evacuated and major repairs carried out.
5	Very Serious	Walls out of plumb by five or six degrees; structure grossly distorted; differential settlement has seriously cracked floors and walls or caused major rotation or slewing of the building [wooden buildings are detached completely from their foundations]. Partition walls and brick infill will have at least partly collapsed; roofs may have partially collapsed; outhouses, porches, and patios may have been damaged more seriously than the principal structure itself. Occupants will need to be re-housed on a long-term basis, and rehabilitation of the building will probably not be feasible.
6	Partial Collapse	Requires immediate evacuation of the occupants and the cordoning off of the site to prevent accidents with falling masonry.
7	Total Collapse	Requires clearance of the site.

Source: 2013 New Mexico State Hazard Mitigation Plan

Previous Occurrences

Research during the development of this plan did not yield any previous occurrences of notable landslide or rockfall events.

Probability of Future Occurrences

Likely - Based on historical data, and given the sloped terrain along many of the roads within the Santa Fe area, landslide and rockfall hazards are likely to continue.

Vulnerability Assessment

People

People are susceptible if they are caught in a landslide or rockfall; falling debris can cause injury or death. There is also a danger to drivers operating vehicles, as rocks and debris can strike vehicles passing through the hazard area or cause dangerous shifts in roadways

Economy

Economic impacts would likely center around transportation routes temporarily closed by debris flow, rockfall or slide activity. These roads may be used to transport goods across the county, especially Highway 285. Depending on the amount of damage, the road may simply need to be cleaned off, or may need some level of reconstruction, but little evidence of slide risk was noted in this assessment.

Built Environment

Based on information provided by the HMPC and data from the USGS, there is some limited exposure to landslides in the County.

Areas of high landslide incidence include the northwestern corner of the County at the base of the Pajarito Plateau in the Diablo Canyon. This area, however, is National Forest land and uninhabited so human exposure to the hazard is limited. There is also an area of high landslide incidence in the White Bluffs area in between highways 285 and 41. This area is also sparsely populated.

During September 2013 the community of Madrid has suffered mudslide, debris flow and flood issues, some associated with runoff from abandoned mines. Efforts were underway in 2015 to mitigate erosion and debris issues.

Impacts to Critical Infrastructure

According to the USGS landslide map, while the county has areas susceptible to landslides and rockfall, the greatest risk occurs in locations without much development. The greatest risk would be landslide and rockfall debris over roads, specifically Highway 285 in the southeastern part of the County.

Natural Environment

Landslides and rockfalls have minimal impacts to the natural environment; these impacts would be confined to a small area. There is a slight chance that a rockfall or landslide could affect one of the rivers running through the hazard impact area, possibly causing blockages and water backup.

Future Development

There is no anticipated future development in landslide/rockfall areas, but lack of adequate hazard mapping should be taken into consideration.

Risk Summary

- Detailed maps of landslide, rockfall, or debris flow hazards in the County are currently not available;
- The Rio Grande valley is potentially susceptible to landslides and rockfall; this area has little or no development. It also shows moderate susceptibility to landslides in the southeastern portion of the county, nearest of the communities of Glorieta, Lamy, Galisteo and Stanley; this area also has little to no development , though Highway 285 runs through the area and could be adversely impacted by a landslide;
- Initial research did not result in any rockfall problem areas. The lack of adequate mapping should be taken into consideration;
- The community of Madrid has suffered debris flow and flood issues, some associated with runoff from abandoned mines. Some mitigation is underway.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Negligible	Likely	Negligible	Low

4.3.8 Land Subsidence

Hazard/Problem Description

Land subsidence as the sinking of the land over manmade or natural underground voids. Subsidence occurs naturally and also through man-driven or technologically exacerbated circumstances. Natural causes of subsidence occur when water in the ground dissolves minerals and other materials in the earth, creating pockets or voids. When the void can no longer support the weight of the earth above it, it collapses, causing a sinkhole depression in the landscape. Man-driven or technology-exacerbated subsidence conditions are associated with the lowering of water tables, extraction of natural gas, or subsurface mining activities. As the underground voids caused by these activities settle or collapse, subsidence occurs on the surface.

Collapsible soils are a subset of subsidence hazards. Hydrocompactive soil is the most common type of collapsible soil. These soils tend to shift or collapse once they become wet. Hydrocompactive soil forms in semi-arid to arid climates in the western US. These are surprisingly common in New Mexico according to the New Mexico Bureau of Geology and commonly affect home foundations, but the damage is generally not reported publically.

Location

Hydrocompactive soils are typically found on alluvial fans at the base of mountain fronts. A full understanding of this hazard is not clear due to lack of studies/mapping. As of early 2016 the New Mexico Bureau of Geology was in the process of securing funding to developing map of collapsible soils which may provide a better understanding of risk in the future. According to this agency areas in Espanola experienced trouble with collapsible soils in 1984 and the lower to middle Pojoaque valley may also face potential for collapsible soils. During a public meeting on February 11, 2016 the public noted that ground water withdrawals in the eastern Pojoaque Valley, near the Nambe Dam, as a potential area of subsidence concern.

Extent

Impacts related to subsidence historically have been isolated and affected foundations of residential housing.

Previous Occurrences

In December 1984, a number of homes east of Espanola were condemned because of damage caused by hydrocompactive soils.

Probability of Future Occurrences

There has only been one reported incident in the County that caused property damage since 1984, but it is likely that more cases have gone unreported. The probability of subsidence occurring in any given year is 3.2% based on 1 incident in the past 31 years. Modern construction practices that include proper geotechnical investigations should limit the probability of occurrence with new development. It is possible that hydrocompactive soils may become more problematic during wet climate cycles in the future.

Vulnerability Assessment

People

Typically this hazard results in property damage, not risk to human life.

Economy

The consequences of improper use of land subject to ground subsidence can be excessive economic losses, including the high costs of repair and maintenance for buildings, irrigation works, highways, utilities, and other structures. This results in direct economic losses to citizens as well as indirect economic losses through increased taxes and decreased property values.

Built Environment

Subsidence may result in serious structural damage to buildings, roads, irrigation ditches, underground utilities, and pipelines. It can disrupt and alter the flow of surface or underground water. Weight, including surface developments such as roads, reservoirs, and buildings and manmade vibrations from such activities as blasting or heavy truck or train traffic can accelerate natural processes of subsidence, or incur subsidence over manmade voids. Fluctuations in the level of underground water caused by pumping or by injecting fluids into the earth can initiate sinking to fill the empty space previously occupied by water or soluble minerals. Available data prevented further estimation of loss potential.

Critical Infrastructure. Linear infrastructure (roads, buried pipelines) tends to have the most risk to land subsidence. Due to the lack of specific mapping of this hazard a more specific risk assessment was not conducted for this plan.

Natural Environment

Typically there is little impacts to the natural environment from this hazard.

Future Development

Collapsible soils issues can typically be avoided by careful geotechnical testing before construction. As such, vulnerability to this hazard is not anticipated to increase with new development, provided that land use planning and engineering practices are followed. Increased efforts to monitor mining operations, increased accuracy of mapping, and emphasis on appropriate grading and ground compaction during development will help alleviate vulnerability for future development in unknown areas of risk.

Risk Summary

- Hydrocompactive soils tend to shift and collapse when wet and have damaged homes and structures in the past;
- In December 1984, a number of homes east of Espanola were condemned because of damage caused by hydrocompactive soils;
- Typically found on alluvial fans at the base of mountain fronts;
- A full understanding of this hazard is not clear due to lack of studies/mapping.

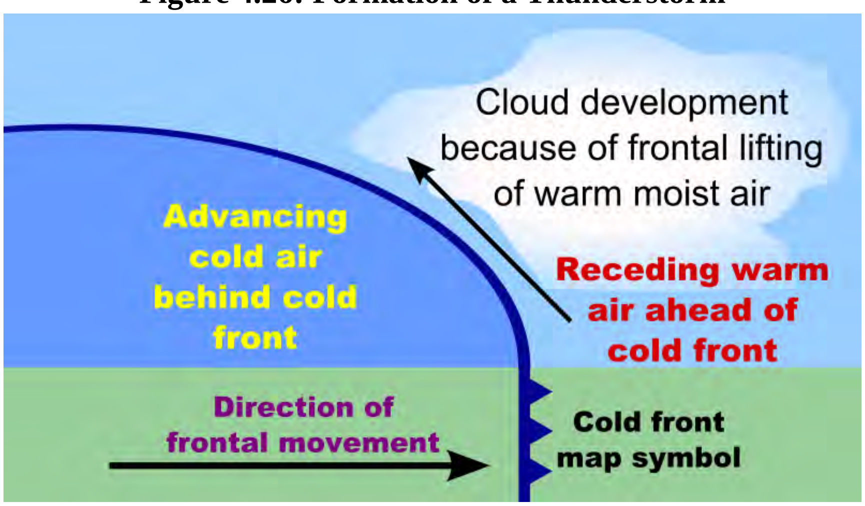
Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Negligible	Unlikely	Negligible	Low

4.3.9 Severe Thunderstorms (includes Monsoon, Hail and Lightning)

Hazard/Problem Description

Severe thunderstorms in the Santa Fe County Planning Area are generally characterized by heavy rain, often accompanied by strong winds and sometimes lightning and hail. Approximately 10 percent of the thunderstorms that occur each year in the United States are classified as severe. According to the National Weather Service, a thunderstorm is classified as severe when it contains one or more of the following phenomena: hail that is three-quarters of an inch or greater, winds in excess of 50 knots (57.5 mph), or a tornado. In an average year, Santa Fe experiences 51 thunderstorm days, usually occurring between April and September. This chapter profiles several sub-hazards that can impact Santa Fe County in different ways – monsoon, hail and lightning. Thunderstorm winds are addressed in the High Winds section, and tornadoes are also addressed separately.

Figure 4.26: Formation of a Thunderstorm



Source: NASA. http://rst.gsfc.nasa.gov/Sect14/Sect14_1c.html

Monsoon

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 feet. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at Earth's surface and causes strong winds associated with thunderstorms.

The term monsoon generally refers to a seasonal wind shift, or monsoon circulation, that produces a radical change in moisture conditions in a given area or region. In the southwestern United States, this shift in wind direction is primarily the result of two meteorological changes:

- The movement northward from winter to summer of the huge upper level subtropical high pressure system, specifically known as the Bermuda High, and
- The intense heating of the Mojave Desert creates rising air and surface low pressure, called a thermal low.

These two features then combine to create a strong southerly flow that helps bring in moisture (i.e., from the Gulf of Mexico, the Gulf of California, and the Pacific Ocean) that lifts and forms thunderstorms when it encounters the higher terrain of New Mexico, including Santa Fe.

Hail

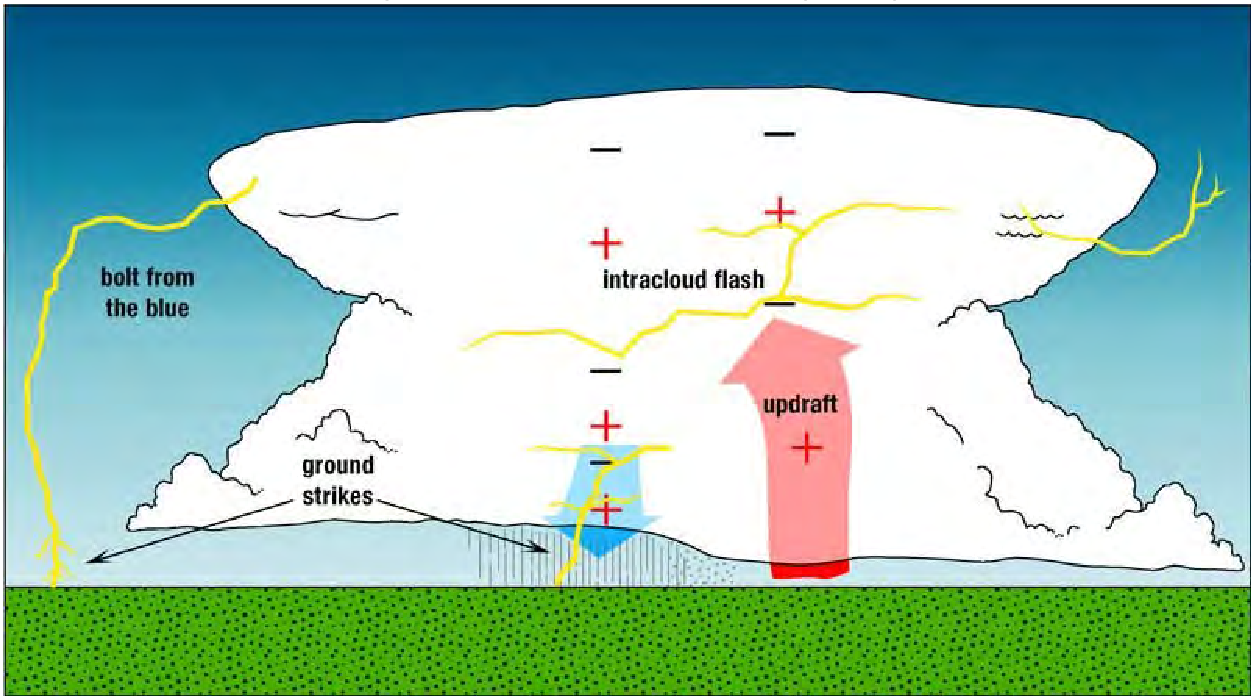
Hail is formed when water droplets freeze and thaw as they are thrown high into the upper atmosphere by the violent internal forces of thunderstorms. Hail is sometimes associated with severe storms within the Santa Fe County Planning Area. Hailstones are usually less than two inches in diameter and can fall at speeds of 120 miles per hour (mph). Severe hailstorms can be quite destructive, causing damage to roofs, buildings, automobiles, vegetation, and crops.

Lightning

Lightning is defined as any and all of the various forms of visible electrical discharge caused by thunderstorms. Thunderstorms and lightning are usually (but not always) accompanied by rain. Cloud-to-ground lightning can kill or injure people by direct or indirect means. Objects can be struck directly, which may result in an explosion, burn, or total destruction. Damage may also be indirect, when the current passes through or near an object, which generally results in less damage.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning. Most flashes originate near the lower-negative charge center and deliver negative charge to earth. However, a large minority of flashes carry positive charge to earth. These positive flashes often occur during the dissipating stage of a thunderstorm's life. Positive flashes are also more common as a percentage of total ground strikes during the winter months. This type of lightning is particularly dangerous for several reasons. It frequently strikes away from the rain core, either ahead or behind the thunderstorm. It can strike as far as 5 or 10 miles from the storm in areas that most people do not consider to be a threat. Positive lightning also has a longer duration, so fires are more easily ignited. And, when positive lightning strikes, it usually carries a high peak electrical current, potentially resulting in greater damage.

Figure 4.27: Cloud to Ground Lightning



Source: National Weather Service

Location

Thunderstorms are generally expansive in size. The entire county is susceptible to any of the effects of a severe thunderstorm, including monsoon, hail and lightning. The typical thunderstorm is 15 miles in diameter, and lasts 30 minutes. Thunderstorms generally move from west to east across the county.

Extent

The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.33 indicates the hailstone measurements utilized by the National Weather Service.

Table 4.33: Hailstone Measurements

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf-Ball
2.0 inch	Hen Egg
2.5 inch	Tennis Ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

The largest hailstones recorded in Santa Fe County had a diameter of 1.75 inches; this measurement has been recorded seven separate times between 1960 and 2015. While 1.75 inches is a historical maximum size, Santa Fe could be susceptible to larger stones that could do even more damage. The largest hailstones recorded in New Mexico had a diameter of 4.50 inches.

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide. The LAL is reproduced below (Table 4.34):

Table 4.34: Lightning Activity Level Scale

LIGHTNING ACTIVITY LEVEL	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning.

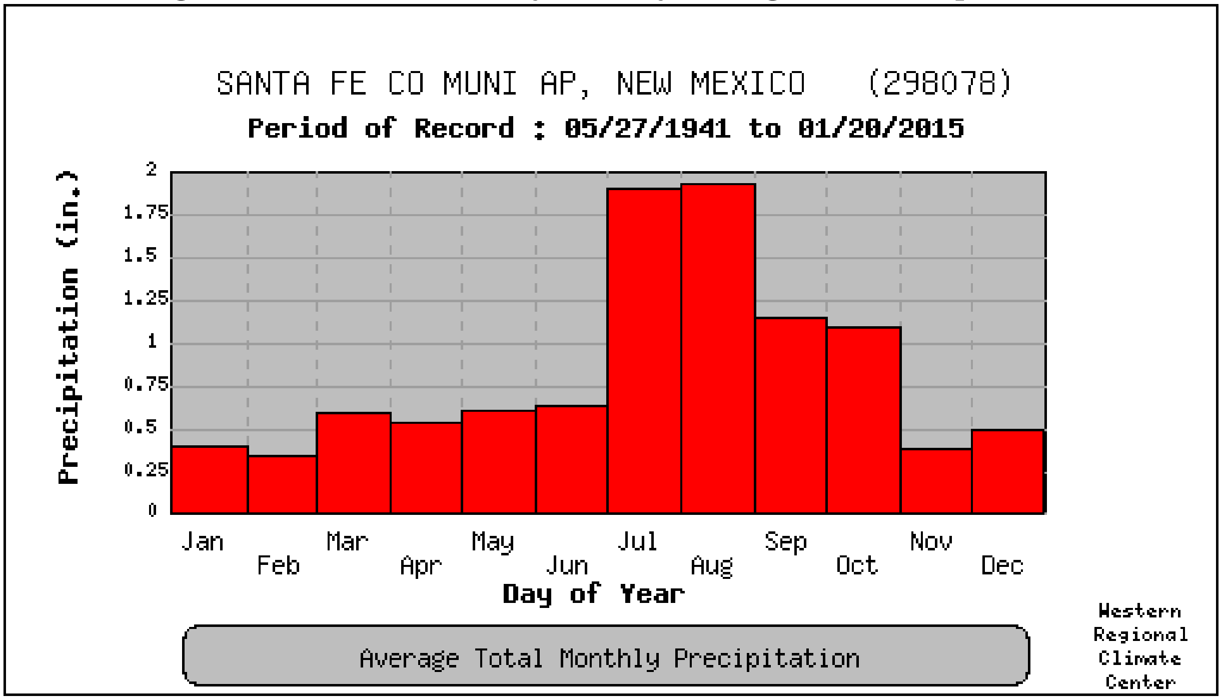
Source: National Weather Service

Santa Fe County is at risk to experience lightning in any of these categories.

Previous Occurrences

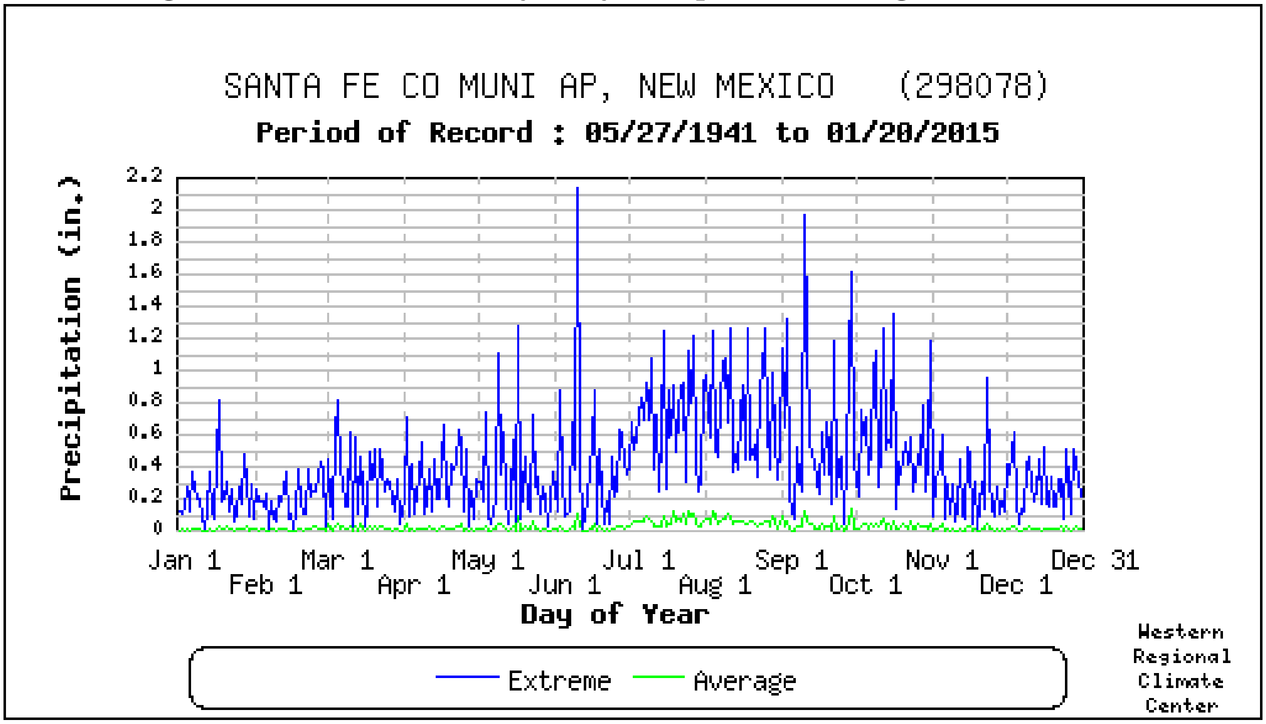
In Santa Fe County, summer begins with warm, and often dry, conditions in June, followed by a 2-month rainy season. This rainy season in July and August, often referred to as the “monsoon” season, is really just predictable afternoon rainstorms that make up approximately 36% of the annual 18.7 inches of precipitation. However, the annual total fluctuates considerably from year to year and the monsoon can start as early as mid-June. Average monthly precipitation totals for Santa Fe County are shown in Figure 4.28. Precipitation extremes for the County are shown in Figure 4.29.

Figure 4.28: Santa Fe County Monthly Average Total Precipitation



Source: Western Regional Climate Center

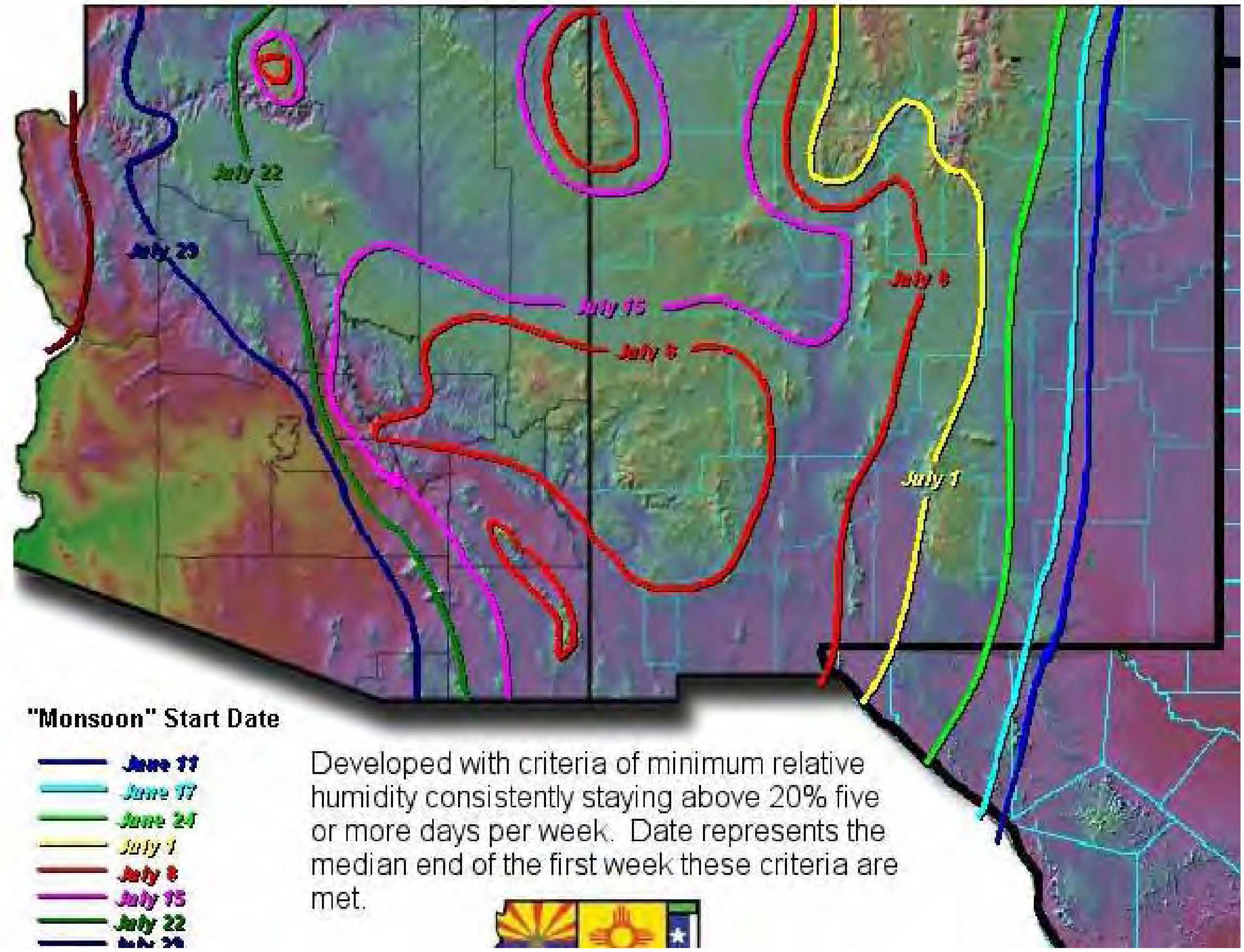
Figure 4.29: Santa Fe County Daily Precipitation Average and Extremes



Source: Western Regional Climate Center

Consistent with the monthly annual precipitation records, Figure 4.30 illustrates the typical monsoon season “start date” in New Mexico and Santa Fe County.

Figure 4.30: Monsoon Start Dates in New Mexico and Santa Fe County



Source: Southwest Area Predictive Services

Heavy rain, monsoons, thunderstorms, lightning, and hail in Santa Fe County are many in number and occur on a yearly basis. The NCDC has not recorded a heavy rain incident between 1960 and 2015.

The NCDC recorded 88 hail incidents between 1960 and 2015, though there were no damages to crops or property, nor were there any direct injuries or fatalities. Of the 88 incidents, 43 recorded hail with a diameter under one inch, and 45 recorded hail with a diameter between one inch and two inches. Hail with a diameter over two inches was not recorded. The average diameter of hailstone was 1", with the highest recorded hailstorm diameter being 1.75".

Lightning in Santa Fe County occurs on a yearly basis everywhere in the county. Not all lightning causes damages. Specific events are detailed by the NCDC database, and are noted in Table 4.35. NCDC records any "sudden electrical discharge from a thunderstorm, resulting in a fatality, injury or damage."

Table 4.35NCDC Lightning Incidents in Santa Fe County, 1996 to 2012

Date	Location	Time	Injuries	Fatalities	Property Damage (2015 USD)	Crop Damage (2015 USD)
07/09/1996	Santa Fe	20:30	0	0	$90,992	$0
08/03/1997	Santa Fe	11:30	1	2	-	-
08/12/1998	Santa Fe	16:30	0	1	-	-
08/30/1998	Santa Fe	20:30	0	1	-	-
08/17/2006	Santa Fe	14:00	0	2	-	-
07/24/2007	Santa Fe	17:55	0	0	$2,295	-
07/02/2010	Tesuque	21:00	0	0	$15,775	-
07/12/2013	Santa Fe	17:00	0	0	-	-
08/04/2014	Santa Fe	16:30	0	0	$1,005	-
Totals			**1**	**6**	**$110,067**	**$0**

Source: NCDC

Injuries and fatalities recorded for Santa Fe County from lightning included hikers, construction workers and others who were not under shelter during a thunderstorm. Property damage was mostly centered on damage to homes. The HMPC noted that the number of damaging lightning strikes recorded seems very low – they cited a single thunderstorm in 2015 that had an estimated 1500 lightning strikes.

Probability of Future Occurrences

Likely – Severe weather, including monsoon, thunderstorms, hail and lighting, is a well-documented seasonal occurrence that will continue to occur in the Santa Fe County Planning Area.

Vulnerability Assessment

People

Exposure is the greatest danger to people from severe thunderstorms. People can be hit by lightning, pelted by hail, and caught in rising waters. Serious injury and loss of human life is rarely associated with hailstorms.

While national data shows that lightning causes more injuries and deaths than any other natural hazard except extreme heat, there doesn't seem to be any trend in the data to indicate that one segment of the population is at a disproportionately high risk of being directly affected. Anyone who is outside during a thunderstorm is at risk of being struck by lightning. Aspects of the population who rely on constant, uninterrupted electrical supplies may have a greater, indirect vulnerability to lightning. As a group, the elderly or disabled, especially those with home health care services relying on rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged. If they do not have a back-up power source, rural residents and agricultural operations reliant on electricity for heating, cooling, and water supplies are also especially vulnerable to power outages.

Economy

Economic impact of severe thunderstorms are typically short term. Lightning can cause power outages and fires. Hail can destroy exposed property; an example is car lots, where entire inventories can be damaged. Generally, long-term economic impacts center more around hazards that cascade from a severe thunderstorm, including wildfires ignited by lightning and flooding.

Built Environment

The Santa Fe County Planning Area experiences a rainy season in the summer, often referred to as the "monsoon" season. These summer storms can include significant precipitation, winds, and hail. According to historical hazard data, severe weather is an annual occurrence in Santa Fe County. Damage and disaster declarations related to severe weather have occurred and will continue to occur in the future. Heavy rain and thunderstorms are the most frequent type of severe weather occurrences in the County. Utility outages, downing of trees, debris blocking streets and damage to property can be a direct result of these storm events. Given the nature of these types of storms, the entire County is potentially at risk.

The NCDC records no property or crop damage caused by the 88 recorded hail incidents in Santa Fe County. However, hail is one of the costliest hazards in the United States, causing over $1 billion in damage to crops and property each year.

The NCDC records $78,000 in property damage and $0 in crop damage from lighting in Santa Fe County since 1996. The bulk of the damage occurred during a specific lightning incident in 1996 that caused $60,000 in damage to a home. These figures likely do not include insured losses. According to the Rocky Mountain Insurance Information Association, lightning strikes nationally cost about $674 million in homeowner's insurance losses in 2013. The average claim in 2013 was $5,869.

Based on historic information, the primary effect of these storms has not resulted in significant injury or damages to people and property, or the losses are typically covered by insurance. It is the secondary hazards caused by weather, such as floods, that have had the greatest impact on the County.

Impacts on Critical Infrastructure

Because of the unpredictability of severe thunderstorm strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. Due to the random nature of these hazards, a more specific risk assessment was not conducted for this plan.

Natural Environment

Severe thunderstorms are a natural environmental process. Environmental impacts include the sparking of potentially destructive wildfires by lightning and localized flattening of plants by hail. As a natural process, the impacts of most severe thunderstorms by themselves are part of the overall natural cycle and do not cause long-term consequential damage.

Future Development

New critical facilities, such as communication towers should be built to withstand heavy rain, monsoon, and hail damage. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Stormwater master planning and site review (included in the SLDC) should be considered for all new development. Thus development trends in the County are not expected to increase overall vulnerability to the hazard, but population growth will increase potential exposure to hazards such as lightning.

Risk Summary

- In an average year, Santa Fe experiences 51 thunderstorm days, usually occurring between April and September. The typical thunderstorm is 15 miles in diameter, and lasts 30 minutes.
- The largest hailstones recorded in Santa Fe County had a diameter of 1.75 inches; this measurement has been recorded seven separate times between 1960 and 2015;
- Injuries (1) and fatalities (6 since 1996) recorded for Santa Fe County from lightning included hikers, construction workers and others who were not under shelter during a thunderstorm. Property damage was mostly centered on damage to homes.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Significant	Highly Likely	Negligible	Low

4.3.10 Severe Winter Storms

Hazard/Problem Description

Santa Fe County receives snowfall on a regular seasonal basis, mostly between the months of October and April. Because of the size of average storms, every area of the county is usually affected. Winter storms occur when precipitation and freezing temperatures mix to produce a significant accumulation of snow or ice. Winter storms are often worsened by wind that produces blowing and drifting snow and reduced visibility. Winter storms can be quite disruptive. Road closures can occur causing people to become stranded; accidents occur; power, water and sewer services can be temporarily interrupted. These events can cause great impact to the County depending on the severity and duration of a storm.

Location

Blizzards and severe winter storms are regional in nature, typically occurring across large areas of the county at once; higher elevations are more prone to deeper snow accumulations and more intense storms.

Extent

The extent of winter storms and cold that cause issues in Santa Fe County includes storms forecasted to be Winter Storm Warnings, Wind Chill Warnings or Blizzard Warnings. The National Weather Service in Albuquerque issues a Winter Storm Warning when conditions that can quickly become life threatening and are more serious than an inconvenience are imminent or already occurring. Heavy snows, or a combination of snow, freezing rain or extreme wind chill due to strong wind, may bring widespread or lengthy road closures and hazardous travel conditions, plus threaten temporary loss of community services such as power and water. Deep snow and additional strong wind chill or frostbite may be a threat to even the appropriately dressed individual or to even the strongest person exposed to the frigid weather for only a short period.

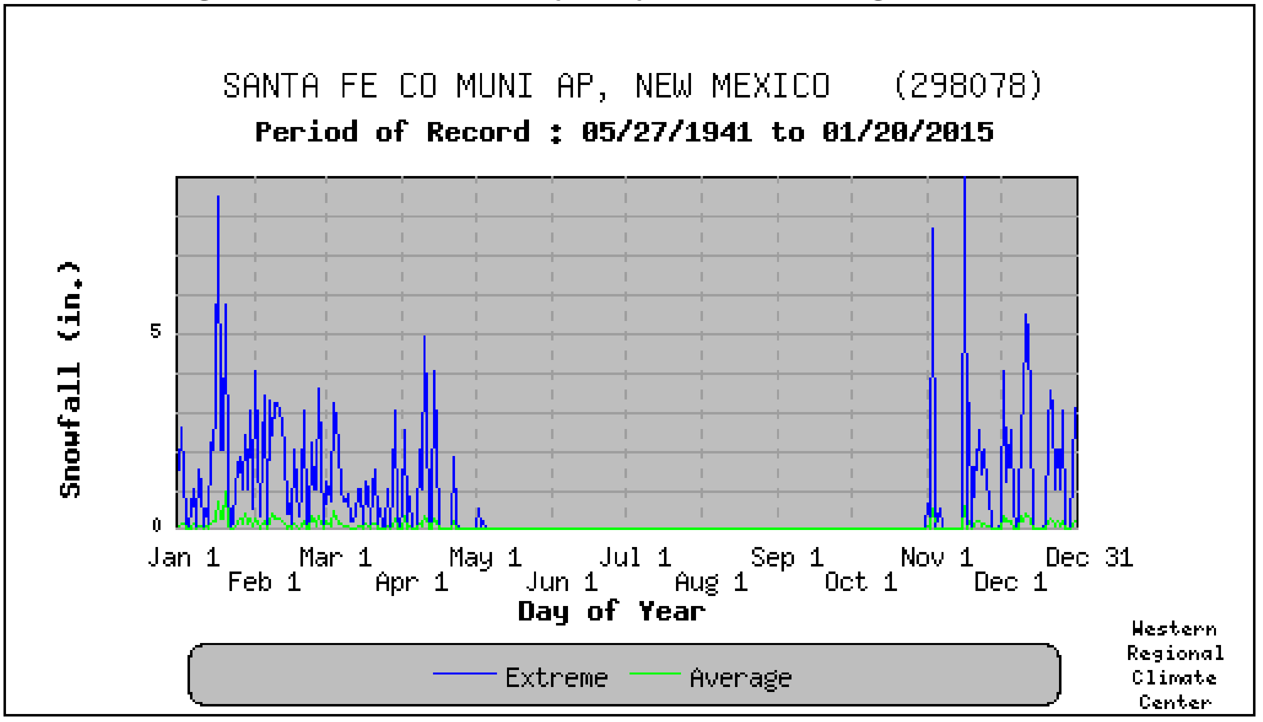
A Wind Chill Warning is issued when the wind chill temperatures at or colder than minus 50 degrees F. At this level, frostbite can occur on exposed flesh within minutes. As the wind chill temperature drops, the frostbite time decreases, especially with higher wind speeds.

The most dangerous of all winter storms is the blizzard. A blizzard warning is issued when winds of 35 miles an hour will occur in combination with considerable falling and/or blowing snow for at least 3 hours. Visibilities will frequently be reduced to less than 1/4 mile and temperatures are usually 20 degrees Fahrenheit or lower.

Between the period from 1941 to 2015 and based on the sum of monthly averages, Santa Fe County received an annual average of 53.2 inches of snow per year. In 1987, the County received 172.1 inches of snow for the year. 1987 had snow totals of 64.8 inches in January, and 48.5 inches in

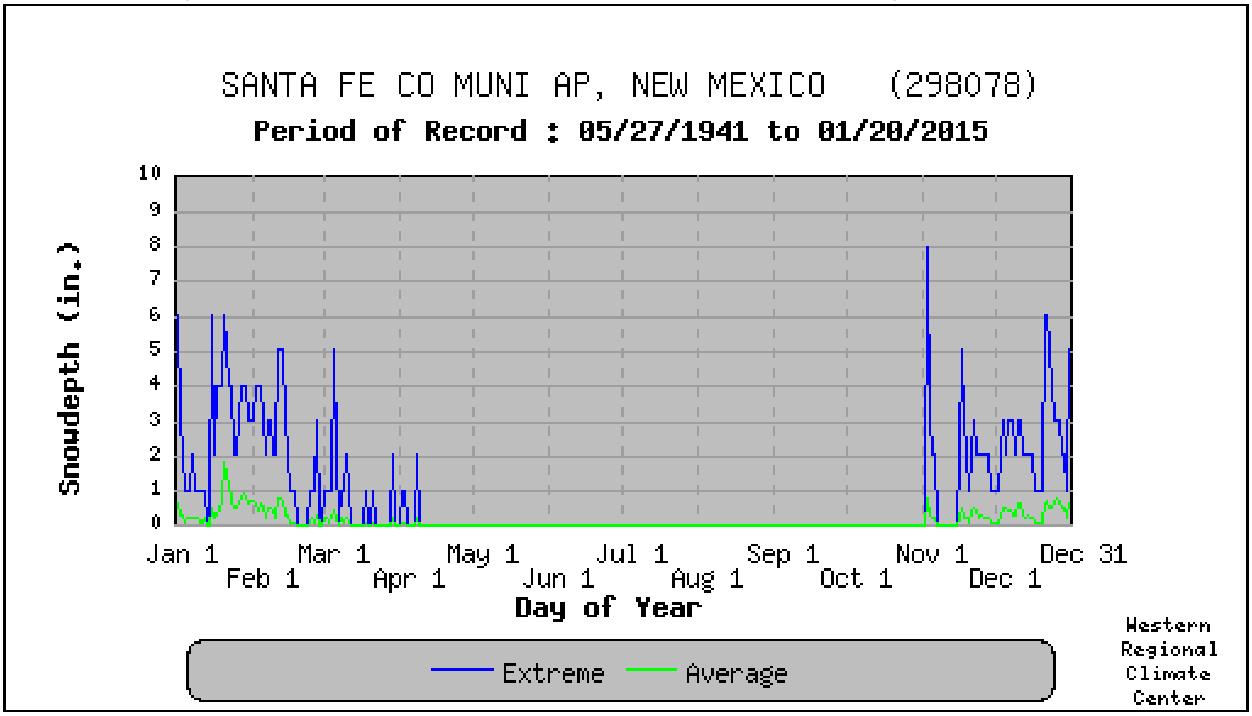
February. Figure 4.31 shows daily snowfall averages and extremes for the western portion of the County. 01 shows average snow depths for the Santa Fe County Municipal Airport.

Figure 4.31: Santa Fe County Daily Snowfall Average and Extreme



Source: Western Regional Climate Center

Figure 4.32: Santa Fe County Daily Snowdepth Average and Extreme



Source: Western Regional Climate Center

The maximum daily snowdepth in Santa Fe County at the airport occurred in the month of November, with eight inches of snow on the ground. The record snowfall amount in a 24-hour period at this site is 9 inches, also recorded in the month of November. Much greater amounts of snow can occur in the higher elevations of the County that are sparsely populated or developed.

Previous Occurrences

The heavy levels of snow in Santa Fe County at the airport combined with other inclement weather create many issues that impact the area. Extreme weather events associated with snow and blizzard events occur almost on an annual basis. Winter storms occur countywide and involve heavy rains, snow, ice, and high winds causing downed trees and power lines, power outages, accidents, and road closures. There are typically few injuries and limited damages.

Table 4.36 contains the NCDC database information for winter storm and winter weather events in Santa Fe County; the database contains records back to 2010. According to the NCDC, winter storms are recorded when more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis. Normally, a winter storm noted in the database would have posed a threat to life or property.

Remarks and details are shown in the narrative below the table.

Table 4.36: Santa Fe County Winter Storm and Winter Weather January 2010-August 2015

Date	Direct Injuries	Direct Fatalities	Property Damage	Crop Damage
01/28/2010	0	0	$0	$0
12/06/2013	1	0	$0	$0
12/25/2014	0	0	$0	$0
12/26/2014	0	0	$0	$0
02/22/2015	0	0	$0	$0
05/15/2015	0	0	$0	$0
Total	**1**	**0**	**$0**	**$0**

Source: NCDC

January 28, 2010 - Despite a respite from winter storms for a few days, icy roads were still a factor across much of northern New Mexico due to several rounds of winter storms the previous week.

December 6, 2013 - A powerful jet stream that surged over the area on the 3rd and 4th drove an arctic airmass south across a vast section of the western United States. This airmass pushed into New Mexico early on the 4th and interacted with a moist upper level disturbance shifting northeast out of eastern Pacific Ocean through the 5th. The eastern plains were socked in by low clouds, freezing fog, freezing drizzle and snow behind this front. Meanwhile, a band of snow developed over northwestern New Mexico then shifted southeast across the Continental Divide and diminished quickly over the Rio Grande Valley. A secondary band of snowfall then developed over southwestern New Mexico and shifted slowly northeast across the Rio Grande Valley and into the eastern plains, producing significant snowfall for the Albuquerque and Santa Fe Metro areas and the East Mountain communities. Numerous accidents were reported along with several highway and interstate closures. At least 2 fatalities were attributed to the wintry weather. An extremely violent semi-truck crash occurred along Interstate 40 east of Clines Corners early on December 6th. One of the semis rear-ended another semi and one of the drivers died as a result of that crash while being taken to the hospital.

December 25, 2014 - A strong, slow-moving upper level storm system crossed central and northern New Mexico Christmas night through the 26th. Areas of snow initially set up over northwest and west-central New Mexico late Christmas day along the associated Pacific front. As the cold front slowly moved eastward, bands of heavy snow developed and quickly expanded resulting in widespread, moderate to significant accumulations for the higher elevations of central and northern New Mexico as well as the east-central and northeast high plains. Meanwhile, a back door cold frontal boundary shifted southwest over the northeast plains and stalled along the east slopes of the central mountain chain. The combination of strong lift with the upper low and upslope flow along the front produced heavy snowfall accumulations for the Sangre de Cristo Mountains. Many areas in the high terrain reported 5 to 11 inches. Moderate snowfall accumulations of 3 to 6 inches were also reported along the Interstate 40 corridor around the Sandia Mountains and the Continental Divide, as well as near Clines Corners and Vaughn.

February 22, 2015 - A very dry and warm start to the month of February ended with an extremely beneficial pattern change that delivered large snowfall amounts to the northern high terrain of New Mexico. The big change arrived beginning on the 22nd as a powerful blast of arctic air moved south and west across the area and plunged New Mexico into winter once again. Meanwhile, a series of upper level low pressure systems crossed from southern California into Arizona and pumped abundant moisture over New Mexico. The heaviest snowfall accumulations occurred over the northern high terrain where 1 to 2 feet of new snow was reported. A strong surface pressure gradient in place over the area also produced strong gap winds in the Rio Grande Valley. Widespread difficult to severe driving conditions were reported along with several road closures over portions of New Mexico. This was the first in a series of significant winter storms that impacted the area through early March.

The HMPC noted that Edgewood and the southern areas in the county experienced 1.5 to 2 feet of snow in the last week of December, 2015.

Probability of Future Occurrences

Winter storms with snow and freezing temperatures in the County are a frequent event, and occur annually.

Vulnerability Assessment

People

While virtually all aspects of the population are vulnerable to severe winter weather, there are segments of the population that are more vulnerable to the potential indirect impacts of a severe winter storm than others, particularly the loss of electrical power. If they do not have a back-up power source, rural residents reliant on electricity for heating and water supplies are also especially vulnerable to power outages. As a group, the elderly or disabled, especially those with home health care services that rely heavily on an uninterrupted source of electricity. Resident populations in nursing homes, residential facilities, or other special needs housing may also be vulnerable if electrical outages are prolonged.

Public education efforts may help minimize the risks to future populations by increasing knowledge of appropriate mitigation behaviors, clothing, sheltering capacities, and decision making regarding snow totals, icy roads, driving conditions, and outdoor activities (all of which are contributors to decreased public safety during severe winter storms.) New establishments or increased populations who are particularly vulnerable to severe winter storms (such as those with health concerns or those who live in communities that may be isolated for extended periods of time due to the hazard) should be encouraged to maintain at least a 72-hour self-sufficiency as recommended by FEMA. Encouraging contingency planning for businesses may help alleviate future economic losses caused by such hazards while simultaneously limiting the population exposed to the hazards during commuting or commerce-driven activities.

Economy

Most economic impacts would be short term in duration. Impacts to the economy would center around road closings, travel restrictions, temporary power losses and pressure on power surge capacity.

Built Environment

Property vulnerabilities to severe weather include damage caused by high winds, ice, or snow pack and subsequently melting snow. Vehicles may be damaged by the same factors, or temporarily un-useable due to the driving conditions created by severe winter weather. Contents of homes, storage units, warehouses and storefronts may be damaged if the structures are compromised or fail due to the weather, or during potential flooding caused by melting snow. The density of very wet snow packs may create strains on structures, causing partial or entire collapses of walls, roofs, or windows. Vulnerability is influenced both by architecture (flat roofs being more vulnerable), age and type of construction material, and should be assessed on a building-by-building basis. Research did not yield significant issues with building collapse associated with winter storms.

The HMPC noted increased vulnerability to roads during a severe winter storm, and the secondary impacts this can cause to day to day life in the county; specifically, the HMPC discussed the difficulty in getting medical staff to and from work.

Impacts to Critical Infrastructure

Because of the unpredictability of severe winter storm strength and path, most critical infrastructure that is above ground is equally exposed to the storm's impacts. Roads are especially susceptible to the effects of a winter storm. A more specific risk assessment was not conducted for this plan.

Natural Environment

Natural resources may be damaged by the severe winter weather, including broken trees and death of wildlife. Unseasonable storms may damage or kill plant and wildlife, which may impact natural food chains until the next growing season. Most of these impacts would be short-term.

Future Development

Future residential or commercial buildings should be built to be able to withstand snow loads from severe winter storms; snow load standards are not currently codified in the County's Sustainable Land Development Code (SLDC). Population growth in the County and growth in visitors will increase problems with road, business, and school closures, and increase the need for snow removal and emergency services related to severe winter weather events. Development in the County will increase the number of vehicles and persons vulnerable to this hazard.

Population and commercial growth in the County will increase the potential for complications with traffic and commerce interruptions associated winter storms, as well as increased exposed populations vulnerable to the impacts of a severe winter storm such as power outages or delays in vital services. Future power outages or delays in power delivery to future developments may be mitigated by construction considerations such as buried power lines. Future development will also require future considerations for snow removal capacity including equipment, personnel, and logistical support. Adequate planning will help establish the cost-effective balance.

Risk Summary

- Research indicated that severe winter storms contribute to traffic and vehicle collisions but little in significant damages;
- Most economic impacts are short term in duration. Impacts to the economy include road closings, travel restrictions, temporary power losses and pressure on power surge capacity;

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Likely	Limited	Medium

4.3.11 Tornadoes

Hazard/Problem Description

Tornadoes affect Santa Fe County primarily during the rainy season in the late fall and early spring. Tornadoes form when cool, dry air sits on top of warm, moist air. Tornadoes are rotating columns of air marked by a funnel-shaped downward extension of a cumulonimbus cloud whirling at destructive speeds of up to 300 mph, usually accompanying a thunderstorm. Tornadoes are the most powerful storms that exist. They can have the same pressure differential across a path only 300 yards wide or less as 300 mile wide hurricanes. Figure 4.33 illustrates the potential impact and damage from a tornado.

Figure 4.33: Potential Impact and Damage from a Tornado

Figure 2-2 Potential impact of a tornado

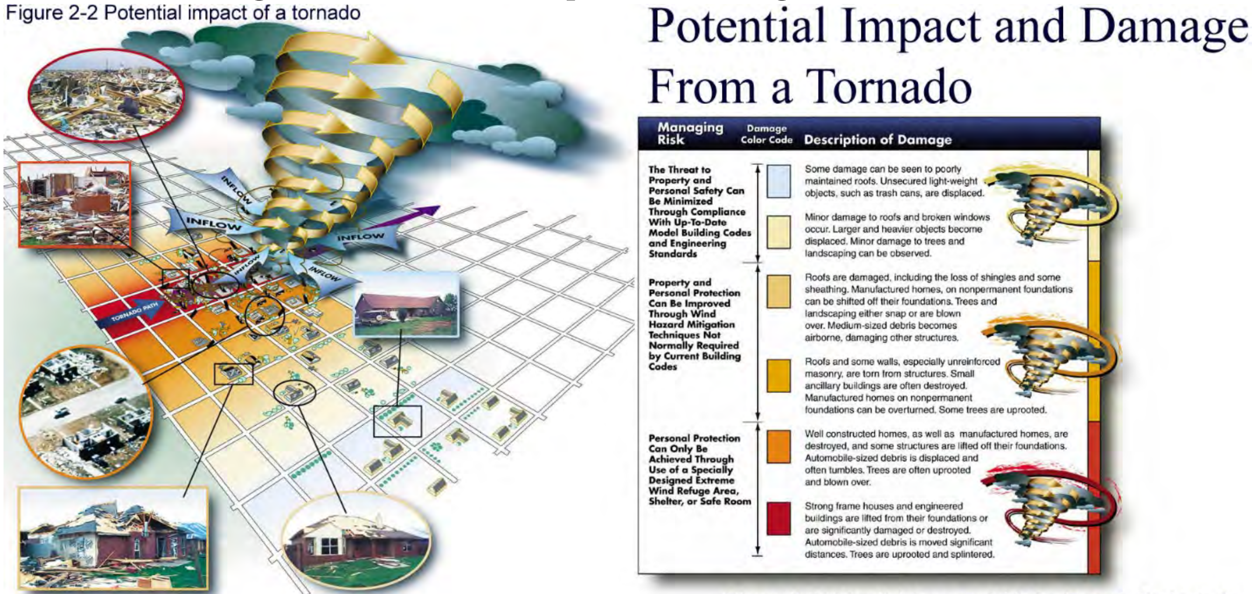


Figure 2-2 Potential damage table for impact of a tornado

Source: FEMA: Building Performance Assessment: Oklahoma and Kansas Tornadoes

Tornadoes can cause damage to property and loss of life. While most tornado damage is caused by violent winds, the majority of injuries and deaths generally result from flying debris. Property damage can include damage to buildings, fallen trees and power lines, broken gas lines, broken sewer and water mains, and the outbreak of fires. Agricultural crops and industries may also be damaged or destroyed. Access roads and streets may be blocked by debris, delaying necessary emergency response.

Location

A tornado can strike anywhere in the county. Size and length of a tornado can be extrapolated. While the average length of the NCDC-recorded tornadoes in Santa Fe County is 1.4 miles, the maximum length is 15.8 miles. The average recorded tornado width in the county is 30 yards, with 60 yards being the recorded maximum. Due to varying atmospheric conditions and characteristics of the thunderstorm, it is difficult to extrapolate average dimensions for an EF5 tornado.

Extent

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis and better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 4.37 shows the wind speeds associated with the original Fujita scale ratings and the damage that could result at different levels of intensity. Table 4.38 shows the wind speeds associated with the Enhanced Fujita Scale ratings.

Table 4.37: Fujita Scale

Fujita (F) Scale	Fujita Scale Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Source: National Oceanic and Atmospheric Administration Storm Prediction Center

Table 4.38: Enhanced Fujita Scale

Enhanced Fujita (EF) Scale	Enhanced Fujita Scale Wind Estimate (mph)
EF0	65-85
EF1	86-110
EF2	111-135
EF3	136-165
EF4	166-200
EF5	Over 200

Source: National Oceanic and Atmospheric Administration Storm Prediction Center

Historically, the highest-rated tornado occurring in the county was rated F1 on the Fujita Scale; once the switch was made to the Enhanced Scale, the highest-rated historical tornado was an EF0. Nationally, 80% of tornadoes are rated EF0 or EF1. According to the records of the NCDC, the highest rated tornadoes occurring in New Mexico were rated F3. This provides a historical basis to suggest a likely maximum tornado strength in the county, though rare atmospheric conditions could produce a tornado that could rate up to an EF5.

Previous Occurrences

Table 4.39 depicts the total number of tornado events reported and recorded by NCDC in the planning region. According to the NCDC, an incident will be characterized as a tornado if the type or intensity of the structural and vegetative damage and/or scarring of the ground could only have been tornadic, or if any two of the following guidelines are satisfied:

1. Fairly well-defined lateral boundaries of the damage path;
2. Evidence of cross-path wind component, e.g. trees lying 30 degrees or more to the left/right of the path axis (suggesting the presence of circulation)
3. Evidence of suction vortices, ground striations, and extreme missiles; or
4. Evidence of surface wind convergence as suggested by debris-fall pattern and distribution. In fast-moving storms, the convergence pattern may not be present and debris pattern may appear to fall in the same direction.

A total of 24 tornadoes have been recorded by the NCDC since 1956.

Table 4.39: NCDC Tornadoes in Santa Fe County 1956 to 2015

Date	Location	Time	Magnitude	Injuries	Fatalities	Property Damage (2015 USD)	Crop Damage (2015 USD)
05/25/1956	Santa Fe County	11:54	F0	0	0	-	-
08/20/1956	Santa Fe County	13:30	F1	0	0	$21,870	-
05/30/1957	Santa Fe County	13:20	F0	0	0	$254	-
05/09/1959	Santa Fe County	16:00	F0	0	0	-	-
05/09/1959	Santa Fe County	16:00	F0	0	0	-	-
05/15/1959	Santa Fe County	13:45	F0	0	0	-	-
09/30/1960	Santa Fe County	17:30	F0	0	0	-	-
08/16/1961	Santa Fe County	13:30	F0	0	0	-	-
05/26/1966	Santa Fe County	15:18	F0	0	0	-	-
12/26/1966	Santa Fe County	18:40	F1	0	0	$1.84 M	-
04/15/1971	Santa Fe County	15:00	F1	0	0	$146,880	-
06/15/1972	Santa Fe County	16:28	F0	0	0	-	-
06/08/1989	Santa Fe County	16:45	F0	0	0	-	-
06/08/1989	Santa Fe County	17:12	F1	0	0	-	-

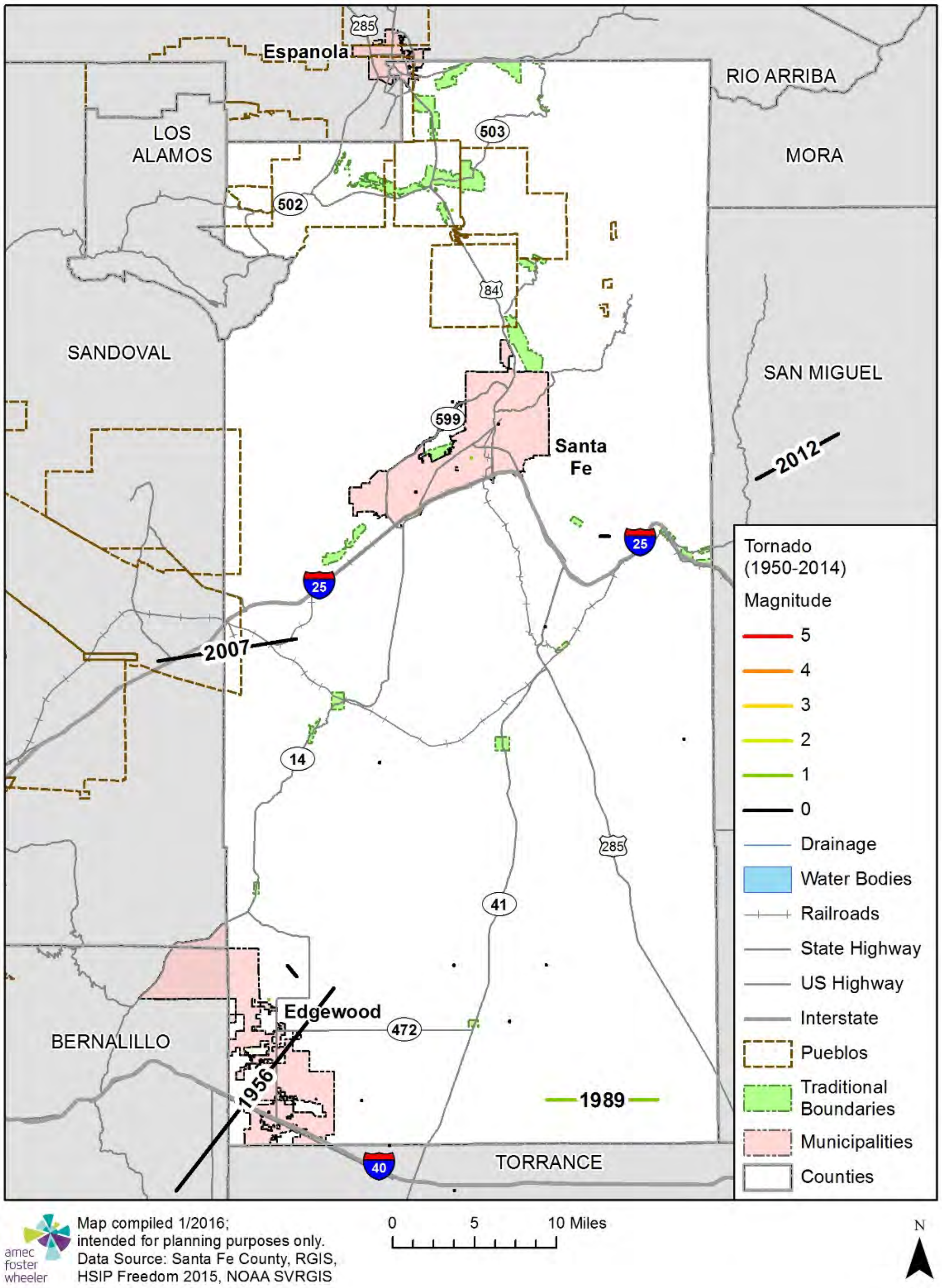
Date	Location	Time	Magnitude	Injuries	Fatalities	Property Damage (2015 USD)	Crop Damage (2015 USD)
08/15/1990	Santa Fe County	17:14	F0	0	0	-	-
06/29/1991	Santa Fe County	16:00	F0	0	0	$4,368	-
06/09/2007	Cerrillos	14:45	EF0	0	0	-	-
06/09/2007	Cerrillos	15:10	EF0	0	0	-	-
08/17/2008	Canyoncito	15:40	EF0	0	0	-	-
10/11/2008	Stanley	17:33	EF0	0	0	$13,262	-
07/18/2009	Golden	20:02	EF0	0	0	-	-
07/24/2012	Agua Fria	14:57	EF0	0	0	-	-
10/12/2012	Glorieta	16:08	EF0	0	0	$51,819	-
07/07/2015	Edgewood	16:15	EF0	1	0	$100,000	-
Total				**1**	**0**	**$2,178,453**	**$0.00**

Source: NCDC

Historically, the average tornado in Santa Fe County occurs between 1 PM and 3 PM in May or June. It's typically an EF0 or EF1 in magnitude. Since 1956, 38% of the 24 tornadoes recorded in the county have done damage; damaging tornadoes cause an average of $49,000 worth of damage to property, and no reported damage to crops.

Figure 4.34 shows tornado touchdowns and paths in Santa Fe County since 1950.

Figure 4.34: Tornado Touchdowns and Tornado Paths – Santa Fe County



The HMPC stated that the National Weather Service estimates that Santa Fe County averages 3 tornadoes per year, though these may not all touch down. The HMPC also stated that the Sandia Mountains can block radar signatures, which may impact the ability to detect tornadoes. Finally, the HMPC noted that while they often go unreported, dust devils do occur in the county and can cause property damage or injuries. As an example, the NCDC records a dust devil occurring in neighboring Los Alamos County in 2002 that picked up and threw a person, and pelted them with debris; it reasonable to assume that the same type of incident could occur in Santa Fe County. In Santa Fe County, the NCDC records 2 dust devils since 2000; these dust devils caused minor property damage in the Edgewood area, though no injuries or fatalities.

Probability of Future Occurrences

The likelihood of a tornado occurring somewhere in the county is **Medium**. Santa Fe County experienced 24 separate NCDC-recorded tornado incidents between 1956 and 2015, or a 56-year span. Based on these numbers, there is a 43% chance that Santa Fe County will experience a tornado in any given year. Eight of the 24 tornadoes in the 56-year timespan caused damage; based on this information, there is a 14% chance that Santa Fe County will experience a tornado that causes some level of damage in any given year.

Vulnerability Assessment

People

Populations are the most vulnerable to tornados. The availability of sheltered locations such as basements, buildings constructed using tornado-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. However, there are also segments of the population that are especially exposed to the indirect impacts of tornadoes, particularly the loss of electrical power. These populations include the elderly or disabled, especially those with medical needs and treatments dependent on electricity. Nursing homes, Community Based Residential Facilities, and other special needs housing facilities are also vulnerable if electrical outages are prolonged, since backup power generally operates only minimal functions for a short period of time.

Since 1950, Santa Fe County has experienced one recorded injury and no fatalities directly caused by a tornado. On July 7, 2015, a metal barn used for hay storage was tossed a quarter of a mile by an EF0 tornado and slammed into a house where a woman inside was injured by flying glass. Statewide, New Mexico has seen two deaths and 90 injuries as a direct result of a tornado. The majority of these were due to building collapses and flying debris; 45 of the injuries and the two fatalities were caused by a tornado outbreak on March 23, 2007; the outbreak occurred in Quay, Chaves, De Baca, Union, Roosevelt and Curry counties simultaneously.

Economy

Economic impacts are dependent on the size and path of the tornado. An EF5 tornado that hits the remote, unincorporated areas of the county most likely wouldn't have much economic impact, if at all.

Built Environment

General damages are both direct (what the tornado physically destroys) and indirect, which focuses on additional costs, damages and losses attributed to secondary hazards spawned by the tornado, or due to the damages caused by the tornado. Depending on the size of the tornado and its path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage.

Secondary impacts of tornado damage often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a tornado put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Historically damaging tornadoes in the County cause an average of $49,000 worth of damage to property, and no reported damage to crops, according to NCDC data.

Critical Infrastructure. Public gathering places including (but not limited to) schools, community centers, shelters, nursing homes and churches, may have increased impacts at certain times of day if struck by a tornado. Due to the random nature of these hazards, a more specific risk assessment was not conducted for this plan.

Natural Environment

Tornadoes can cause massive damage to the natural environment, uprooting trees and other debris. This is part of a natural process, however, and the environment will return to its original state in time.

Future Development

As the County continues to add population, the number of people and housing developments exposed to the hazard increases. Proper education on building techniques and the use of sturdy building materials, basements, attached foundations, and other structural techniques may minimize the property vulnerabilities. Public shelters at parks and open spaces may help reduce the impacts of tornadoes on the recreational populations exposed to storms. Per the SLDC, new critical facilities such as communications towers are required to meet the ANSI/TIA-222-G standards for high winds.

Risk Summary

- Historically, the average tornado in Santa Fe County occurs between 1 PM and 3 PM in May or June. It's typically rated as an EF0 or EF1 in magnitude;

- Since 1956, 38% of the 24 tornadoes recorded in the county have done damage; damaging tornadoes cause an average of $49,000 worth of damage to property, and no reported damage to crops. A tornado resulted in an injury in 2015 in Edgewood;
- The event of record caused $1.8M in property damage in 1966.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Negligible	Highly Likely	Limited	Medium

4.3.12 Volcano

Hazard/Problem Description

A volcano is a vent through which molten rock escapes to the earth's surface. Unlike other mountains, which are pushed up from below, volcanoes are built by surface accumulation of their eruptive products (e.g., layers of lava, pyroclastic flows, and ash). When pressure from gases within the molten rock becomes too great, an eruption occurs. Volcanic hazards include gases; lava and pyroclastic flows; airborne ash; landslides; earthquakes; and explosive eruptions.

Eruptions can be relatively quiet; producing lava flows that creep across the land at 2 to 10 mph. Explosive eruptions can shoot columns of gases and rock fragments tens of miles into the atmosphere, spreading ash hundreds of miles downwind. Lava flows are streams of molten rock that either pour from a vent quietly or explosively by lava fountains. Because of their intense heat, lava flows are also great fire hazards. Lava flows destroy everything in their path, but most move slowly enough that people can move out of the way. The speed at which lava moves across the ground depends on several factors, including the type of lava erupted, the steepness of the ground, and the rate of lava production at the vent.

Steam blasts commonly produce large pits or craters. Explosive eruptions, which may create fiery flows of hot ash (pyroclastic flows), are usually followed by the pushing up of a lava dome. Some less violent eruptions only produce lava flows.

Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS notes specific characteristics of volcanic ash. Volcanic ash is composed of small jagged pieces of rocks, minerals, and volcanic glass the size of sand and silt. Very small ash particles can be less than 0.001 millimeters across. Volcanic ash is not the product of combustion, like the soft fluffy material created by burning wood, leaves, or paper. Volcanic ash is hard, does not dissolve in water, is extremely abrasive and mildly corrosive, and conducts electricity when wet.

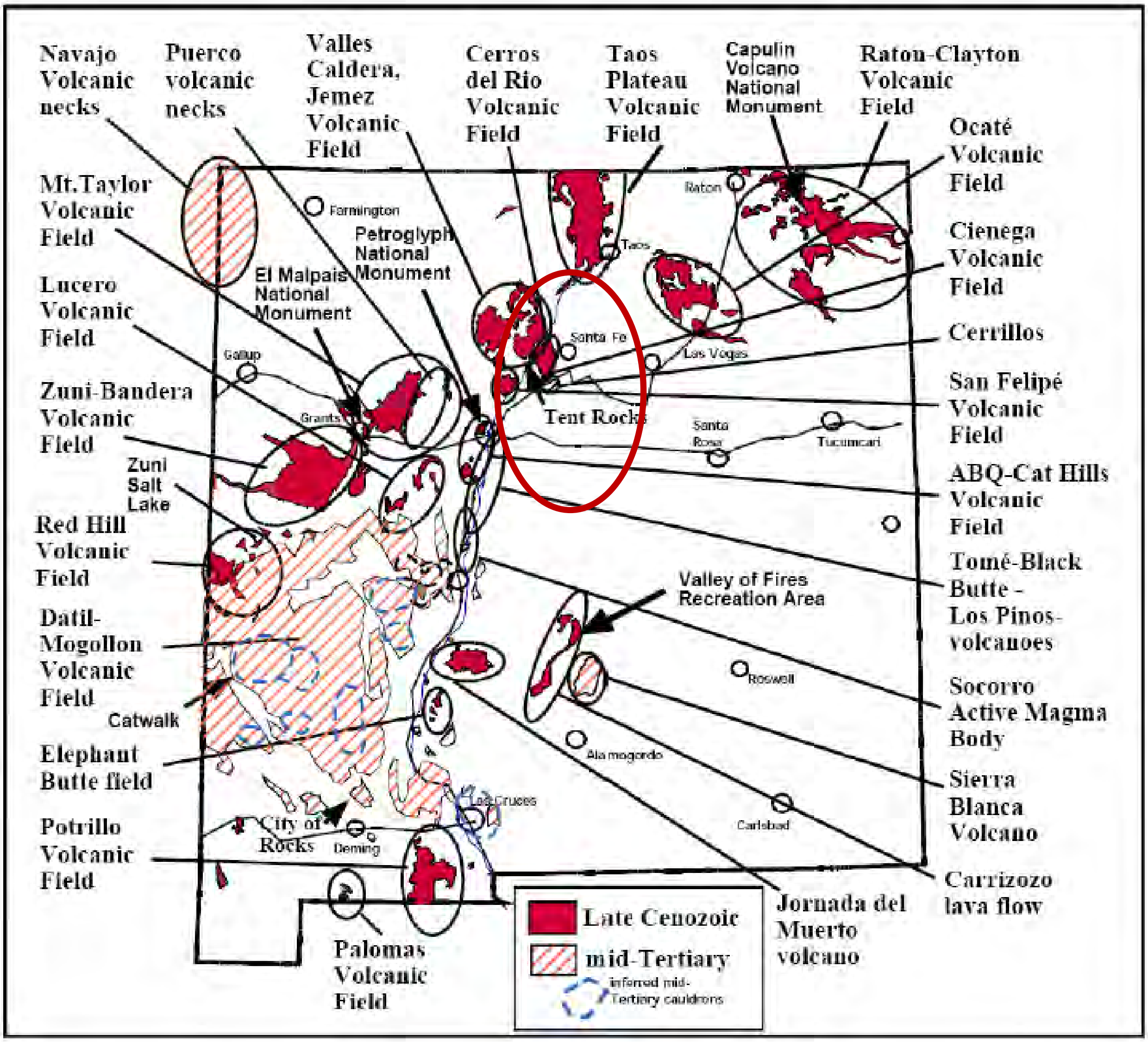
Volcanic ash is formed during explosive volcanic eruptions. Explosive eruptions occur when gases dissolved in molten rock (magma) expand and escape violently into the air, and also when water is heated by magma and abruptly flashes into steam. The force of the escaping gas violently shatters solid rocks. Expanding gas also shreds magma and blasts it into the air, where it solidifies into fragments of volcanic rock and glass. Once in the air, wind can blow the tiny ash particles tens to thousands of miles away from the volcano.

The United States is third in the world, after Japan and Indonesia, for the number of active volcanoes. Since 1980, as many as five volcanoes have erupted each year in the United States. Eruptions are most likely to occur in Hawaii and Alaska. For the Cascade Range in Washington, Oregon, and California, volcanoes erupt on the average of once or twice each century. Volcanoes produce a wide variety of hazards that can kill people and destroy property. Large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate.

Location

New Mexico has one of the greatest concentrations of young, well-exposed, and un-eroded volcanoes on the continent. This can be seen in Figure 4.35. The Jemez Mountains, located to the northwest of Santa Fe County and circled in red, are a volcanic field that overlies the west edge of the Rio Grande rift.

Figure 4.35: Volcanic Areas of New Mexico



*Santa Fe County circled by red oval
Source: New Mexico Museum of Natural History

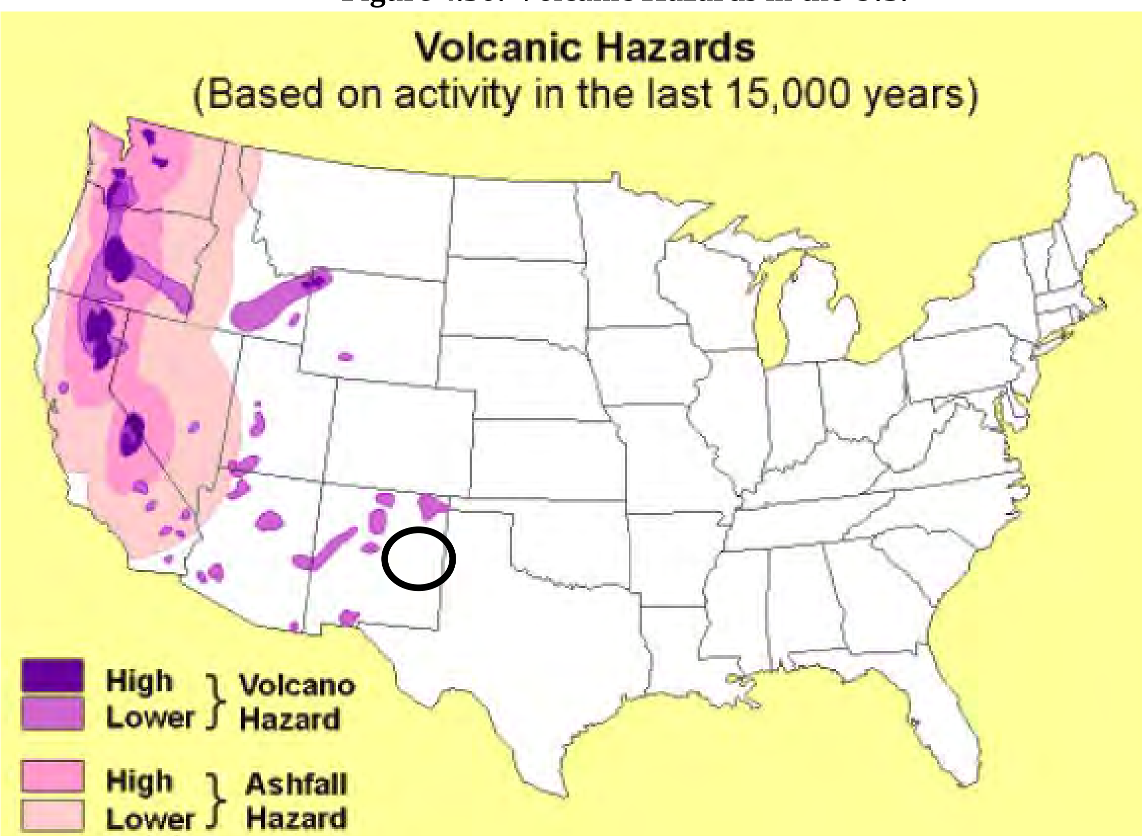
This volcanic field is best known for the Valles Caldera. A Caldera is formed when huge amounts of magma are erupted out of sub-surface magma chambers. The removal of all this magma leaves a void below the surface and the top collapses in to form the caldera. Subsequent eruptions usually fill them in partially so that the jumbled debris is buried. At 15 miles in diameter, the Valles Caldera is believed to have been formed during two explosive events, 1.6 and 1.2 million years ago, when the volcanic pile collapsed in response to this eruption of ash and rock from the magma chamber.

During these events over 90 cubic miles of ash/rock spewed out, forming the Bandelier tuff. Subsequent resurgence of magma formed domes along the caldera ring fracture, including Redondo Peak, which is over 3,000 feet above the caldera floor. The geothermal and hot springs systems in the area are caused by flow of groundwater through the caldera. The water flows near the top of a subsurface body of igneous rock that still may be partially molten. Some of the water rises to the surface to supply fumaroles and hot springs. Geothermal activity continues.

Extent

Figure 4.36 illustrates the volcanic hazard areas in the United States based on events over the last 15,000 years. Areas in blue or purple show regions at greater or lesser risk of local volcanic activity, including lava flows, ashfalls, lahars (volcanic mudflows), and debris avalanches. Areas in pink show regions at risk of receiving 5 cm or more of ashfall from large or very large explosive eruptions, originating at the volcanic centers (shown in blue). These projected ashfall extents are based on observed ashfall distributions from an eruption ("large") of Mt. St. Helens that took place 3,400 years ago, and the eruption of Mt. Mazama ("very large") that formed Crater Lake, Oregon, 6,800 years ago.

Figure 4.36: Volcanic Hazards in the U.S.



Source: 2013 New Mexico State Hazard Mitigation Plan
Santa Fe County highlighted by black oval

Previous Occurrences

Having been studied since the 1920's to learn about the fundamental processes of magmatism, hydrothermal systems and ore deposition, the Valles Caldera is one of the most well-known resurgent calderas in the United States. Due to the proximity of the caldera to Los Alamos National Labs (LANL) in neighboring Los Alamos County, the U.S. Department of Energy has been closely monitoring and researching the potential for seismic and volcanic activity in the region. Researchers from LANL estimate that the most recent volcanic activity ended 50,000 years ago.

Probability of Future Occurrences

The New Mexico State Hazard Mitigation Plan noted that based on past occurrence of volcanism in the state, it is estimated that there is roughly a 1% chance that some type of volcanic eruption could occur somewhere in the entire State of New Mexico in the next 100 years, and a 10% chance that an eruption will occur in the next 1,000 years. For Santa Fe County, these estimates are applicable, though it is highly unlikely that volcanic activity will resume any time soon. Several studies, including those conducted by LANL, and other studies conducted in conjunction with the New Mexico Bureau of Mines & Mineral Resources, indicate that based on the long history of the Jemez volcanic field and past cycles in activity, the Valles Caldera should be considered a dormant volcano. Since it is not extinct there is the possibility that it could erupt again. Should an eruption occur, based on past record, it would probably be explosive and highly destructive, making effective mitigation difficult. When or if the next cycle of volcanic activity will begin is unknown. Renewed activity would likely be preceded with increased seismic activity that would provide some warning of the potential hazard. The HMPC noted that LANL has observation equipment around the caldera to monitor activity.

Vulnerability Assessment

When discussing vulnerability to volcanoes, it is important to note that research on the impacts of a volcanic eruption to specific areas and sectors of Santa Fe County is limited.

People

Volcanoes can have devastating impacts on people. These include ash accumulation on the ground and in the air that can affect the ability to breathe. More devastating could be the need to evacuate the area entirely, and a temporary or permanent relocation of large segments of the population.

Economy

A large-scale volcanic eruption could have many impacts on the economy of Santa Fe County. Direct impacts could damage infrastructure including buildings, roads, and bridges. Ash fall could accumulate on cropland, diminishing the ability to grow crops, and impacting agriculture. Depending on the size and scope of the eruption and its impacts, Santa Fe County's economy could be impacted only on a short-term basis, or a larger-scale eruption could have long term impacts on the economy.

Built Environment

Volcanoes can cause two major types of impacts to the built environment. One type of impact has to do with the accumulation of ash and eruption debris on infrastructure, which needs to be removed. The other type of impact is direct impacts from lava flows and lahars, which can destroy buildings and infrastructure in their path.

The area north and west of the City of Santa Fe is a dissected plateau of volcanic origin known as the Caja del Rio monogenetic volcanic field. This area of approximately 84,000 acres includes approximately 60 cinder cones, spatter cones, and basalt outflows, yet has not been active for an estimated 40,000 to 50,000 years. As such, the risk from renewed volcanic activity resulting in an eruption is unlikely. Should an eruption occur, however, the potential impact to the County would be catastrophic. In the event of a cataclysmic eruption, all assets and individuals in the County would truly be at risk, and the vulnerability would be the total values of all development, infrastructure, cultural and natural resources within the jurisdiction (and beyond).

Critical Infrastructure. Depending on the size of the blast, a volcanic eruption could be catastrophic to the critical infrastructure in Santa Fe County. Due to the catastrophic nature of this hazard, a more specific assessment of critical infrastructure risk was not conducted for this plan.

Natural Environment

Volcanoes can have devastating impacts on the natural environment. The direct impacts of volcanoes can also destroy the landscape around the eruption – flattening trees, starting fires, moving debris and contaminating water sources. Volcanic eruptions can even affect the global climate. According to research conducted by NASA, after Mount Pinatubo in the Philippines erupted in 1991, strong winds spread the aerosol particles from the plume around the globe. The result was a measurable cooling of the Earth’s surface for a period of almost two years.

Future Development

Because of Santa Fe County’s location on top of the Caja del Rio, it would be extremely difficult if not impossible to steer development in ways that mitigate the risk from this hazard. The destructive impacts of a volcanic eruption cannot be easily mitigated by building codes or smart construction.

Risk Summary

- Due to the prolonged inactivity of the volcanic fields in northern New Mexico, it is believed that they are not likely to erupt in the foreseeable future;

- Because of Santa Fe County's location on top of the Caja del Rio, it would be extremely difficult if not impossible to steer development in ways that mitigate the risk from this hazard. The destructive impacts of a volcanic eruption cannot be easily mitigated by building codes or smart construction.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Unlikely	Catastrophic	Low

4.3.13 Wildfire

Hazard/Problem Description

A wildfire is a fire burning uncontrolled on lands covered wholly or in part by timber, brush, grass, grain or other inflammable vegetation. There are several types of wildfires. Prescribed fires are planned fires ignited by land managers to accomplish specific natural resource improvement objectives. Fires that occur from natural causes, such as lightning, that are then used to achieve management purposes under carefully controlled conditions with minimal suppression costs are known as wildland fire use (WFU). Wildfires are unwanted and unplanned fires that result from natural ignition, unauthorized human-caused fire, escaped WFU, or escaped prescribed fire. A wildland-urban interface (WUI) fire is a wildfire occurring in areas where structures and other human developments meet or intermingle with wildland vegetation-fuels. WUI fires are a specific concern because they directly pose risks to human lives, property, structures, and critical infrastructure more so than the other types of wildland fires.

Wildland fire is an ongoing concern for the Santa Fe County Planning Area. Generally, the worst fires occur from April to July of each year, before monsoon rains temper the risk during hotter, drier months. Fire conditions arise from a combination of high temperatures, low moisture content in the air and fuel, accumulation of vegetation, and high winds.

WUI fires are the most damaging. WUI fires occur where the natural and urban development intersect. Even relatively small acreage fires can result in disastrous damages. In the WUI, structures and vegetation are sufficiently close so that a wildland fire could spread to structures or a structure fire could ignite vegetation.

Generally, there are three major factors that sustain wildfires and allow for predictions of a given area's potential to burn. These factors include fuel, topography, and weather. The CWPP for Santa Fe County gives great detail regarding these factors, which are summarized below.

Fuel

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is generally classified by type and by volume. Fuel sources are diverse and include everything from dead tree needles and leaves, twigs, and branches to dead standing trees, live trees, brush, and cured grasses. Also to be considered as a fuel source, are man-made structures and other associated combustibles. The type of prevalent fuel directly influences the behavior of wildfire. Light fuels such as grasses burn quickly and serve as a catalyst for fire spread. Fuel is the only factor that is under human control.

Per the 2008 CWPP, the major vegetation types in Santa Fe County are listed below. Each plant association type offers distinct characteristics of potential fire intensity, fire rate of spread, and probability of fire ignition.

- Grassland (48% total vegetation)
- Forest (46% of total vegetation)
- Riparian woodlands and wetlands (2% of total vegetation)
- Other (4% of total vegetation)

Half of the vegetation in Santa Fe County is divided between two dominant types - western great plains shortgrass prairie (21% of total vegetation) and southern rocky mountain pinon-juniper woodland (29% of total vegetation).

During the risk and goals meeting, the HMPC also made special note of the prevalence of tumbleweeds as a fuel for wildfire.

Topography

An area's terrain and land slopes affect its susceptibility to wildfire spread. Fire intensities and rates of spread increase as slope increases due to the tendency of heat from a fire to rise via convection. The natural arrangement of vegetation throughout a hillside can also contribute to increased fire activity on slopes. Terrain factors influencing fire behavior cannot be modified. Fires often run rapidly up steep slopes and are often pushed up or down canyons by daily cycles of wind direction.

Despite the dramatic elevations of Santa Fe County, the majority of the land area is relatively flat. The southern area of the county exhibits only small hills and large spans of high desert plains. Although much of the County is relatively flat, the topography varies greatly throughout the areas of greatest risk. The percent of slope is an important factor in determining the types of treatments that should be implemented.

Weather

Weather components such as temperature, relative humidity, wind, and lightning also affect the potential for wildfire. High temperatures and low relative humidity dry out the fuels that feed wildfire, creating a situation where fuel will more readily ignite and burn more intensely.

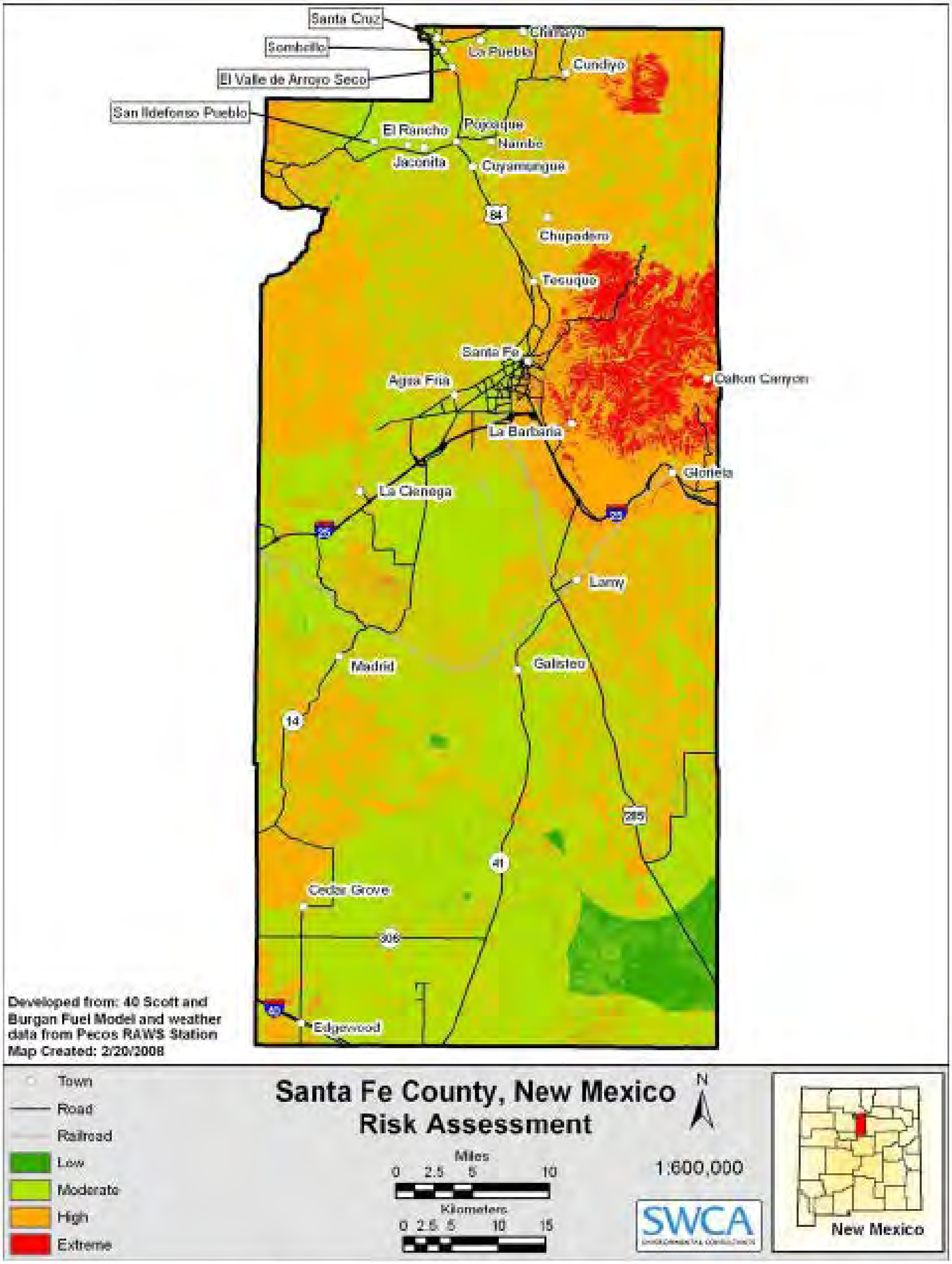
Differences in topographical characteristics throughout the State of New Mexico and Santa Fe County contribute to the divergent climatic regimes within the planning area. The state generally has a mile, arid to semi-arid continental climate characterized by abundant sunshine, light total precipitation, low relative humidity, and relatively large annual and diurnal temperature ranges. July is generally the warmest month. The mean annual precipitation within Santa Fe County is typically light. July and August mark the onset of the region's monsoonal weather patterns and are typically the hottest and wettest months of the year, accounting for 30% to 40% of the state's annual precipitation as a whole. These storms also generate frequent lightning activity, which may result in multiple fire ignitions from each storm.

Winter is the driest season in New Mexico. Overall climate changes in the State of New Mexico consist of cyclical drought/wet year patterns.

Location

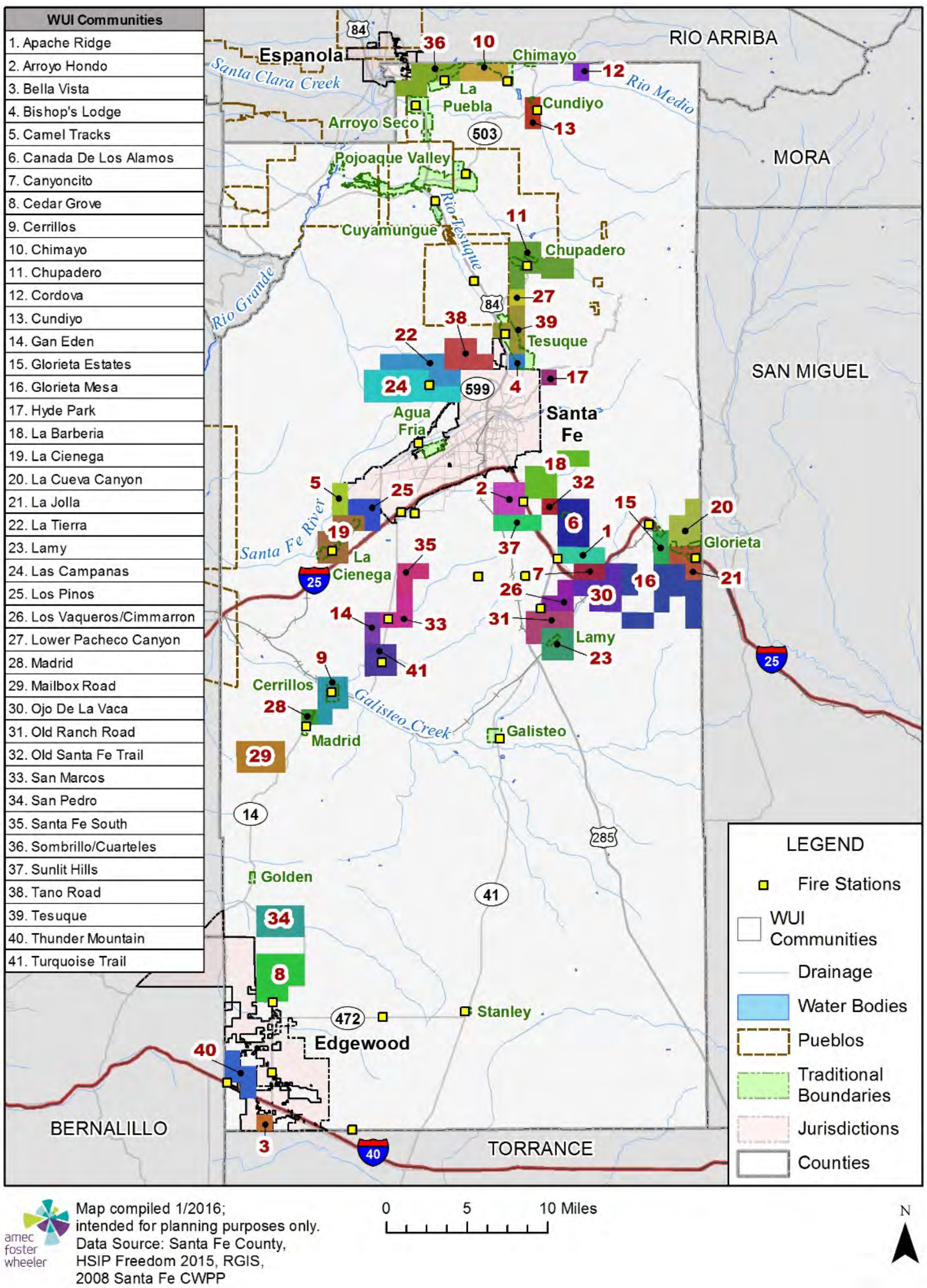
The 2008 Community Wildfire Protection Plan (CWPP) identifies risk areas for wildfire, based on fire environment and defensibility. Figure 4.37 shows these areas on a map of the county.

Figure 4.37: Santa Fe County Composite Risk Assessment - CWPP



Santa Fe County contains 41 Wildland-Urban Interface (WUI) communities. These communities are at increased risk of wildfire, as they reside in areas where urban development and areas of vulnerable vegetation meet. The following map shows WUI communities in Santa Fe County.

Figure 4.38: Santa Fe County Wildland-Urban Interface Communities

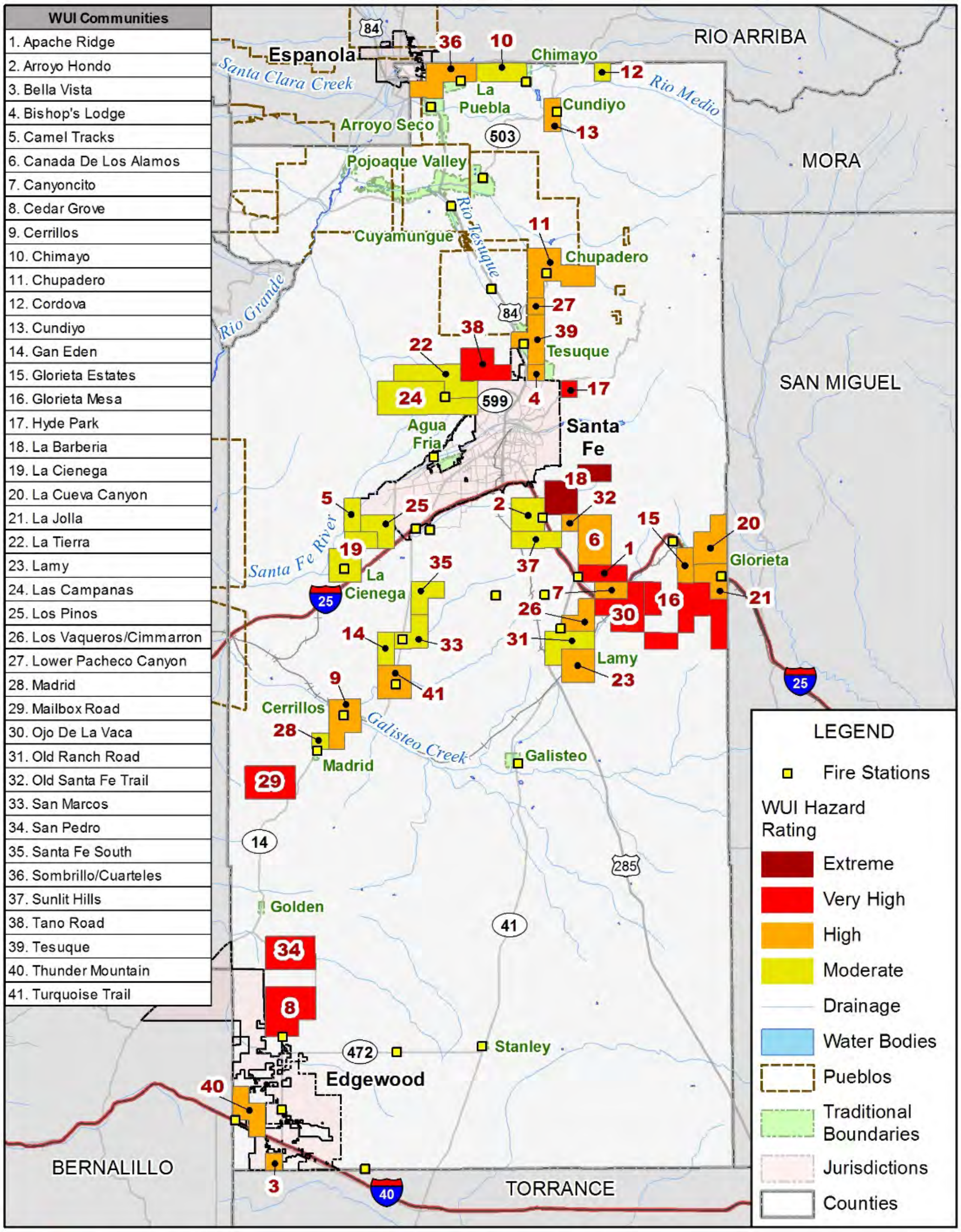


The risk assessment completed for the 2008 Santa Fe CWPP identified communities into one of four hazard classes – moderate, high, very high, and extreme based on fire environment and defensibility. La Barbaria was the only community rated at "extreme" risk. Apache Ridge, Cedar Grove, Glorieta Mesa, Hyde Park, Mailbox Road, Ojo de la Vaca and San Pedro were all rated as "very high." Six communities were rated "high," and the remaining 15 were rated "moderate."

Extent

The Santa Fe County CWPP classifies hazard level to its various WUI communities with a hazard rating scale, based on fire danger, based on a hazard and risk assessment. Risk refers to the potential and frequency with which wildfire ignitions might occur; hazard refers to those conditions of fuels, topography, and other environmental conditions, as well as the relative degree of defensibility that affect the behavior of fires within the interface. According to the Composite Risk Assessment in the CWPP, no communities identified in this plan are at low risk of wildfire. The majority of communities are depicted as either high or very high risk.

Figure 4.39: Santa Fe County WUI Hazard Ratings



Map compiled 1/2016;
intended for planning purposes only.
Data Source: Santa Fe County,
HSIP Freedom 2015, RGIS,
2008 Santa Fe CWPP

0 5 10 Miles

N

Previous Occurrences

There have been numerous wildland fires within Santa Fe County and vicinity. The Federal Wildland Fire Occurrence database, maintained by the USGS and other agencies, includes perimeter and point GIS layers for fires on public lands throughout the United States. The data includes fires dating back to 1980. The National Park Service, Bureau of Land Management, and US Forest Service reports include fires of 10 acres and greater. The database is limited to fires on federal lands. Some fires may be missing altogether or have missing or incorrect attribute data. Some fires may be missing because historical records were lost or damaged, fires were too small for the minimum cutoffs, documentation was inadequate, or fire perimeters have not yet been incorporated into the database. Also, agencies are at different stages of participation. For these reasons, the data should be used cautiously for statistical or analytical purposes.

The data provides a reasonable view of the spatial distribution of past large fires in the County. Using GIS, fire perimeters that intersect Santa Fe County were extracted and are listed in Table 4.40 and shown in Figure 4.40. There are 17 fires recorded in this database for Santa Fe County that exceeded 100 acres. Each of them was tracked by the National Fire Database; this database was last updated in 2014. Table 4.41 lists each fire's name, start date and calculated acreage.

Table 4.40: Santa Fe County Fire History – Fires Over 100 Acres

Fire Name	Start Date	Acres Burned
Unknown	May 10, 1988	122
Frijoles	June 15, 1993	2,626
Quemado	June 15, 1993	4,300
Lamy	May 3, 1996	220
Familia	May 31, 1996	300
Ramada	March 4, 1998	600
Windmill	March 10, 1998	100
Curvey	March 12, 1998	125
Turquoise	June 15, 2000	100
Borrego	May 22, 2002	12,995
Molina	June 3, 2003	900
Capulin	June 23, 2003	7,429
Mosely	June 15, 2006	1,250

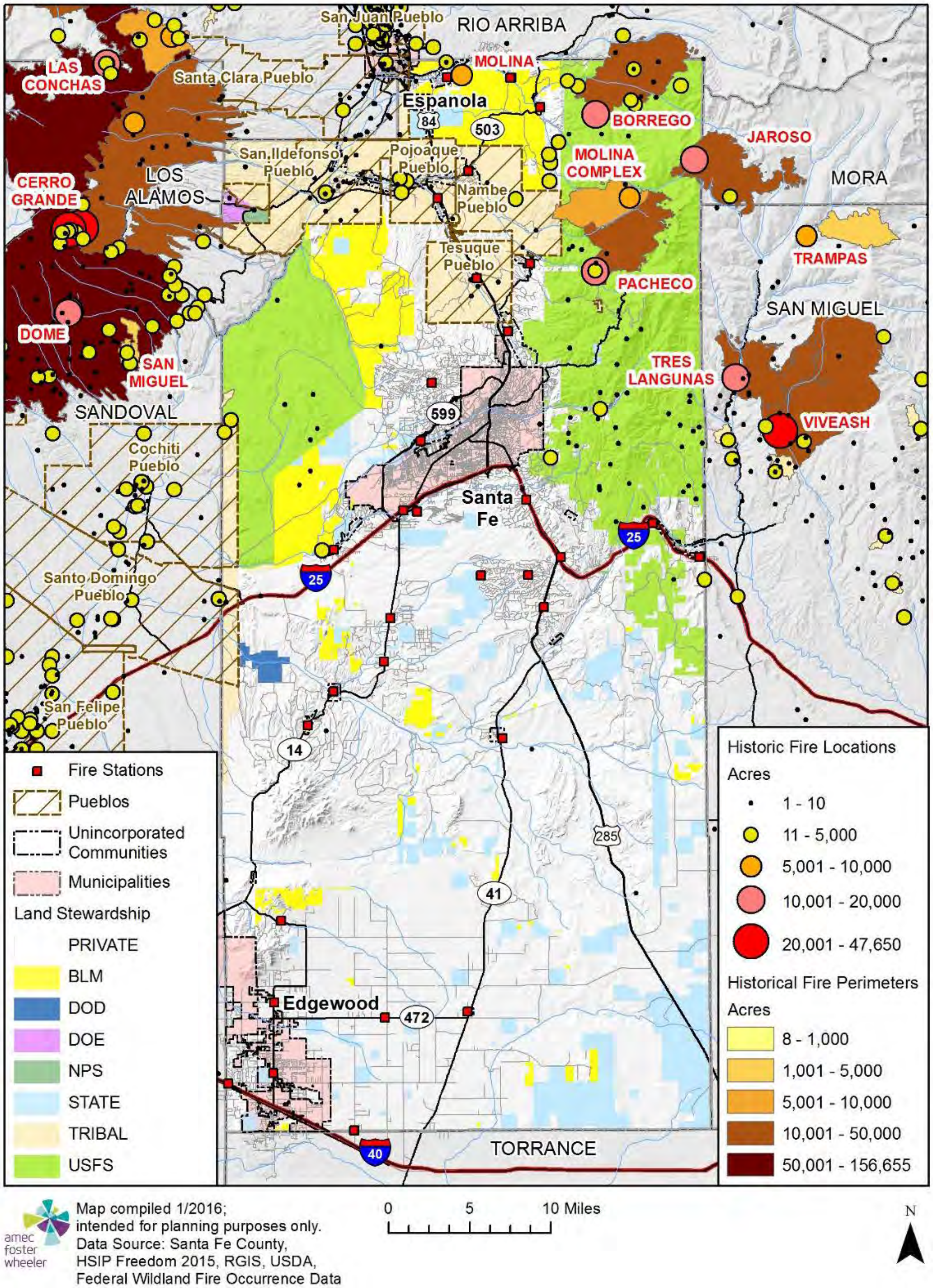
Pacheco Canyon	June 18, 2011	10,113
Pacheco	June 18, 2011	158
Colorado Peak	June 5, 2012	243
Jaroso	June 9, 2013	11,149

Source: CWPP; Federal Fire Occurrence database

Of the 17 major fires burning over 100 acres, 3 occurred in March, 4 occurred in May and 10 occurred in June. Of the 148 total fires listed in the Federal Fire Occurrence Database, 69 were caused by human activity, while 77 occurred naturally, usually by lightning strikes.

Figure 4.40 provides a visual reference of historical fires in Santa Fe County, along with large-scale historical fires in the surrounding counties. Fires in Santa Fe County have generally occurred in the northern third of the county, where more flammable material is available and the risk is higher.

Figure 4.40: Santa Fe County Fire History 2000-2014



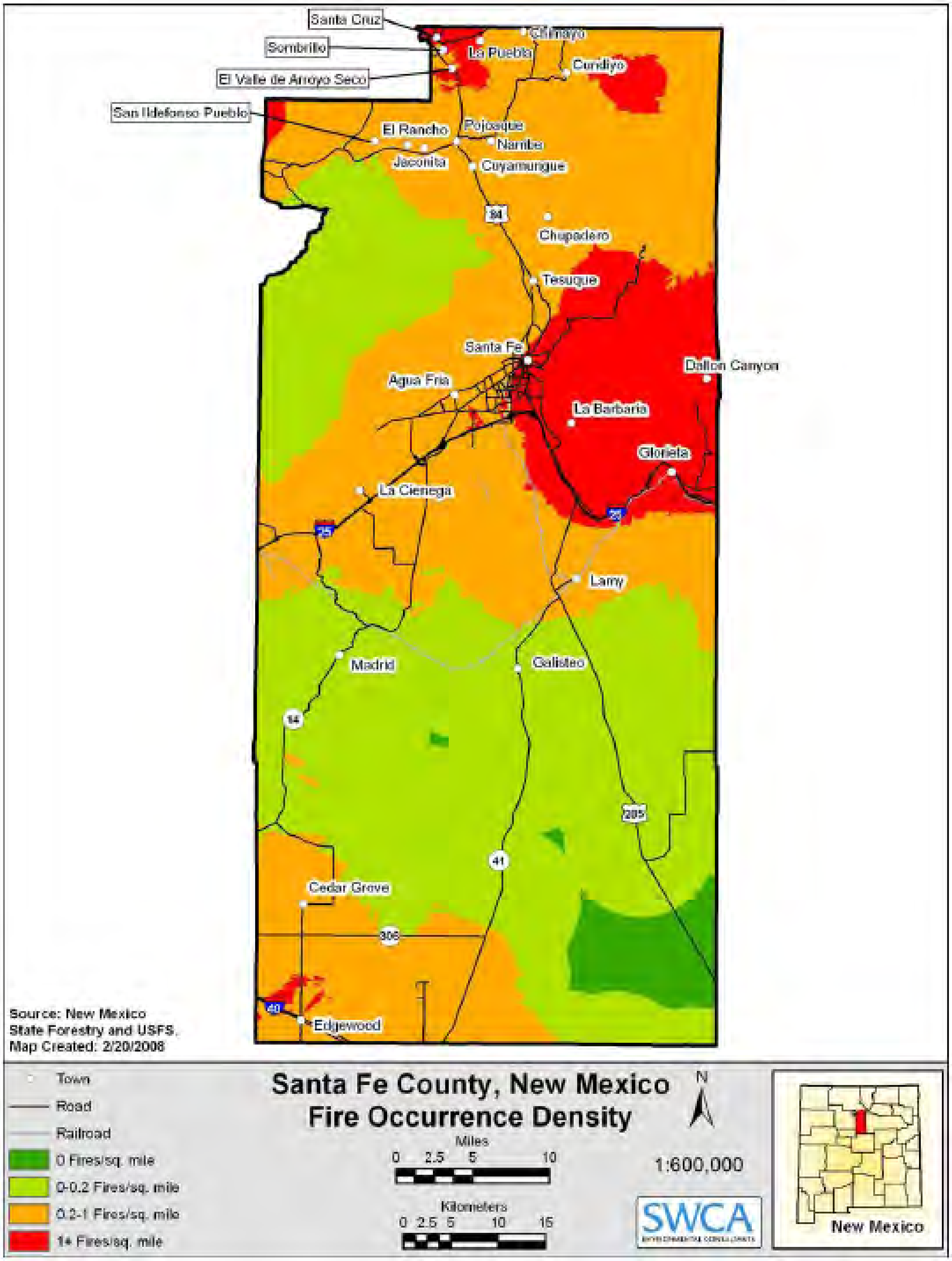
Other Wildfires

Other major wildfires within Santa Fe County and the immediate vicinity include:

- Dome Fire, 1996, 16,683 acres
- Cerro Grande, 2000, 48,000 acres
- Viveash Fire, 2000, 29,000 acres
- Las Conchas Fire, 2011, 156,293 acres
- Jaroso, 2013, 11,149 acres

The Santa Fe CWPP provides a study of fire occurrence density, rated by fires per square mile. The highest fire occurrence density is in the eastern area of the county around La Barbaria, Glorieta and Dalton Canyon, as well as a few pockets in the very northern and very southwestern portions of the county.

Figure 4.41: Santa Fe County Fire Occurrence Density



Source: 2008 Santa Fe County CWPP

Probability of Future Occurrences

From approximately May to October of each year, Santa Fe County faces a wildfire threat; fires will continue to occur on an annual basis in the County. The threat of wildfire and potential losses constantly increase as human development and population increase in the wildland urban interface area in the County. This results in a **highly likely** rating of future occurrence.

Vulnerability Assessment

People

The most exposed population are those living in the wildland-urban interface (WUI) zones, where residential properties are directly intruding into traditional wildland areas. The exposure of the population in these zones increases with the exposure of the corresponding general property, examined in the section below. Other exposed groups include children, the elderly, or those with breathing conditions who may be exposed to high levels of smoke. Populations living in long term care facilities or other skilled care facilities face additional exposures because of increased evacuation times and the potential that the population may be required to shelter in place.

Over 18,000 people are estimated to live in the WUI zones in Santa Fe County, with the highest numbers in La Cienaga, La Tierra, Las Campanas, Sombrillo/Cuarteles and Tesuque. Table 4.41 shows the vulnerable populations in each WUI community, based on GIS assessment of residential housing within each WUI multiplied by a US Census average household size.

Table 4.41: Population Within the WUI

Community	WUI RATING	Population
Apache Ridge	Very High	367
Arroyo Hondo	Moderate	651
Bella Vista	High	487
Bishop's Lodge	High	176
Camel Tracks	Moderate	365
Canada De Los Alamos	High	384
Canyoncito	High	264
Cedar Grove	Very High	395
Cerrillos	High	309
Chimayo	Moderate	531
Chupadero	High	594
Cordova	Moderate	0
Cundiyo	High	110
Gan Eden	Moderate	145
Glorieta Estates	High	180

Community	WUI RATING	Population
Glorieta Mesa	Very High	23
Hyde Park	Very High	253
La Barberia	Extreme	608
La Cienega	Moderate	1,034
La Cueva Canyon	High	253
La Jolla	High	276
La Tierra	Moderate	1,079
Lamy	High	147
Las Campanas	Moderate	2,230
Los Pinos	Moderate	576
Los Vaqueros/Cimmarron	High	356
Lower Pacheco Canyon	High	77
Madrid	Moderate	185
Mailbox Road	Very High	101
Ojo De La Vaca	Very High	157
Old Ranch Road	Moderate	426
Old Santa Fe Trail	High	108
San Marcos	Moderate	470
San Pedro	Very High	180
Santa Fe South	Moderate	80
Sombrillo/Cuarteles	High	1,107
Sunlit Hills	Moderate	480
Tano Road	Very High	786
Tesuque	High	1,004
Thunder Mountain	High	962
Turquoise Trail	High	293
	TOTAL	18,209

Economy

A major wildfire can cause many economic impacts, depending on the parameters and size of the fire. Most of the populated areas in Santa Fe County fall under medium to extreme risk for wildfire. Economic impacts could include direct fire damage to buildings and facilities, cascading impacts to industries and supply chains, road closures and the accumulation of fire suppression costs.

Built Environment

Any flammable materials are vulnerable during a wildfire, including structures and personal property. The vulnerability of general property increases as the distance of the property to wildfire-prone areas decreases, and is particularly high for structures located in the WUI. These structures receive an even higher level of vulnerability if the properties surrounding them are not properly mitigated for fire. Appropriate mitigation techniques include using non-flammable materials such as ignition-resistant construction, leaving appropriate spaces between buildings and vegetation, landscaping with non-flammable materials (such as decorative rock or stone), and clearing of underbrush and trees. If a wildland fire were to cross completely into an urban zone, the damage could be extensive and there would likely be a higher exposure of property and homes themselves become fuel in extreme fire weather conditions.

Potential losses to Santa Fe County from wildfire was analyzed by using the Wildland Urban Interface (WUI) Community layer from the 2008 Santa Fe CWPP with parcel data and structure point data provided by the Santa Fe County Assessor‘s Office.

A wildfire vulnerability assessment was performed for Santa Fe County using GIS. The county‘s parcel layer and associated assessor’s building improvement valuation data were provided by the county and were used as the basis for the inventory. Santa Fe County‘s WUI Assessed Communities was used as the hazard layer. The WUI layer contains communities throughout the county with associated hazard ratings that range from Extreme, Very High, and High to Moderate. The community ratings are based on the methodology described in the 2008 Santa Fe County CWPP.

GIS was used to intersect the parcel boundaries with a structure location layer to obtain number of buildings per parcel. The WUI layer was overlaid in GIS on the structure data to identify structures in each WUI community. Structure improvement and agriculture values and counts for those points were then extracted from the parcel/assessor‘s data and summed for the WUI Communities. Contents values were also estimated (see discussion in flood vulnerability discussion). The WUI communities are mainly in unincorporated Santa Fe so results were not broken out by jurisdiction but by Community. Results of the overlay analysis area shown in Table 4.42 and Table 4.43, and are sorted by property type, and by WUI hazard and WUI community.

The results indicate that $3.5 billion in property value and 12,673 structures are potentially exposed to wildland fire hazards in the unincorporated county. About 12% of that value and structures are located in a WUI community designated as Very High risk. Only one WUI community, La Barberia, is rated as extreme and has 365 structures which equates to about 3% of the total structures and values at risk. The exposure values for wildfire can be considered equivalent to loss estimates, as typically the entire structure and contents are consumed by wildfires. It would be extremely rare, however, for a wildfire to affect all the at-risk communities simultaneously. For purposes of loss estimation, assuming a large wildfire that burned 10% of the WUI exposed structures, this would result in a loss of approximately 1,200 structures and $236M.

Property type refers to the land use of the parcel and includes commercial, exempt (county, federal, state), open space, other, park, residential (condominium, mobile home, single family) and vacant. Based on the analysis the majority of risk to single family residences with $2B worth of improvements exposed.

Table 4.42: Property Type Exposure Within the WUI

Property Type	Building Count	Improved Value	Agriculture Value	Content Value	Total Value
Commercial	227	$90,368,787	$6,150	$90,368,787	$180,743,724
Exempt	108	$4,891,667	$140	$4,891,667	$9,783,474
Exempt County	4	$0	$0	$0	$0
Exempt Federal	8	$0	$0	$0	$0
Exempt State	1	$0	$0	$0	$0
Open Space	18	$0	$0	$0	$0
Other	105	$0	$0	$0	$0
Park	3	$0	$0	$0	$0
Residential Condominium	56	$11,813,946	$0	$5,906,973	$17,720,919
Residential Mobile Home	564	$3,360,486	$4,590	$1,680,243	$5,045,319
Residential Multi Family	81	$785,283	$660	$392,642	$1,178,585
Residential Single Family	10,688	$2,248,888,322	$69,470	$1,124,444,161	$3,373,401,953
Vacant	810	$1,551,240	$67,170	$0	$1,618,410
Total	**12,673**	**$2,361,659,731**	**$148,180**	**$1,227,684,473**	**$3,589,492,384**

Table 4.43: WUI Community and Hazard Exposure

WUI Community	WUI Hazard	Building Count	Improved Value	Agriculture Value	Content Value	Total Value
Apache Ridge	Very High	247	$32,898,077	$1,040	$16,868,734	$49,767,851
Arroyo Hondo	Moderate	498	$107,051,244	$620	$53,767,409	$160,819,273
Bella Vista	High	269	$26,614,253	$0	$13,307,127	$39,921,380
Bishop's Lodge	High	103	$76,467,717	$40	$42,613,379	$119,081,136
Camel Tracks	Moderate	273	$22,111,226	$0	$11,833,153	$33,944,379
Canada De Los Alamos	High	314	$25,036,916	$500	$12,103,814	$37,141,230
Canyoncito	High	207	$16,310,826	$100	$8,556,033	$24,866,959
Cedar Grove	Very High	268	$26,986,458	$1,840	$13,481,044	$40,469,342
Cerrillos	High	260	$13,774,223	$0	$7,065,894	$20,840,117
Chimayo	Moderate	523	$19,763,257	$15,790	$11,073,556	$30,852,603
Chupadero	High	437	$94,328,108	$13,550	$58,983,139	$153,324,797
Cordova	Moderate	0	$0	$0	$0	$0
Cundiyo	High	104	$5,001,870	$4,430	$2,502,105	$7,508,405
Gan Eden	Moderate	98	$16,419,333	$420	$8,209,667	$24,629,420
Glorieta Estates	High	104	$9,294,191	$0	$4,647,096	$13,941,287
Glorieta Mesa	Very High	20	$1,022,489	$2,970	$511,245	$1,536,704
Hyde Park	Very High	146	$43,785,166	$0	$23,469,708	$67,254,874
La Barberia	Extreme	365	$84,396,618	$0	$42,198,309	$126,594,927
La Cienega	Moderate	906	$65,725,012	$6,640	$35,486,037	$101,217,689
La Cueva Canyon	High	199	$13,849,523	$480	$7,047,992	$20,897,995
La Jolla	High	203	$13,028,548	$1,480	$6,512,374	$19,542,402
La Tierra	Moderate	521	$239,670,692	$2,200	$120,032,036	$359,704,928
Lamy	High	180	$9,589,530	$890	$4,943,090	$14,533,510
Las Campanas	Moderate	1,063	$656,166,084	$0	$338,841,302	$995,007,386
Los Pinos	Moderate	450	$27,671,101	$0	$15,384,597	$43,055,698
Los Vaqueros/Cimmarron	High	173	$43,672,077	$0	$21,836,039	$65,508,116
Lower Pacheco Canyon	High	53	$17,281,160	$0	$8,640,580	$25,921,740
Madrid	Moderate	148	$10,447,636	$0	$7,513,603	$17,961,239
Mailbox Road	Very High	113	$4,106,348	$660	$2,050,354	$6,157,362
Ojo De La Vaca	Very High	105	$10,243,907	$1,180	$5,121,954	$15,367,041
Old Ranch Road	Moderate	261	$56,848,783	$2,160	$29,134,392	$85,985,335
Old Santa Fe Trail	High	63	$11,888,870	$0	$5,944,435	$17,833,305
San Marcos	Moderate	424	$25,079,719	$150	$12,771,640	$37,851,509
San Pedro	Very High	146	$7,983,287	$2,370	$3,999,184	$11,984,841
Santa Fe South	Moderate	42	$8,601,124	$0	$4,300,562	$12,901,686

Sombrillo/Cuarteles	High	1,034	$54,082,527	$34,490	$29,700,489	$83,817,506
Sunlit Hills	Moderate	345	$50,090,396	$44,860	$25,390,673	$75,525,929
Tano Road	Very High	419	$162,084,118	$210	$81,042,059	$243,126,387
Tesuque	High	836	$168,029,618	$6,100	$87,680,826	$255,716,544
Thunder Mountain	High	593	$62,493,450	$0	$32,233,510	$94,726,960
Turquoise Trail	High	160	$21,764,249	$3,010	$10,885,340	$32,652,599

It is important to note that there could be more than one structure or building on an improved parcel (i.e., condo complex occupies one parcel but might have several structures). All parcels and the value of their improvements were analyzed. The end result is an inventory of the types of parcels and number of buildings subject to the hazards.

Critical Infrastructure. A GIS analysis was conducted to determine the number of critical facilities located in WUI hazard zones; these facilities are at increased risk from a wildfire. Table 4.44 shows the facilities by hazard level and jurisdiction.

Table 4.44: Jurisdictional Analysis of Critical Infrastructure in the WUI

Extreme WUI Hazard			
Jurisdiction	**Category**	**Facility Type**	**Facility Count**
Unincorporated	Transportation and Lifelines	Bridge	1
	Grand Total		**1**
Very High WUI Hazard by Jurisdiction Critical Facilities			
Jurisdiction	**Category**	**Facility Type**	**Facility Count**
Unincorporated	Essential Facilities	Fire Station	2
	Transportation and Lifelines	Bridge	2
	Transportation and Lifelines	Communication	1
	Grand Total		**5**
High WUI Hazard by Jurisdiction Critical Facilities			
Jurisdiction	**Category**	**Facility Type**	**Facility Count**
Edgewood	High Potential Loss Facilities	School	1
	Transportation and Lifelines	Communication	5
	Total		**6**
Nambe Pueblo	Transportation and Lifelines	Communication	1
	Total		**1**
Santa Clara Pueblo	Transportation and Lifelines	Communication	1
	Total		**1**
Tesuque Pueblo	Transportation and Lifelines	Bridge	1
	Total		**1**

Unincorporated	Essential Facilities	Fire Station	7
	High Potential Loss Facilities	Hazmat	1
	High Potential Loss Facilities	School	3
	Transportation and Lifelines	Bridge	19
	Transportation and Lifelines	Communication	4
	Transportation and Lifelines	Train Station	1
	Total		**35**
	Grand Total		**44**
Moderate WUI Hazard by Jurisdiction Critical Facilities			
Jurisdiction	**Category**	**Facility Type**	**Facility Count**
Santa Fe	Transportation and Lifelines	Bridge	1
	Total		**1**
Unincorporated	Essential Facilities	Fire Station	4
	High Potential Loss Facilities	Dam	2
	High Potential Loss Facilities	School	2
	Transportation and Lifelines	Bridge	13
	Transportation and Lifelines	Communication	9
	Transportation and Lifelines	Potable Water	1
	Total		**31**
	Grand Total		**32**

Natural Environment

Fire is a keystone process in the natural environment, providing many benefiting impacts to the surrounding habitat. Some natural resources and natural areas may benefit from wildland fire, as at some level they must also be exposed to wildfire for a healthy ecological development of the area. However, extremely hot fires can result in habitat loss, watershed damage and increased erosion, and other impacts that could take decades to recover.

Future Development

Areas vulnerable to a higher wildfire risk are identified in the County's CWPP. Long term comprehensive planning needs to take these areas into account, and new construction needs to be built with wildfire mitigation measures in mind. Generally, the adobe construction popular in the area is ignition-resistant.

Risk Summary

- Of the 17 major fires burning over 100 acres, 3 occurred in March, 4 occurred in May and 10 occurred in June. Of the 146 total fires listed in the Federal Fire Occurrence Database, 69 were caused by human activity, while 77 occurred naturally, usually by lightning strikes;
- GIS analysis for this plan indicates $3.5 billion in property value and 12,673 structures are potentially exposed to wildland fire hazards in the unincorporated county. About 12% of that value and structures are located in a WUI community designated as Very High risk. Only one WUI community, La Barberia, is rated as extreme and has 365 structures which equates to about 3% of the total structures and values at risk. 90% of the structures are residential, 2% commercial, and 8% associated with other property types;
- An estimated 18,208 people live in the WUI, including 2,263 living in Very High and 608 in Extreme rated WUI communities;
- Critical facility risk includes fire stations, schools, communication facilities and potable water facilities.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Extensive	Highly Likely	Critical	High

4.3.14 Agriculture Incident Animal/Plant/Crop Disease

Hazard/Problem Description

Agricultural infestation is the naturally occurring infection of vegetation, crops or livestock with insects, vermin, or diseases that render the crops or livestock unfit for consumption or use. The potential for infestation of crops or livestock poses a significant risk to the economy of the State. New Mexico cropland is vulnerable to disease and other agricultural pests. An agricultural disease or infestation could be devastating, as an incident in a single area could affect the statewide, regional and national agriculture sectors.

Some level of agricultural infestation is normal in New Mexico. The concern is when the level of an infestation escalates suddenly, or a new infestation appears, overwhelming normal control efforts. The levels and types of agricultural infestation appear to vary by many factors, including cycles of heavy rains and drought.

According to the 2014 New Mexico Agriculture Statistics bulletin, Santa Fe County had 715 farms and ranches; the county contained 460 ranches in 2002, with the largest amount of growth between 2007 and 2012 (+46%). The county's Sustainable Growth Management Plan notes fragmentation of large farms, which could help account for this rise; additionally, the HMPC noted the rise in urban farming as another possible source for the rise in number of farms. Santa Fe County ranked

31st (of 33 counties) in farm commodities by county in 2014, with commodities totaling approximately $10,355,000. The total commodities figure encompasses total livestock ($7,637,000 in 2014) and crops ($2,718,000 in 2014). According to the 2012 Census for Agriculture, of the land used in the county for agriculture, 91.8% is used for pastureland, while 8.2% is classified as "other use."

Animal Disease

Agricultural disasters in New Mexico's animal populations can be caused by intentional or unintentional introduction of foreign animal disease on the production agriculture sector that can de-stabilize or disrupt markets for food and agricultural products. Livestock could be contaminated with insects, vermin, or diseases that render the livestock unfit for consumption or use. According to the HMPC, the livestock inventory in Santa Fe County is predominantly beef cattle; the County had 3,700 head of beef cattle in 2014 (milk cow numbers were not reported in the 2014 New Mexico Agriculture Statistics bulletin). Santa Fe County is also estimated to have 600 head of sheep.

According to New Mexico state law, the following livestock diseases must be reported to the New Mexico Livestock Board and the State Veterinarian:

- African horse sickness
- All transmissible spongiform encephalopathies
- Anthrax
- Avian influenza
- Bluetongue and epizootic hemorrhagic disease
- Botulism
- Brucellis
- Classical swine fever
- Contagious bovine or caprine pleuropneumonia
- Contagious equine metritis
- Dermatophilosis
- Equine encephalopathies
- Equine herpesvirus
- Equine infectious anemia
- Equine piroplasmosis
- Foot and mouth disease
- Fungal diseases of livestock with zoonotic potential
- Glanders
- Malignant catarrgal fever
- Newcastle disease

- Plague
- Pseudorabies
- Psittacosis
- Q fever
- Rabies
- Scabies in livestock
- Screwworm
- Strangles
- Swine influenza
- Texas cattle fever
- Trichomoniasis
- Tuberculosis
- Tularemia
- West Nile virus and other arboviral diseases

Crop Pests/Diseases

A plant disease outbreak or a pest infestation could negatively impact crop production and agriculturally dependent businesses. An extreme outbreak or infestation could potentially result in billions of dollars in production losses. The cascading net negative economic effects could result in wide-spread business failures, reduction of tax revenues, harm to other state economies, and diminished capability for this country to compete in the global market.

Many factors influence disease development in plants, including hybrid/variety genetics, plant growth stage at the time of infection, weather (e.g., temperature, rain, wind, hail, etc.), single versus mixed infections, and genetics of the pathogen populations. The two elements of coordination and communication are essential when plant diseases or pest infestations occur. The United States Department of Agriculture/ Animal Plant Health Inspection Service, New Mexico Department of Agriculture, local producers, local government, assessment teams, and state government entities must work together to effectively diagnose the various plant hazards to determine if immediate crop quarantine and destruction is required. Plant diagnostic services for pathogens and other environmental stresses in New Mexico are provided by the Plant Diagnostic Clinic at New Mexico State University.

Geographic Location/Extent

All agriculture areas of Santa Fe County are subject to animal/livestock incidents and agricultural infestations. Agricultural infestation of crops or livestock in the planning area could severely affect the economy.

According to the HMPC, the rise of urban farming has situated many of the identified farms and ranches close to and within city boundaries; it also accounts for the rise in the number of ranches and farms over the last decade.

Probability of Future Occurrence

The planning area experiences some level of agricultural loss every year as a result of naturally-occurring diseases that impact animals/livestock. The HMPC rated the probability of occurrence for this hazard as occasional.

4.3.15 Vulnerability Assessment

People

A widespread infestation of animals/livestock and crops could impact the economic base of the County. According to the USDA 2012 Census of Agriculture, Santa Fe County agriculture provided 715 jobs. These jobs could be negatively impacted during an agriculture emergency; jobs tangentially tied to the agriculture industry could also be affected.

Additionally, different animal or crop contaminations could adversely affect the health of consumers. In some cases, diseases can be transferred from animals to humans. The scope of impact would be contingent on the contaminant.

Animal mortality must also be considered in the event of an animal disease outbreak. Diseases normally affect herds, and the number of animals impacted is directly related to the speed of onset and the parameters of the response. Euthanasia needs must be considered for impacted herds.

Economy

According to the 2012 Census of Agriculture, the market value of all agriculture products sold in Santa Fe County was $12,766,000. Of this, $3,179,000 (25%) are comprised of livestock sales, and $9,597,000 (75%) are comprised of crop sales. Direct infestations could impact large percentages of these sales, heavily impacting the economy.

Agriculture disasters can also have a devastating economic impact without direct infestation or contamination. Rumors of tainted meat or crops anywhere in the country can cause consumers to stay away from those types of products, adversely affecting the economy.

Built Environment

Buildings, infrastructure, and critical facilities are not vulnerable to this hazard. Its impacts are primarily economic and environmental, rather than structural affects. The HMPC noted a specific concern about agriculture products coming into the state of New Mexico over the southern border, and whether that could cause any contamination. They stated the State has been looking at this issue.

Critical Infrastructure. Agricultural centers are generally not considered critical infrastructure in this plan, though this by no means undermines their importance. Should an agriculture incident occur, any facility or location with the same type of vulnerable agriculture product would be considered vulnerable to contamination.

Natural Environment

The biggest impacts to the natural environment would be animal or plant pests and diseases that can transfer to animals or plants in the wild.

Future Development

Future development is not expected to significantly impact the planning area's vulnerability to this hazard. However, if crop production and numbers of animals/livestock increases, the amount vulnerable to infestation also increases.

Risk Summary

- According to the 2014 New Mexico Agriculture Statistics bulletin, Santa Fe County had 715 farms and ranches; the county contained 460 ranches in 2002, with the largest amount of growth between 2007 and 2012 (+46%);
- Santa Fe County ranked 31st (of 33 counties) in farm commodities by county in 2014, with commodities totaling approximately $10,355,000;
- The total commodities figure encompasses total livestock ($7,637,000 in 2014) and crops ($2,718,000 in 2014). According to the 2012 Census for Agriculture, of the land used in the county for agriculture, 91.8% is used for pastureland, while 8.2% is classified as "other use;"
- The agriculture sector is vulnerable to incidents outside of the county.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Significant	Occasional	Critical	Medium

4.3.16 Dam Failure

Hazard/Problem Description

Dams are man-made structures built for a variety of uses including flood protection, power generation, agriculture, water supply, and recreation. When dams are constructed for flood protection, they are usually engineered to withstand a flood with a computed risk of occurrence. For example, a dam may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any one year. If prolonged periods of rainfall and flooding occur that exceed the design requirements, that structure may be overtopped and fail. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can also result from any one or a combination of the following causes:

- Earthquake;
- Inadequate spillway capacity resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage, or piping or rodent activity;
- Improper design;
- Improper maintenance;
- Negligent operation; and/or
- Failure of upstream dams on the same waterway.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major loss of life could result as well as potentially catastrophic effects to roads, bridges, and homes. Electric generating facilities and transmission lines could also be damaged and affect life support systems in communities outside the immediate hazard area. Associated water supply, water quality and health concerns could also be an issue. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

In general, there are three types of dams: concrete arch or hydraulic fill, earth and rockfall, and concrete gravity. Each type of dam has different failure characteristics. A concrete arch or hydraulic fill dam can fail almost instantaneously; the flood wave builds up rapidly to a peak then gradually declines. An earth-rockfill dam fails gradually due to erosion of the breach; a flood wave will build gradually to a peak and then decline until the reservoir is empty. And, a concrete gravity dam can fail instantaneously or gradually with a corresponding buildup and decline of the flood wave.

Dams and reservoirs have been built throughout New Mexico to supply water for agriculture and domestic use, to allow for flood control, as a source of hydroelectric power, and to serve as recreational facilities. The storage capacities of these reservoirs range from a few thousand acre feet to five million acre-feet.

The Office of the State Engineer - Dam Safety Bureau regulates the design, construction, reconstruction, modification, removal, inspection, operation, maintenance and continued safety of dams over 10 feet high, or dams that store more than 10 acre-feet of water. Dams 10 feet or less in height, or dams that store 10 acre-feet or less, are generally not regulated and are considered non-jurisdictional dams; however, if a non-jurisdictional dam threatens life and property due to an unsafe condition, the state engineer can issue a safety order to the owner requiring action to remove the threat.

Location

According to data provided by the National Inventory of Dams, there are 14 high hazard dams within or near the border Santa Fe County. Eleven of these dams has an Emergency Action Plan (EAP) according to the database. Additionally, there are a number of dams on drainages to the north that could release water in the County should failure occur. Dam locations can be seen in Figure 4.42 and Figure 4.43. Table 4.45 gives details of the 14 dams in or closest to the county. In addition, there are 44 high hazard dams located outside of the County (mostly in the Espanola area north of the City of Santa Fe) whose failure could cause impacts within the jurisdiction.

Figure 4.42: Location of Dams in Santa Fe County and Vicinity

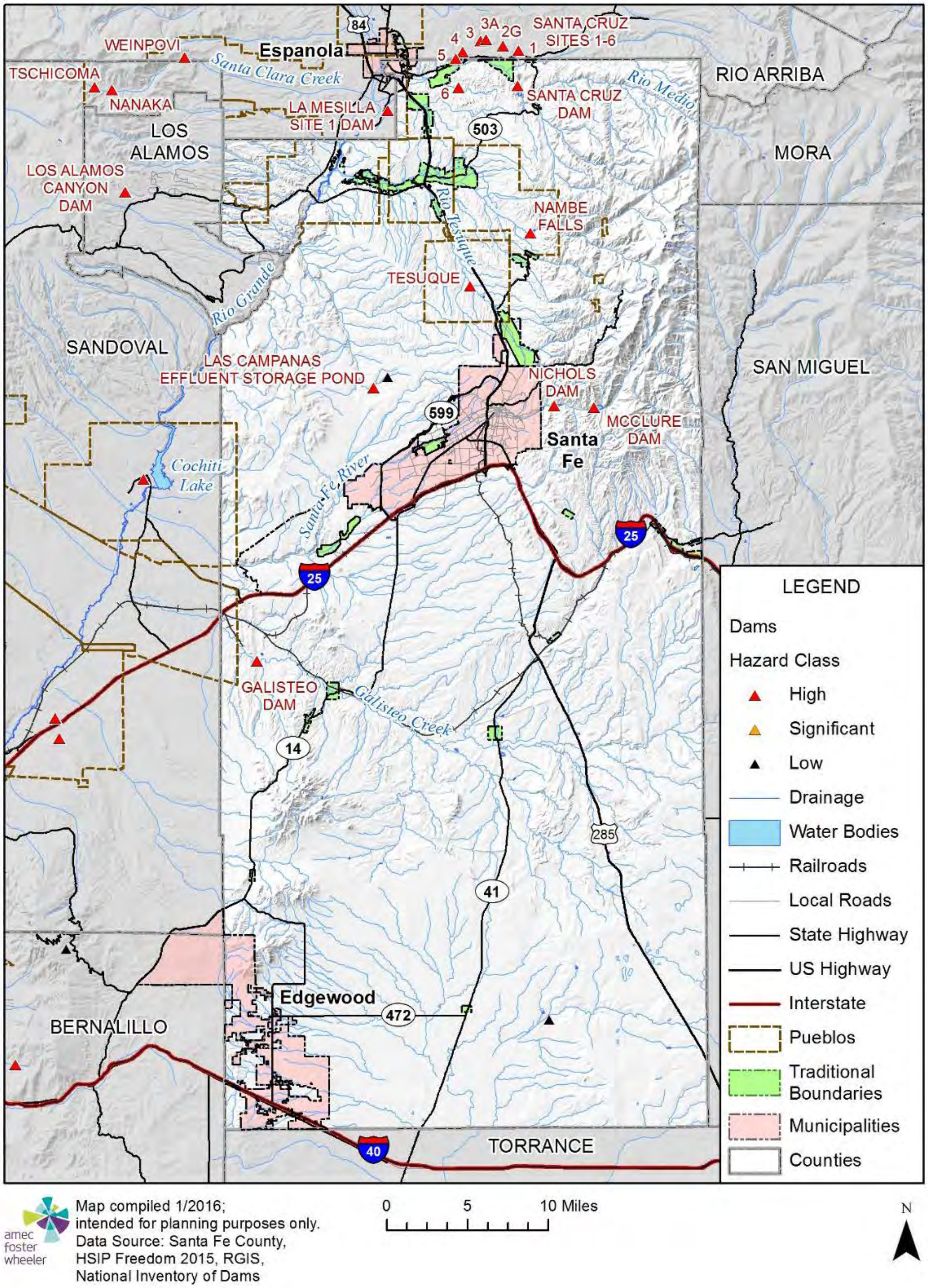


Figure 4.43: Location of Dams Outside Santa Fe County

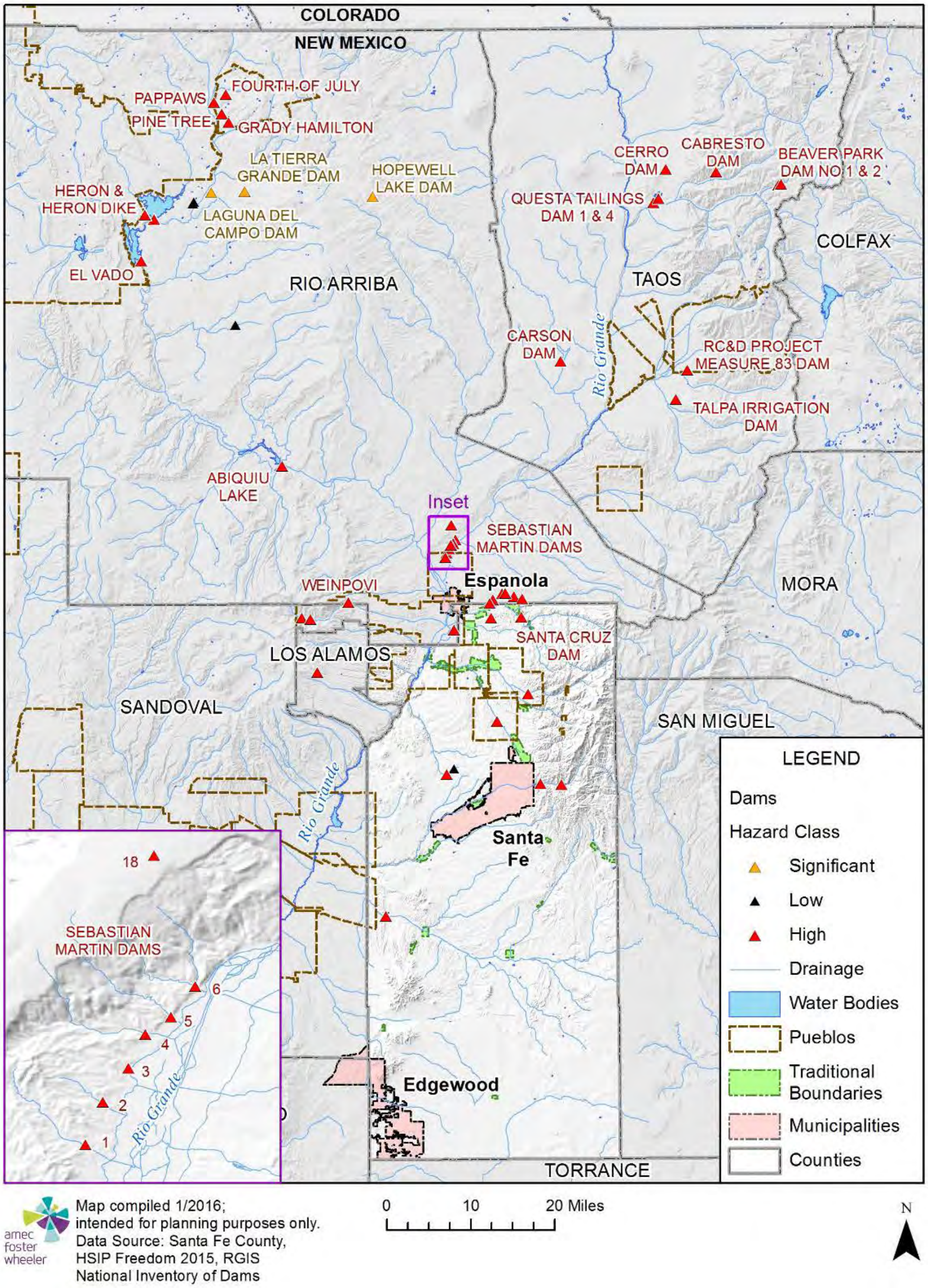


Table 4.45: Santa Fe County Dam Inventory

Dam	River/Stream	Nearest Community at Risk	Hazard Class	Year Built	Owner	EAP in Place
Galisteo	Galisteo Creek	Santo Domingo Pueblo (9 miles)	High	1970	CESPA	Y (2012)
Las Campanas Effluent Storage Pond	Rio Grande – OS	Santa Fe (6 miles)	High	1995	Las Campanas Development Company, Inc.	N
McClure Dam	Santa Fe River	Santa Fe (6 miles)	High	1926	City of Santa Fe	N
Nambe Falls	Rio Nambe River	Nambe Pueblo (5 miles)	High	1975	Bureau of Reclamation	N
Nichols Dam	Santa Fe River	Santa Fe (3 miles)	High	1943	City of Santa Fe	N
Santa Cruz Dam	Santa Cruz River	Chimayo (0 miles)	High	1929	Santa Cruz Irrigation District	N
Santa Cruz Site 1 Dam	Canada Ancha	Chimayo (1 mile)	High	1962	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Santa Cruz Site 2G Dam	Arroyo De Los Vecinos	Chimayo (1 mile)	High	1982	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Santa Cruz Site 3 Dam	Canada De Los Ramones	Chimayo (1 mile)	High	1962	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Santa Cruz Site 3A Dam	Santa Cruz River – TR	Chimayo (1 mile)	High	1972	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Santa Cruz Site 4 Dam	Martinez Arroyo	Espanola (3 miles)	High	1961	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Santa Cruz Site 6	Alamo Arroyo; TR-Santa Cruz	Sombrillo (3 miles)	High	1962	Santa Fe – Pojoaque Soil and Water Conservation District	Y
Santa Cruz Site 6 Dam	Alamo Arroyo	Sombrillo (1 mile)	High	1962	Santa Fe – Pojoaque Soil and Water Conservation District	Y (1999)
Tesuque	Rio Tesuque – TR	Tesuque Pueblo (0 miles)	High	1960	BIA	Y
Las Campanas Dam 18E	Rio Grande – OS	La Cienega (11 miles)	Low	1992	Las Campanas Development Company, Inc.	-

Source: National Inventory of Dams

From a hazard standpoint the Santa Cruz and Nambe Falls dams pose the greatest potential for downstream impacts should failure occur. The Santa Cruz 1-6 dams are High Hazard earthen dams that are owned by the Pojoaque Valley Irrigation District. They are located in Rio Arriba County but drain into Santa Fe County and the Chimayo Valley. These were originally built for flood control to protect people and farms in the Chimayo Valley and only hold water on a temporary basis during large rain events. These dams were constructed in the 1960s and some have silted in, are experiencing erosion and recreational vehicle impacts, and the arroyos below them are experiencing increased encroachment of development. The Santa Fe – Pojoaque Soil and Water Conservation District is in the process of rehabilitating dam #1 in 2016, which has experienced the greatest siltation.

Extent

Standard practice among federal and state dam safety offices is to classify a dam according to the potential impact a dam failure (breach) or mis-operation (unscheduled release) would have on downstream areas. The hazard potential classification system categorizes dams based on the probable loss of human life and the impacts on economic, environmental and lifeline facilities. Dams are classified in three categories that identify the potential hazard to life and property:

- *High hazard* indicates that a failure would most probably result in the loss of life;
- *Significant hazard* indicates that a failure could result in appreciable property damage;
- *Low hazard* indicates that failure would result in only minimal property damage and loss of life is unlikely.

Since the County has High hazard dams, there is potential for loss of life and property damage. The extent of impacts depends on the nature of failure and location of the dam. Dam Emergency Action Plans for High hazard dams typically contain information on inundation areas for dam breaks, and areas that would need evacuation and warning.

Previous Occurrences

According to the database of the National Performance of Dams Program, there have been no past incidents of dam failure or any dam incidents in Santa Fe County.

Probability of Future Occurrences

Unlikely—No known dam failure events have occurred in the County. The State Hazard Mitigation plan made efforts to determine a probability of occurrence for dam failure. Santa Fe County falls in Preparedness Area 3, which the State determined had a 6% chance of a dam failure occurring in a given year.

Vulnerability Assessment

People

Persons located underneath or downstream of a dam are at risk of a dam failure, though the level of risk can be tempered by topography, amount of water in the reservoir and time of day of the breach. The largest populations potentially at risk are in the Chimayo Valley area and Espanola, downstream of the Santa Cruz Dam. The Pojoaque Valley downstream of the Nambe Falls dam is another area of risk. Nichols and McClure dams could have impacts as well, mostly to the City of Santa Fe. Injuries and fatalities can occur from debris, bodily injury and drowning. Once the dam has breached, standing water presents all the same hazards to people as floodwater from other sources.

Economy

Depending on the circumstances and location of the breach, dam failure can have significant impacts on the economy. Waters can flood and ruin buildings, and wash out culverts, roads, bridges and other transportation systems. Depending on what the water damages, the economic impacts will vary.

Built Environment

In general, communities located below a dam and along a waterway are likely to be exposed to the impacts of a dam failure. Specific inundation maps and risk information are included in the dam-specific emergency action plans on file with the Santa Fe County Office of Emergency Management. Due to the sensitive nature of this information, it is not included in this plan. Inundation maps that identify anticipated flooded areas (which may not coincide with known floodplains) are produced for all high hazard dams and are contained in the Emergency Action Plan (EAP) required for each dam. However, the information contained in those plans is considered sensitive and is not widely distributed. For reference, high hazard dams threaten lives and property, significant hazard dams threaten property only.

The potential impacts from a dam failure in the County are largely dependent on the specific dam or area in question. There are a number of dams above urbanized areas (such as the Nichols and McClure dams above Santa Fe, Nambe Falls above Pojoaque, and the Santa Cruz series of dams above Espanola and the Chimayo Valley). Most of these dams in are small by relative storage capacity, with the Santa Cruz dam being one of the larger ones. By far the largest dam in the County is the Galisteo Dam, west of the community of Los Cerillos with a normal storage capacity of 89,800 acre-feet of water. Failure of this dam, however, would not have impacts in the County because the drainage that it dams flows out of the jurisdiction.

Impacts to Critical Infrastructure

A total dam failure can cause catastrophic impacts to areas downstream of the water body, including critical infrastructure. Any structures under the dam would be susceptible to a dam failure. The greatest risk would be to roads and bridges that could be vulnerable to washouts that further complicate response and recovery.

Natural Environment

Dam failure effects on the environment would be similar to those caused by flooding from other causes. Water could erode topsoil, cover the environment with debris. For the most part the environment is resilient and would be able to rebound from whatever damages occurred.

Future Development

Areas slated for future development should be cognizant of dam failure risk upstream. In the case of a dam failure, inundation would likely follow some existing FEMA mapped floodplains, which contains development restrictions for the 1% annual chance floods, but it could exceed those floodplains. It should be noted that development below a low hazard dam could increase its hazard rating. Encroachment of homes has occurred on arroyos downstream of the Santa Cruz 1-6 flood control dams.

Risk Summary

- According to data provided by the National Inventory of Dams, there are 14 high hazard dams within or near Santa Fe County.
- Several of these dams are above the Chimayo Valley and Le Puebla community in the northern half of the county; several additional high hazard dams are in watersheds north of the County.
- According to the National Performance of Dams program, Santa Fe County has never suffered a failure of one of these dams.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Significant	Unlikely	Catastrophic	High

4.3.17 Hazardous Materials (including Radiological Incidents)

Hazard/Problem Description

A hazardous material is any item or agent (biological, chemical, physical) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Hazardous materials can be present in any form; gas, solid, or liquid. Environmental or atmospheric conditions can influence hazardous materials if they are uncontained.

The U.S. Occupational Safety and Health Administration's (OSHA) definition of a hazardous material includes any substance or chemical which is a "health hazard" or "physical hazard," including chemicals which are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents which act on the hematopoietic system; agents which damage the lungs, skin, eyes, or mucous membranes; chemicals which are combustible, explosive, flammable, oxidizers, pyrophorics, unstable-reactive or water-reactive; and chemicals which in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapors, mists or smoke which may have any of the previously mentioned characteristics.

The Environmental Protection Agency (EPA), through various regulations including the Resource Conservancy and Recovery Act, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and others, provide a series of definitions depending on the applicable regulation. A release or spill of bulk hazardous materials could result in fire, explosion, toxic cloud, or direct contamination of people and property. The effects may involve a local site or many square miles. Health problems may be immediate, such as corrosive effects on skin and lungs, or be gradual, such as the development of cancer from a carcinogen. Damage to property could range from immediate destruction by explosion to permanent contamination by a persistent hazardous material.

Accidents involving the transportation of hazardous materials could be just as catastrophic as accidents involving stored chemicals, and possibly more so, since the location of a transportation accident is not predictable. The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property (e.g., radioactivity, flammability, etc.).

Figure 4.44: Hazardous Materials Classes

Source: U.S. Department of Transportation

According to the HMPC, hazardous materials transported across the county include:

- Basic household waste and commercial materials;
- Nuclear waste routed to the Waste Isolation Pilot Plant;

- Nuclear weapons transported for maintenance from Kirtland Air Force Base;
- Shipments to and from Los Alamos National Labs.

Hazardous and radiological materials are transported across Santa Fe County on a daily basis. The vast majority of these shipments move across the county without incident. According the HMPC, Santa Fe County has a higher than average risk of a hazardous materials incident, due to the sheer volume of shipments moving across the county.

Waste Isolation Pilot Plant (WIPP)

The Waste Isolation Pilot Plant (WIPP), the nation's repository for "defense-related" transuric wastes, received its first shipment of non-mixed transuric waste in 1999 from Los Alamos National Laboratory. As other generator sites became certified, wastes generated from research, development and production of nuclear weapons at Department of Energy sites across the country will be shipped to WIPP, located southeast of Carlsbad, NM. Approximately 38,000 shipments are expected to continue to the site through 2050.

Specific routes have been identified for all WIPP shipments. Shipments from Los Alamos National Laboratory cross Santa Fe County, traveling a route along NM 502, U.S. 84/285, NM 599 and I-25, finally traveling southeast along Highway 285 and out of the county.

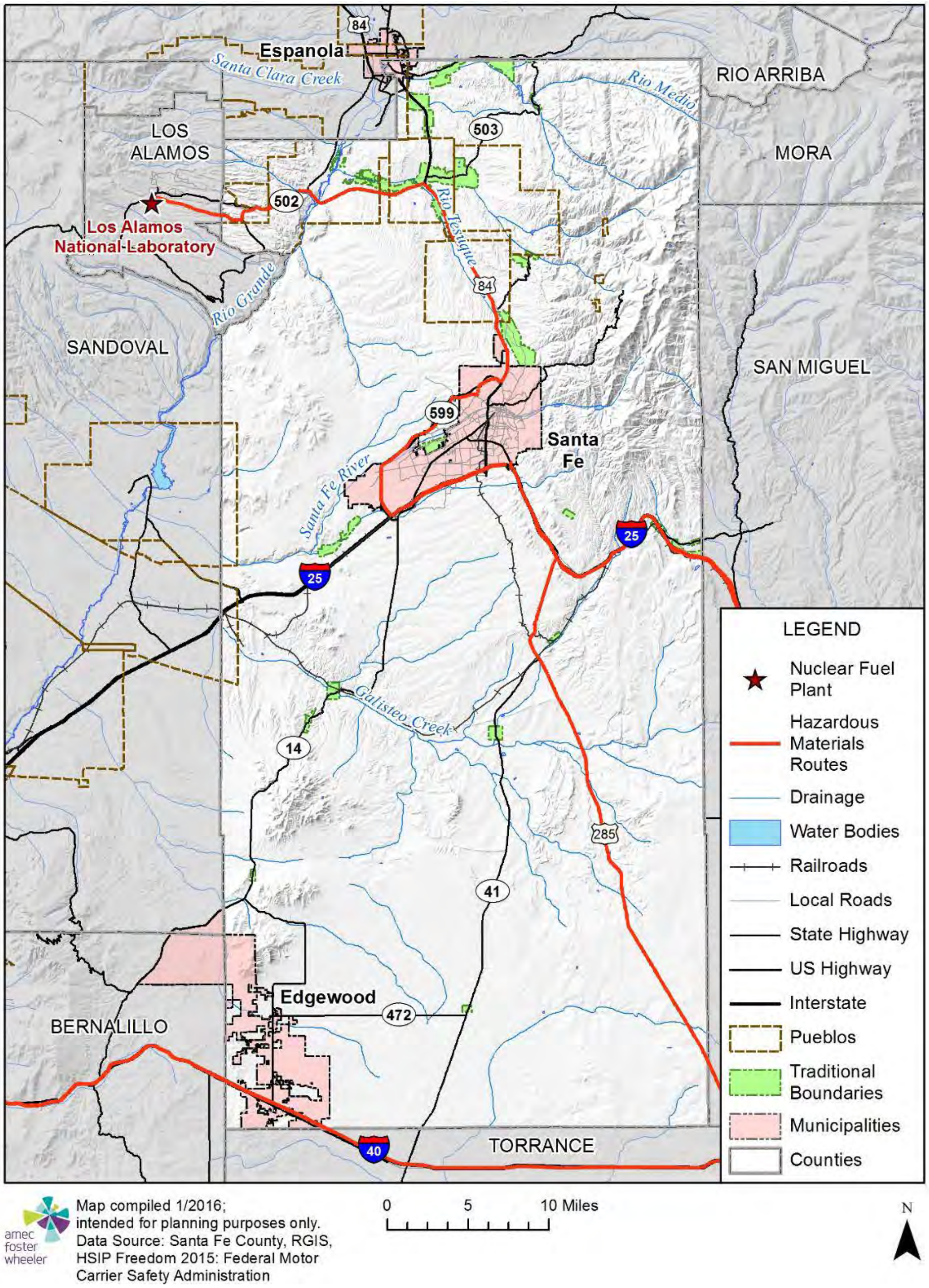
Location

Hazardous materials are everywhere, and spills or releases occur in the U.S. on a daily basis. Transportation incidents can occur during the transportation of hazardous materials to and from storage facilities. The most likely routes for the transportation of hazardous materials are major roadways and railroads.

There are four major designated hazardous materials transportation routes in the county: Highway 84/285, Highway 599, Interstate 25 and Interstate 40. Highway 599 is a designated hazardous materials bypass around the City of Santa Fe.

While Santa Fe County does have rail lines running through it, these are used for passenger service and no official hazardous materials shipments move on rail lines in the county.

Figure 4.45: Hazardous and Nuclear Materials Routes in Santa Fe County



The Buckman Direct Diversion Facility is a water treatment plant located on Highway 599. This facility sees a high volume of hazardous materials transportation to and from the plant on a regular basis.

Extent

Because of the variability of hazardous materials transported across the county, a general extent measure is difficult to determine. On a transportation incident with relatively normal weather and environmental conditions, it is anticipated that the impact area would be no more than a mile around the incident site.

Previous Occurrences

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) tracks hazardous materials spills and occurrences. A list of the incidents from this database occurring in Santa Fe County can be found in Table 4.46; it is important to note that incidents in the City of Santa Fe were omitted from this list.

Table 4.46: Hazardous Material Incidents in the Planning Area 1971-2015

Date	Incident City	Incident Route	Hazardous Class	Mode of Transport	Failure Cause Description
07/04/96	Edgewood	Interstate 40	Flammable - combustible liquid	Highway	Loose closure component or device
04/23/15	Edgewood	Interstate 40	Flammable - combustible liquid	Highway	Human error
06/29/79	Espanola		Flammable - combustible liquid	Highway	
02/21/78	Espanola		Flammable - combustible liquid	Highway	
07/28/00	Espanola	Route 4 Box 279	Corrosive material	Highway	Loose closure component or device
08/27/93	Espanola	301 Los Alamos Highway	Combustible liquid	Highway	
10/09/98	Espanola	Albuquerque NM 87107	Corrosive material	Highway	
09/28/78	Espanola		Flammable - combustible liquid	Highway	
01/15/72	Espanola		Flammable - combustible liquid	Highway	Defective component or device
02/22/80	Espanola		Flammable - combustible liquid	Highway	
08/08/95	Espanola	Riverside Drive	Corrosive material	Highway	Improper preparation for transportation; inadequate blocking and bracing
09/22/71	Espanola		Flammable - combustible liquid	Highway	

Date	Incident City	Incident Route	Hazardous Class	Mode of Transport	Failure Cause Description
02/08/80	Espanola		Flammable - combustible liquid	Highway	
03/19/07	Santa Fe County	20 Reata Rd	Combustible liquid	Highway	Improper preparation for transportation
05/22/15	Santa Fe County	4700 Hart Rd	Corrosive material	Highway	Defective component or device
04/18/15	Santa Fe County	4700 Hart Rd	Corrosive material	Highway	Defective component or device
06/02/15	Santa Fe County	2778 Agua Street	Corrosive material	Highway	Dropped
09/07/12	Santa Fe County	4700 Hart Rd.	Oxidizer	Highway	Loose closure component or device
04/25/15	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Loose closure component or device
04/24/14	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Defective component or device
03/25/13	Santa Fe County	4700 Hart Rd	Oxidizer	Highway	Loose closure component or device
04/22/14	Santa Fe County	4700 Hart Rd	Flammable solid	Highway	Defective component or device
05/02/15	Santa Fe County	4700 Hart Rd	Corrosive material	Highway	Defective component or device
06/17/11	Santa Fe County	4700 Hart Rd	Combustible liquid	Highway	Dropped
10/10/14	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Improper preparation for transportation
07/26/11	Santa Fe County	4700 Hart Rd	Oxidizer	Highway	Loose closure component or device
02/18/15	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Loose closure component or device
01/24/12	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Loose closure component or device
06/17/15	Santa Fe County	4700 Hart Rd	Flammable - combustible liquid	Highway	Loose closure component or device

Source: PHMSA Incident Reports Database

Since 1971, Santa Fe County has had 29 hazardous materials incidents between the unincorporated county, Edgewood and Espanola. Hazardous materials classes involved in spills in Santa Fe County fall into four of the nine categories; the majority of materials released fell under the flammable liquid category.

Corrosive materials: 7
Flammable liquid: 16
Flammable solid: 3
Oxidizer: 1

The incidents have a variety of different causes:

Loose Closure Component or Device:	9
Human Error:	1
Defective Component or Device:	6
Improper Preparation for Transportation:	2
Dropped:	2

Nine incidents had no cause listed. All incidents were classified as highway incidents, though some took place at shipping distribution centers. There were no recorded fatalities or injuries associated with these hazardous materials releases; $32,066 in damages were recorded over 5 incidents, with an average of $6,400 damages per incident.

Probability of Future Occurrences

Likely—Due to the amount of past occurrences and the number of hazardous materials routes that cross the County, and the potential magnitude and severity of a release, the likelihood of future occurrence is high.

Vulnerability Assessment

The impact to life and property from any given release depends on a number of factors:

- Application mode: the human act(s) or unintended event(s) necessary to cause the hazard to occur.
- Duration: the length of time the hazard is present on the target.
- Dynamic/static characteristic of a hazard: its tendency, or that of its effects, to either expand, contract, or remain confined in time, magnitude, and space.
- Mitigating conditions: characteristics of the target and its physical environment that can reduce the effects of a hazard.
- Exacerbating conditions: characteristics that can enhance or magnify the effects of a hazard.

People

The public's general vulnerability to hazardous materials incidents depends on the hazard. There are three exposure pathways for a person to come into contact with a hazardous materials: inhalation, ingestion and skin contact. Effects to people can include burns, breathing problems, and contamination. Designated hazardous materials routes in Santa Fe County are designed to bypass population centers as much as possible, reducing the risk to people in the county from a hazardous materials release.

Economy

Hazardous materials in Santa Fe County are transported along major highways and interstates; an incident could require the closure of roads that are also used for commerce and travel. While this may cause a small economic impact, in most cases the road wouldn't be closed for an extended period of time.

Built Environment

Impacts on the built environment are dependent on the site of the hazardous materials spill, weather and environmental conditions, and the material itself. Designated hazardous materials routes are designed to bypass large segments of the built environment, especially the city of Santa Fe. Interstate 40 travels through southern Edgewood; construction along the interstate could be impacted, and roads could be closed long-term.

Critical Infrastructure. Hazardous materials are routed through the county on specific hazardous materials routes. Any critical facilities within a mile on either side of these roads has an increased vulnerability to impacts from a hazardous materials release, dependent on environmental factors.

Natural Environment

Like all other vulnerability, vulnerability of the environment is predicated on the material, the location and prevailing conditions at the time of the incident. Specific areas of concern include areas where routes intersect or parallel rivers, and areas that present difficulty of access due to topography. Specific areas of note include Highway 502 intersecting the Rio Grande, Highway 84 paralleling the Rio Tesuque, and Highway 285 intersecting tributaries of Highway 285**.**

Future Development

When planning future development, proximity and vulnerability to hazardous materials routes and facilities should be taken into consideration, especially in Edgewood, around Santa Fe and in the Pueblos where development may be more prevalent.

Risk Summary

- Hazardous and radiological materials are transported across Santa Fe County on a daily basis. The vast majority of these shipments move across the county without incident. According to the HMPC, Santa Fe County has a higher than average risk of a hazardous materials incident, due to the sheer volume of shipments moving across the county and nearby National Labs.
- There are four major designated hazardous materials transportation routes in the county: Highway 84/285, Highway 599, Interstate 25 and Interstate 40. Highway 599 is a designated hazardous materials bypass around the city of Santa Fe;
- Since 1971, Santa Fe County has had 29 hazardous materials incidents between the unincorporated county, Edgewood and Espanola;

- There were no recorded fatalities or injuries associated with these hazardous materials releases; $32,066 in damages were recorded over 5 incidents, with an average of $6,400 damages per incident;
- The Buckman Direct Diversion Facility is a water treatment plant located on Highway 599. This facility sees a high volume of hazardous materials transportation to and from the plant on a regular basis.

Geographic Extent	Probability of Future Occurrence	Potential Magnitude/Severity	Overall Significance
Negligible	Likely	Critical	High

4.4 Capability Assessment

Thus far, the planning process has identified the natural hazards posing a threat to the Planning Area and described, in general, the vulnerability of the County to these risks. The next step is to assess what loss prevention mechanisms are already in place. This part of the planning process is the mitigation capability assessment. Combining the risk assessment with the mitigation capability assessment results in the County's net vulnerability to disasters, and more accurately focuses the goals and proposed actions of this plan.

The HMPC used a two-step approach to conduct this assessment for the County. First, an inventory of common mitigation activities was made through the use of a matrix. The purpose of this effort was to identify policies and programs that were either in place, needed improvement, or could be undertaken if deemed appropriate. Second, the HMPC conducted an inventory and review of existing policies, regulations, plans, and programs to determine if they contributed to reducing hazard-related losses or if they inadvertently contributed to increasing such losses.

Similar to the HMPC's effort to describe hazards, risks, and vulnerability of Santa Fe County, this mitigation capability assessment describes the County's existing capabilities, programs, and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. This assessment is divided into four sections: regulatory mitigation capabilities are discussed in Section 4.4.1; administrative and technical mitigation capabilities are discussed in Section 4.4.2; fiscal mitigation capabilities are discussed in Section 4.4.3; and mitigation outreach and partnerships are discussed in Section 4.4.4. A discussion of other mitigation efforts follows in Section 4.4.5.

4.4.1 Santa Fe County's Regulatory Mitigation Capabilities

Table 4.47 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in Santa Fe County.

Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.47: Santa Fe County Regulatory Mitigation Capabilities

Regulatory Tool (Ordinances, Codes, Plans)	Y/N	Date	Comments
Comprehensive plan	Y	2010	The Sustainable Growth Management Plan (SGMP) functions as the County's Comprehensive Plan
Zoning ordinance	Y	2013	The Sustainable Land Development Code (SLDC) is the ordinance that codifies the SGMP
Subdivision ordinance	Y	2011	New Mexico Subdivision Act 2011
Growth management ordinance	Y	2013	SLDC
Floodplain ordinance	Y	2013	Section 7.18 of the SLDC
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y	2013	SLDC
Building code	Y	2009	State of NM Building Code
BCEGS Rating	N		
Fire department ISO rating	Y	2015	Varies – See Chart Below
Erosion or sediment control program	Y	2013	Section 7.17 of the SLDC
Stormwater management program	Y	2013	Section 7.26 of the SLDC
Site plan review requirements	Y	2013	Section 10.17.3 of the SLDC
Capital improvements plan	Y	2013	Section 12.3 of the SLDC
Economic development plan	Y	2010	Section 2.1.1.3 of the SGMP
Local emergency operations plan	Y		
Community Wildfire Protection Plans	Y	2008	Located on State Forestry webpage
Flood insurance study or other engineering study for streams	Y	2011	
Elevation certificates	Y		Surveyor Required
Other			County has a 'Evacuation Planning Guide' that provides general information in the event of a wildfire

As indicated in the table above, Santa Fe County has several plans and programs that guide the County's mitigation of development of hazard-prone areas. Starting with the Santa Fe County Sustainable Growth Management Plan, which is the most comprehensive of the County's plans when it comes to mitigation, some of these are described in more detail below.

Table 4.48: Santa Fe County Volunteer Fire District ISO Ratings

District	Properties within 5 miles of a station and/or 1,000 feet of a fire hydrant	Properties beyond 5 miles of a fire station and/or 1,000 feet of a fire hydrant
Agua Fria Volunteer Fire District	5	7
Chimayo Volunteer Fire District	6	9
Edgewood Volunteer Fire District	5	6
El Dorado Volunteer Fire District	3	8B
Galisteo Volunteer Fire District	6	8B
Glorieta Pass Volunteer Fire District	5	8B
Hondo Volunteer Fire District	4	10
La Cienega Volunteer Fire District	6	8B
La Puebla Volunteer Fire District	6	9
Madrid Volunteer Fire District	5	8B
Pojoaque Volunteer Fire District	5	7
Stanley Volunteer Fire District	6	8B
Tesuque Volunteer Fire District	6	10
Turquoise Trail Volunteer Fire District	6	8B

Source: Santa Fe County http://www.santafecountynm.gov/

Santa Fe County Sustainable Growth Management Plan, 2010

The Santa Fe County Sustainable Growth Management Plan (SGMP) is a comprehensive, long-term framework for the protection of the County's resources and for development in the County. State statutes and the County Code require that the County have and maintain a Comprehensive Plan, and give the responsibility for plan updates to the Planning and Zoning Commission subject to final approval by the County Council. The main elements of this plan include:

- A sustainability vision for the county: *Sustainability for Santa Fe County means meeting the needs of the present while preserving our land, our history, our culture, our resources and our communities for future generations. Sustainable development maintains or enhances economic opportunity and community well-being while protecting and restoring the natural environment upon which people, natural systems and economies depend.*
- Land use
- Economic development
- Agriculture and ranching
- Open space, parks, recreation and trails
- Resource conservation
- Renewable energy and conservation

- Green design and development
- Public Safety
- Transportation
- Water (including long range water supply issues and drought)
- Public Facilities
- Housing
- Governance

The County's Growth Management and Land Use Department also has developed a number of community and corridor plans that are more specific to the unincorporated towns and villages in the County. These include:

- The Community Planning Ordinance (Authority)
- Village of Agua Fria
- Community College District Plan
- La Cienega and La Cieneguilla Community Plan
- Los Cerillos
- Town of Madrid
- Pojoaque Valley Community
- San Marcos District
- San Pedro
- Santa Fe NW
- Tesuque Community
- Tres Arroyos
- US 285 Corridor Plan
- El Valle de Arroyo Seco Corridor Plan

Section 9.4 – Fire Protection and Emergency Medical Services

The SGMP summarizes the fire protection and emergency medical services capabilities of the County which includes data and information from the Fire Department's Five Year Plan (2010 – 2014) as well as the 2008 Capital Improvement Plan (2008).

Part of the CIP is a GIS analysis of fire facilities (districts, stations and hydrants) as well as relative wildfire risk (low, medium and high) in the county. Wildfire risk Indicates the potential for property damage and personal injury from wildfire. Distance to fire stations indicates response limes and public costs associated with fire protection.

Santa Fe County Sustainable Land Development Code, 2013

The Santa Fe County Sustainable Growth Management Plan provides policy direction for land use, development, open space protection, and environmental quality; however, this policy direction must be carried out through the County's approved ordinance. Not being a home rule state, towns and villages in New Mexico must follow the code of the state and county in which they are located. The Santa Fe Sustainable Land Development Code (SLDC) is the approved ordinance for this County and includes a number of important tools for implementing the Comprehensive Plan (SGMP) and/or are critical to the mitigation of hazards identified in this plan.

Fire and Building Codes (SLDC Chapter 7.2)

In addition to the requirement of the SLDC, all development shall comply with the most current applicable codes adopted by the State of New Mexico, Santa Fe County and other entities. There is adopted, so far as it is not in conflict with this Code or any law of the state or with any valid regulation issued by any board or agency of the state authorized to make such regulations, for the purpose of regulating the erection, construction, enlargement, alteration, repair, moving, removal, conversion, demolition, occupancy, equipment, use, height, area and maintenance of all buildings or structures, and for the purpose of providing for the issuance of permits and the collection of fees, that certain code known as the New Mexico Building Code (2009), as adopted, amended and revised by the New Mexico Construction Industries Commission, and such code is adopted by reference and incorporated as fully as if set out in this section.

Subdivision, NMSA Chapter 47 Article 6

The SLDC defers to the State statues, specifically Chapter 47: Property Law, Article 6 which specifies regulation of subdivision. Collectively, this set of code is referred to as the 'New Mexico Subdivision Act, 1978' and contains standard practice methods for the responsible development and conveyance of subdivided lots.

Flood Prevention and Flood Control (SLDC Chapter 7.18)

The flood hazard areas of the unincorporated County of Santa Fe, New Mexico are subject to periodic inundation, which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety and general welfare.

These flood losses are created by the cumulative effect of obstructions in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed, or otherwise protected from flood damage.

NMSA 1978 Section 3-18-7(D), establishes that a county with areas designated by FEMA and the county as flood-prone shall participate in the National Flood Insurance Program ("NFIP"). The requirements for participation in the NFIP are included in Title 44 CFR (National Flood Insurance Program Regulations) and form the basis for regulation under this section.

It is the purpose of this chapter to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

- Protect human life and health;
- Minimize expenditure of public money for costly flood control projects;
- Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- Minimize prolonged business interruptions;
- Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in floodplains;
- Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and
- Insure that potential buyers are notified that property is in a flood area.

In order to accomplish its purposes, this chapter uses the following methods of reducing flood losses:

- Restrict or prohibit uses that are dangerous to health, safety or property in times of flood, or cause excessive increases in flood heights or velocities;
- Require that uses vulnerable to floods, including facilities, which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging and other development, which may increase flood damage;
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

The code requires in most cases a one foot freeboard requirement. Specific to new construction:

- Section 7.18.11.1. Residential Construction. New construction and substantial improvement of any residential structure within Zones Al-30, AE and AH on the FIRM shall have the lowest floor (including basement) elevated one (1) foot above the base flood elevation.'
- Section 7.18.11.2. Nonresidential Construction. New construction and substantial improvement of any commercial, industrial, or other nonresidential structure within Zones Al-

30, AE and AH on the FIRM shall either have the lowest floor (including basement) elevated one (1) foot above the base flood elevation or, together with attendant utility and sanitary facilities, be designed so that at one (1) foot above the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water and with structural components have the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.

Encroachments in a floodway are prohibited, including fill, new construction, substantial improvements and other development *unless* it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practices that the proposed encroachment would not result in any increase in flood levels.

There are no special provisions related to critical facilities in the regulations.

Fire Prevention (NMAC Title 14 Chapter 7)

The SLDC defers to the State statues, specifically Title 14 Chapter 7 (parts 2 and 3) which specify residential and commercial building codes. These codes are consistent with the applicable International Building Codes and include provisions for fire safe design and construction.

Growth Management (SLDC Chapter 12)

The purpose of this chapter is to implement the County's growth management strategy set out in the SGMP. That strategy intends to direct growth to areas served by adequate facilities and services. The strategy relies on a wide range of techniques including the Capital Improvements Plan ("CIP"), development fees, funding mechanisms (including public improvement and County improvement districts, among others), and liberal use of voluntary development agreements. In addition, other growth management strategies included in this section include the establishment of sustainable development areas, the CIP, and the Official Map.

Zoning (SLDC Chapter 8)

- This chapter is adopted to promote and protect the public health, safety and general welfare through orderly zoning regulation of land uses throughout the unincorporated area of the County. In addition to the other purposes of the SLDC as described in Chapter 1 and succeeding chapters, the following additional specific purposes are hereby adopted:
- Provide for consistency with the SGMP, and any applicable area, district and community plans, and internally with the SLDC
- Divide the County into base, planned development and overlay zoning districts of a number, size and location deemed necessary to carry out the purposes of the SGMP and the SLDC
- Provide for a system of Sustainable Development Areas (SDAs) that are established by

- the SGMP to guide orderly development when infrastructure and services become available and time and sequence development so that infrastructure and services are available when needed
- Promote and incentivize infill into SDA-1 and SDA-2 areas where adequate public facilities and services presently exist
- Balance residential development with economic development where appropriate to assure County fiscal integrity
- Promote and incentivize flexible planned mixed-use buildings, centers and neighborhoods;
- Protect environmentally sensitive lands, and the preservation of natural, archaeological, cultural and historical resources pursuant to the Land Development Suitability Analysis contained in the SGMP
- Promote sustainable design and improvement standards
- Provide adequate light and air
- Determine the location, density, height, mass, minimum lot size and use of buildings, structures and land for residential, commercial, industrial and other purposes.

Water Conservation

Santa Fe County includes numerous water conservation requirements as part of the SLDC (SLDC Section 7.13.11). Ordinance 2002-13 applies to all residential and commercial water uses in the County and is intended to limit water wasting actions by means of a schedule of fines for infractions, as well as a listing of County personnel authorized to issue those fines. Outdoor watering or irrigation is prohibited between 11 am and 7 pm from May through September of each year with only a few exceptions.

Activities are compiled into: outdoor conservation (irrigation and car washing), indoor conservation (remodeling/construction and leaks) conservation signage, domestic well use, and water harvesting. The water harvesting provisions include requirements for rainwater catchment systems for all new construction with a roof area of 2,500 sq ft or more. Rainwater harvesting provisions include cisterns to capture runoff from roofed areas that are linked to a pump and a drip irrigation system to serve landscaped areas.

Santa Fe County Plans/Studies

Santa Fe County Emergency Operations Plan

Santa Fe County has a current Emergency Operations Plan (EOP). This EOP covers countywide response to all hazards identified in the county’s hazard analysis.

Santa Fe Dam Emergency Action Plans

Having an effective Emergency Action Plan at all high and significant hazard potential dams in the county is critical to reducing the risks of loss of life and property damage from dam failures.

An EAP is a written document that identifies potential emergency conditions at a dam and specifies pre-planned actions to be followed to minimize property damage or loss of life as a result of failure or mis-operation of the plan. The dam owner is responsible for development, maintenance and exercise of the EAP. The current status of dam EAPs in Santa Fe County can be found in Table 4.46. The majority of high hazard dams have EAPs but according to the National Inventory of Dams there are some noted as not having an EAP in place.

Community Wildfire Protection Plan - 2008

The Santa Fe County Community Wildfire Protection Plan (SFC CWPP) addresses hazards and risks of wildland fire throughout Santa Fe County (County) and makes recommendations for fuels reduction projects, public outreach and education, structural ignitability reduction, and fire response capabilities. Some of the recommendations for this plan include more than 55 fuels reduction projects; public education and outreach directed at homeowners to homeowners to help them prepare for wildland fire through events like preplanned triages; strategies for fire responders to improve their capabilities through improved communication, professional training, and equipment; and the reduction of structural ignitability by providing public education on defensible space. Goals for the CWPP are as follows:

- **Collaboration**: Local and state government representatives, in consultation with federal agencies or other interested groups, must collaboratively develop a CWPP (Society of American Foresters [SAF] 2004).
- **Prioritized Fuel Reduction**: A CWPP must identify and prioritize areas for hazardous fuels reduction and treatments and recommend the types and methods of treatment that will protect one or more at risk communities and their essential infrastructure (SAF 2004).
- **Treatments of Structural Ignitability**: A CWPP must recommend measures that communities and homeowners can take to reduce the ignitability of structures throughout the area addressed by the plan (SAF 2004).

To meet these stated goals, the CWPP recommends a series of actions that fall into 4 different categories: 1) fuels reduction projects, 2) public education and outreach, 3) reduction of structural ignitability, and 4) improved fire response capabilities.

Santa Fe County Evacuation Planning Guide

The County's Office of Emergency Management has a page dedicated to evacuation planning that outlines steps to take to prepare for an emergency wildfire evacuation. The Guide includes 3 elements: 1) Get Ready – Preparation and Planning; 2) Get Set – Putting the Plan into Action; and 3) Go – What to do in the Event of a Fire.

The Office of Emergency Management also has an emergency communications network station (770 AM) that serves as a method of information dissemination in the case of a wildfire event.

Santa Fe Open Space and Trails Planning

Chapter 6 of the SGMP serves as the guiding plan for the acquisition of open space and the development of recreational facilities like trail systems. Goal 22 in the SGMP is to: Acquire, preserve and maintain a significant amount of land to support a network of public and private open space, parks and trails throughout the County.

The vision of the Open Space and Trails Program is to create a network of cultural, historical, recreational and natural open spaces and trails throughout Santa Fe County. County Resolution 2011-4 created an open lands, trails and parks advisory committee to:

- Assist with County-wide and site-specific open space, trails and parks planning
- Evaluate applications by property owners and to recommend to the BCC property to be acquired for open space, trails, and parks
- Advise on the funding for the Open Space and Trails Program
- Examine and make changes to the criteria for property selection when necessary
- Establish volunteer subcommittees to address specific concerns for open space and trails and parks
- Work with County staff to provide public outreach

County Departments/Agencies

Santa Fe County has structured its governmental organization to mitigate and respond to natural hazards. The discussion below highlights offices that have either direct or indirect responsibility for planning for or responding to natural hazards.

Santa Fe County Fire Department

The Santa Fe County Fire Department is a combination fire department that integrates both paid staff and the service of dedicated volunteers. Formed in 1997 from the consolidation of 15 volunteer fire districts and the former Office of the County Fire Marshal, the Department protects approximately 1900 square miles of unincorporated area as well as the incorporated Town of Edgewood. Within these borders, the Department provides protection to approximately 76,000 residents living in 27,500 occupied housing units, as well as several million square feet of commercial development. Santa Fe County is also home to four Pueblos – Nambe, Pojoaque, Tesuque, and San Ildefonso - which rely on the Santa Fe County Fire Department for emergency services.

Regional Emergency Communications Center (RECC)

The Santa Fe Regional Emergency Communications Center has existed since 2002 as the result of a "Joint Powers Agreement" between the City of Santa Fe and Santa Fe County. The RECC receives all police, fire, medical and animal control Emergency 911 calls and non-emergency calls for the City of Santa Fe and Santa Fe County and dispatches the appropriate agency to the location as needed. The Center operates on a 24-hour/7 day a week schedule.

Building and Development Services

The Santa Fe County Building and Development Services Department provides services such as zoning, subdivisions, lot splits, development permits for building, business registrations, code enforcement, hydrology, terrain management, special-use permits, and utility allocation to County citizens. This department's mission is to guide future growth and development through effective planning, zoning, permitting and enforcement, preserve resources for future generations, and to address the needs and concerns of its citizens while ensuring their quality of life.

Department of Economic Development

Santa Fe County has a growing economy that provides ample business opportunities, services, and assets for its business community, and strives to promote economic development programs and projects that provide jobs and new sources of revenue. The County approaches economic development from a sustainability filter that balances economic, environmental, and demographic factors. To that end, the County has identified key target industries that fit best with its available resources and constituent needs, including but not limited to:

- Green Industry- Energy and Water Conservation Technology
- Arts and Culture
- Film/Media
- Agriculture
- Ecotourism and Outdoor Recreation

Division of Planning

The Planning Division of the Growth Management Department is responsible for updates to the County Sustainable Growth Management Plan (SGMP) including area, district and community plans, and long range planning activities as well as the creation of ordinances related to the implementation of the Sustainable Growth Management Plan. County planners work on a variety of activities and issues, including the interpretation and implementation of the Sustainable Growth Management Plan and coordinating the Public Participation process to establish the community organization and public notification options. Planning staff also offers expertise related to environmental and natural resource planning, historic and cultural resource/preservation planning, food systems planning, and acequias and land use related issues. In this capacity, planning staff sit on numerous internal and external boards, committees, and commissions throughout the county. The Planning Division has staff for Community Planning, Economic Development, Affordable Housing, Transportation, Open Space and Trails, and internal GIS support.

The Planning Division is responsible for long range planning activities including area plans, region plans, transportation plans and updating the Sustainable Growth Management Plan. County planning staff also reviews development applications in accordance with the County's planning framework.

Santa Fe County Public Works Department

The Public Works Department is made up of six sub-departments:

- Road Maintenance (includes snow removal and drainage/erosion control)
- Public Utilities (includes water and wastewater)
- Solid Waste and Recycling
- Capital Projects and Management (includes project planning and the design/construction of County infrastructure including roads, buildings, and water and waste water facilities)
- Open Space, Trails and Parks
- Renewable Energy and Energy Efficiency

4.4.2 Santa Fe County's Administrative/Technical Mitigation Capabilities

Table 4.49 identifies the County personnel responsible for activities related to mitigation and loss prevention in Santa Fe County.

Table 4.49: Santa Fe County Administrative/Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Yes	Public Works	Tech
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	No		
Planner/Engineer/Scientist with an understanding of natural hazards	No		
Personnel skilled in GIS	Yes	Department of Growth Management	
Full time building official	No		
Floodplain Manager	Yes		
Emergency Manager	Yes	Fire Department	
Grant writer	No		
Other personnel	Yes		
GIS Data – Hazard areas	Yes		

Personnel Resources	Yes/No	Department/Position	Comments
GIS Data - Critical facilities	Yes		
GIS Data – Building footprints	Yes		
GIS Data – Land use	Yes		
GIS Data – Links to Assessor's data	Yes	Growth Management	Available for purchase
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Yes	Office of Public Safety	770 AM Emergency Communications Network Station

4.4.3 Santa Fe County's Fiscal Mitigation Capabilities

Table 4.50 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.50: Santa Fe County Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Yes	
Capital improvements project funding	Yes	
Authority to levy taxes for specific purposes	Yes	
Fees for water, sewer, gas, or electric services	Yes	
Impact fees for new development	Yes	Fire impact fees only
Incur debt through general obligation bonds	Yes	Impact fees
Incur debt through special tax bonds	Yes	Mining/drilling
Incur debt through private activities	No	
Withhold spending in hazard prone areas	No	

4.4.4 Mitigation Outreach and Partnerships

Other collaborative efforts include the Santa Fe Fireshed coalition. A fireshed is an area where social and ecological concerns regarding wildfire overlap and are intertwined. In January 2016, the Santa Fe City Council adopted the Greater Santa Fe Fireshed Resolution. In February 2016 the Santa Fe Board of County Commissioners adopted a Greater Santa Fe Fireshed Resolution as well. The resolution recognizes the the greater Santa Fe fireshed as being in need of application of fire risk reduction techniques and directs Fire Department staff to identify potential funding sources to pursue risk reduction projects.

Other federal agencies have been involved in mitigation actions in the County. The USDA Forest Service performs fuel mitigation work on County land. The work is accomplished by staff from the Santa Fe National Forest.

4.4.5 Additional Capabilities

Santa Fe County is involved in and actively promotes the Firewise Communities program that encourages local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes from the risk of wildfire.

5 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

5.1 Mitigation Strategy: Overview

This section describes the mitigation strategy process and mitigation action plan for the Santa Fe County Hazard Mitigation Plan. It describes how the County met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

The results of the planning process, the risk assessment, the goal setting, the identification of mitigation actions, and the hard work of the HMPC led to this mitigation strategy and action plan. Section 5.2 below identifies the goals of this plan and Section 5.4 details the mitigation action plan.

5.2 Goals and Objectives

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Up to this point in the planning process, the HMPC has organized resources, assessed hazards and risks, and documented mitigation capabilities. The resulting goals, objectives, and mitigation actions were developed based on these tasks. The HMPC held a series of meetings designed to achieve a collaborative mitigation strategy as described further throughout this section.

During the initial goal-setting meeting, the HMPC reviewed the results of the hazard identification, vulnerability assessment, and capability assessment. This analysis of the risk assessment identified areas where improvements could be made and provided the framework for the HMPC to formulate planning goals and objectives and to develop the mitigation strategy for the Santa Fe County Planning Area.

Goals were defined for the purpose of this mitigation plan as broad-based public policy statements that:

- Represent basic desires of the community;
- Encompass all aspects of community, public and private;
- Are nonspecific, in that they refer to the quality (not the quantity) of the outcome;
- Are future-oriented, in that they are achievable in the future; and
- Are time-independent, in that they are not scheduled events.

Goals are stated without regard to implementation. Implementation cost, schedule, and means are not considered. Goals are defined before considering how to accomplish them so that they are not dependent on the means of achievement. Goal statements form the basis for objectives and actions that will be used as means to achieve the goals. Objectives define strategies to attain the goals and are more specific and measurable.

To facilitate the development of plan goals the HMPC members were provided a worksheet that explained goals, objectives and actions and listed examples of each. Related plan goals were listed on the worksheet including the State of New Mexico Multi-Hazard Mitigation Plan (2013) (see worksheet in Appendix A). This review was to ensure that this plan's mitigation strategy was aligned and integrated with existing plans and policies. Based on discussion at the HMPC meeting the group decided that the goals of the state plan would provide a good basis, with some modifications.

Based on the risk assessment review and goals development process, the HMPC identified the following goals which provide the direction for reducing future hazard-related losses within the Santa Fe County Planning Area.

Goal 1: Reduce the number of injuries and fatalities from hazards

Goal 2: Reduce the amount of property damage, both public and private, from hazards

Goal 3: Minimize recovery time for both community function and the natural environment after natural hazard events

Goal 4: Enhance communication, collaboration and integration among county, federal, state, and tribal agencies in regards to hazard mitigation.

5.3 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

The HMPC analyzed viable mitigation options that supported the identified goals. The HMPC was provided with the following list of categories of mitigation actions, which originate from the Community Rating System:

- **Prevention**: Administrative or regulatory actions or processes that influence the way land and buildings are developed and built.
- **Property protection**: Actions that involve the modification of existing buildings or structures to protect them from a hazard or remove them from the hazard area.
- **Structural**: Actions that involve the construction of structures to reduce the impact of a hazard.
- **Natural resource protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Emergency services**: Actions that protect people and property during and immediately after a disaster or hazard event.
- **Public information/education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified and profiled in Chapter 4 was evaluated. At the mitigation strategy meeting the HMPC was also provided with a matrix showing examples of potential mitigation action alternatives for each of the above categories, for each of the identified hazards. The HMPC was also provided a handout that explains the categories and provided further examples. Another reference document titled "Mitigation Ideas" developed by FEMA was distributed to the HMPC via an online link. This document lists the common alternatives for mitigation by hazard. The HMPC was also instructed to consider both future and existing buildings in considering possible mitigation actions. A facilitated discussion then took place to examine and analyze the options. Appendix A provides the matrix of alternatives considered. Each proposed action was written on a large sticky note and posted on flip charts in meeting room underneath the hazard it addressed.

Based upon the key issues identified in the risk assessment, including the capability assessment, and the overall political, technical, and financial feasibility of the potential actions, the HMPC came to consensus on proposed mitigation actions for each hazard. Certain hazards were best addressed through multi-hazard actions. A lead for each new action was identified. The leads were responsible for filling out worksheets with additional details on the project so they could be captured in the plan. Additional discussion and refinement of proposed mitigation actions took place within followup meetings of the HMPC and individual departments. The refined mitigation actions were provided to the HMPC lead and planning consultant by filling out details on a mitigation action worksheet (See Appendix A). The final action strategies are captured in Section 5.4.

5.3.1 Prioritization Process

Once the mitigation actions were identified, the HMPC was provided with several decision-making tools, including FEMA's recommended prioritization criteria STAPLEE to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. STAPLEE is an acronym for the following:

- Social: Does the measure treat people fairly? (e.g., different groups, different generations)
- Technical: Is the action technically feasible? Does it solve the problem?
- Administrative: Are there adequate staffing, funding, and other capabilities to implement the project?
- Political: Who are the stakeholders? Will there be adequate political and public support for the project?
- Legal: Does the jurisdiction have the legal authority to implement the action? Is it legal?
- Economic: Is the action cost-beneficial? Is there funding available? Will the action contribute to the local economy?
- Environmental: Does the action comply with environmental regulations? Will there be negative environmental consequences from the action?

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority. Other criteria used to assist in evaluating the benefit-cost of a mitigation action includes:

- Does the action address hazards or areas with the highest risk?
- Does the action protect lives?
- Does the action protect infrastructure, community assets or critical facilities?
- Does the action meet multiple objectives (Multiple Objective Management)?
- What will the action cost?
- What is the timing of available funding?

The mitigation categories, multi-hazard actions, and criteria are included in Appendix A.

At the mitigation strategy meeting the HMPC used STAPLEE to determine which of the identified actions were most likely to be implemented and effective. Keeping the STAPLEE criteria in mind, each member 'voted' for the new mitigation actions by sticking a colored dot on the sticky note on which the action was written. The number of dots next to each action was totaled as an indication of relative priority and translated into 'high,' 'medium' and 'low.' The results of the STAPLEE evaluation process produced prioritized mitigation actions for implementation within the planning area.

The process of identification and analysis of mitigation alternatives allowed the HMPC to come to consensus and to prioritize recommended mitigation actions. During the voting process, emphasis was placed on the importance of a benefit-cost review in determining project priority; however, this was not a quantitative analysis. The Disaster Mitigation Act regulations state that benefit-cost review is the primary method by which mitigation projects should be prioritized. Recognizing the federal regulatory requirement to prioritize by benefit-cost, and the need for any publicly funded project to be cost-effective, the HMPC decided to pursue implementation according to when and where damage occurs, available funding, political will, jurisdictional priority, and priorities identified in the New Mexico Hazard Mitigation Plan. Cost-effectiveness will be considered in additional detail when seeking FEMA mitigation grant funding for eligible projects identified in this plan.

Benefit-cost was also considered in greater detail in the development of the Mitigation Action Plan detailed in Section 5.3. Specifically, each action developed for this plan contains a description of the problem and proposed project, the entity with primary responsibility for implementation, any other alternatives considered, a cost estimate, expected project benefits, potential funding sources, and a schedule for implementation. Development of these project details for each action led to the determination of a high, medium, or low priority for each.

5.4 Mitigation Action Plan

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section outlines the development of the mitigation action plan. The action plan consists of the specific projects, or actions, designed to meet the plan's goals. Over time the implementation of these projects will be tracked as a measure of demonstrated progress on meeting the plan's goals.

5.4.1 Continued Compliance with NFIP

Given the flood hazard in the planning area and as required by DMA, an emphasis will be placed on continued compliance with the National Flood Insurance Program (NFIP). The County, as an NFIP participant, will continue to make every effort to remain in good standing with NFIP. This includes continuing to comply with the NFIP's standards for updating and adopting floodplain maps and maintaining and updating the floodplain zoning ordinance. Actions related to continued compliance include:

- Continued designation of a local floodplain manager whose responsibilities include reviewing floodplain development permits to ensure compliance with the Flood Prevention and Flood Control rules of SLDC Chapter 7.18;
- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Promote and disperse information on the benefits of flood insurance.

As evidence of compliance, Santa Fe County has participated in the NFIP since 1988; initial flood hazard boundary maps were developed in 1977. The first official Flood Insurance Rate Maps were adopted November 4, 1988. Since then, the County has administered floodplain management regulations that meet the minimum requirements of the NFIP. The County adopted new Digital Flood Insurance Rate Maps that became effective December 4, 2012. The County's Flood Prevention and Flood Control rules of SLDC Chapter 7.18 is described in Section 4.4 in more detail and flood insurance coverage is discussed in Section 4.3.5.

Also to be considered are the flood mitigation actions contained in this HMP that support the ongoing efforts by the county to minimize the risk and vulnerability of the community to the flood hazard and to enhance their overall floodplain management program.

5.4.2 Mitigation Action Plan

This action plan presents the recommendations developed by the HMPC outlining how Santa Fe County can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future disaster losses. The mitigation actions developed by the HMPC are summarized in Table 5.1 and listed in detail in the mitigation action worksheets that follow. Table 5.1 is a summary table for quick reference. It identifies the mitigation action title, lead agency/department, hazards mitigated, priority and if the action mitigates losses to existing or future development. The action worksheets that follow provide more background information, ideas for implementation, lead agency, partners, potential funding sources, cost estimates, benefits, and timeline for each identified action.

It is important to note that Santa Fe County has numerous existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as the community wildfire protection plan, capital improvement budgets, and other planning mechanisms. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The HMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

Further, it should be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The County is not obligated by this document to implement any or all of these projects. Rather this mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards.

Also, many of the action items included in this plan are a collaborative effort among County agencies and other local, state, and federal agencies and stakeholders in the Santa Fe County planning area. Table 5.1 identifies the lead agency/department. The individual worksheets for each mitigation action item identify other mitigation partners.

Figure 5.1. Santa Fe County Mitigation Action Summary Table

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal
1	Reduce Catastrophic Impacts from Dam Failure through enhanced monitoring and coordination	Dam Failure	County Emergency Management	Both	High	1
2	Improve public warning capabilities below high hazard dams	Dam Failure	County Emergency Management	Both	High	1
3	Update engineering and geologic studies related to dam safety	Dam failure, earthquake, land subsidence, landslide, expansive soils	County Emergency Management & Growth Management – GIS Division	Both	High	1
4	Support drought-resilient land use planning through implementation of the Sustainable Land Use Development Code	Drought	Growth Management – Building & Development Services	Future	Low	1, 3
5	Drought Management Planning	Drought	Growth Management – Building & Development Services	Both	Low	2,3
6	Enhance Earthquake Monitoring Activities	Earthquake	Growth Management – GIS Division	Both	Low	1, 4
7	Continue to Implement Sound Floodplain Management Practices through Participation in the National Flood Insurance Program	Flood	Growth Management – Building & Development Services	Both	Medium	1,2,3
8	Stream bank stabilization	Flood	Public Works – Roads Maintenance.	Existing	High	2
9	Maximize opportunities to mitigate hazards associated with specific low water crossings as part of ongoing county road improvements	Flood	Public Works - Roads Maintenance; Growth Management - Planning	Both	Medium	1

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal
10	Analyze stream and arroyo migration patterns with available LiDAR data to predict impacts on county roads and culverts	Flood	Public Works - Roads Maintenance	Both	Medium	2
11	Achieve and maintain an operations level radiological / nuclear incident response capability	Hazardous Materials	Fire Department – Office of Emergency Management	Both	High	1
12	Link Hazardous Materials Annex to the Hazard Mitigation Plan; Participate in Regional Hazardous Materials Response Team	Hazardous Materials	Fire Department – Office of Emergency Management	Both	High	1
13	Implement a multi-weather sensor and notification system on the Tesuque Communication Towers	High Wind, Winter Storm, Tornado	Advanced Communications/Regional Emergency Coordination Center (RECC)	Both	Low	1
14	Encourage utility partners to enhance tree trimming near power lines to reduce potential for power outages and wildfires	High Wind, Wildfire	Fire Department & Public Works in cooperation w/PNM; City of Santa Fe	Both	High	2, 3
15	Enhance geologic data in development zones and enhance code enforcement activities	Land Subsidence, Expansive Soils, Landslide	Growth Management - GIS Division	Future	Low	2
16	Utilize LIDAR surveys conducted in 2001 vs 2014 to assess differences in topography that may be indicative of problem areas associated with land subsidence, collapsible soils, landslides, channel migration, subsurface volcanic activity, earthquake faults, etc.	Land Subsidence, Expansive Soils, Landslide, Earthquake, Volcano	Growth Management - GIS Division	Both	Low	2

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal
17	Maintain and update multi-hazard plan through structured process	Multi-Hazard, All	County Emergency Management, and HMPC	Both	Low	1, 2, 3, 4
18	Expand NOAA All-Hazard Radios for all Public Buildings	Multi-Hazard: High Wind, Winter Storm, Wildfire, Extreme Temperatures, Severe Thunderstorm, Hazardous Materials	Fire Department – Office of Emergency Management	Both	Medium	1
19	Enhance Lightning Protection for County Critical Infrastructure	Severe Thunderstorms	Growth Management- Building and Development Services/Facilities	Both	Medium	2
20	Promote Safe Rooms and/or Shelters near Edgewood	Tornado, Winter Storm, High Wind, Severe Thunderstorm, Hazardous Materials	Fire Department – Office of Emergency Management. Growth Management - Building & Development Services;	Both	Low	1
21	Maintain and Implement the CWPP Including Project Recommendations	Wildfire	Fire Department – Wildland Division	Both	High	2,3
22	Expand hazardous fuel mitigation activities	Wildfire, Drought	Fire Department. - Wildland Division	Both	High	2,3
23	Expand Multi-Agency Collaboration to Link Fuel Mitigation Activities	Wildfire	Fire Department.	Both	High	2,3,4
24	Firewise / Ready Set Go Workshops	Wildfire	Fire Department, Emergency Management, USFS, BLM	Both	Medium	1,2
25	Improve Public Warning	Wildfire, Dam Failure, Flood	Fire Department – Office of Emergency Management	Both	High	1
26	Update the Wildland Urban Interface (WUI) Ordinance	Wildfire	Growth Management – Building & Development Services; Fire Department. - Wildland Division	Future	Medium	2

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal
27	Reduce Wildfire Occurrences to Reduce Flood and Debris Flow Potential	Wildfire, Landslide/Debris Flow, Flood	Fire Department	Both	Low	2, 3
28	Severe Storm Mass Shelter / Care Operations	Winter Storm, Extreme Cold, Wildfire	Fire Department – Office of Emergency Management	Both	High	1
29	Write Agricultural / Food Incident Annex to the County Emergency Operations Plan; Participate w/New Mexico Department of Agriculture Response Task Force	Agricultural Disease Incident	Fire Department – Office of Emergency Management	Both	Medium	1
30	Local Emergency Management Investment – Enhance Capabilities - Sustainment	All Hazards	Fire Department – Office of Emergency Management	Both	Medium	1, 2, 3, 4

The following provides project specifics and implementation details for mitigation actions identified. They are grouped by the type of hazard(s) they address.

1. Reduce Catastrophic Impacts from Dam Failure Through Enhanced Monitoring and Coordination

Hazards Mitigated	**Dam Failure**
Project Description, Issue/Background	The risk assessment identified substantial risk to populations living below Santa Cruz Reservoir and Nambe Falls Dam. While the likelihood of failure is low, impacts could be catastrophic. This project would enhance high hazard dam monitoring including: Hydrologic inflow and outflow modeling: Coordinate with agencies monitoring existing stream gage upstream of Santa Cruz Reservoir. Coordinate with dam owners during high releases or spillway flows. Post-earthquake inspections: coordinate with dam owners on post-event assessments.
Other Alternatives	Following an earthquake or other event that has compromised a high hazard dam lower the levels of high hazard reservoirs to mitigate the potential for failure and reduce downstream impacts.
Related planning mechanisms	Dam Emergency Action Plans New Mexico State Engineer dam safety program
Responsible Office/ Agency and Partners	County Emergency Management in partnership with Santa Cruz Irrigation District and Bureau of Reclamation, State Engineer
Priority	High
Cost Estimate	Coordination related items can be done with existing staff time
Benefits (Avoided losses)	Potential to reduce loss of life, improved coordination of mitigation and response agencies
Potential Funding	Staff time within existing budgets.
Schedule	2016-2017

2.

3. Improve Public Warning Capabilities Below High Hazard Dams

Hazards Mitigated	**Dam Failure**
Project Description, Issue/Background	The risk assessment identified substantial risk to populations living below Santa Cruz Reservoir and Nambe Falls Dam. While the likelihood of failure is low, impacts could be catastrophic. The following actions would improve warning and evacuation capabilities below these dams 1) Improve public warning capabilities below high hazard dams 2) install community warning sirens 3) community education on protective actions
Other Alternatives	Develop evacuation area polygons that can pre-identify populations for notification through reverse call-back systems
Related planning mechanisms	Dam Emergency Action Plans
Responsible Office/ Agency and Partners	County Emergency Management in partnership with Santa Cruz Irrigation District and Bureau of Reclamation
Priority	High
Cost Estimate	Approximately $16,000 per siren; Assuming 10 sirens: $160,000
Benefits (Avoided losses)	Loss of life, public awareness of risk and how to mitigate risk
Potential Funding	FEMA
Schedule	2016-2020

4. Update Engineering and Geologic Studies Related to Dam Safety

Hazards Mitigated	**Dam failure, earthquake, land subsidence, landslide, expansive soils**
Project Description, Issue/Background	This project entails promoting updated engineering and geologic studies related to dam safety. This would include: 1. Coordination with State and federal agencies related to characterizing seismic hazards in the vicinity of the dams 2. Assessing land subsidence potential: This could be done using County LiDAR data sets or IFSAR data analysis for precision land surface analysis 3. Reviewing potential landslide and rockfall risks in and around high hazard dams and reservoirs
Other Alternatives	No action
Related planning mechanisms	
Responsible Office/ Agency and Partners	County Emergency Management and Growth Management – GIS Division in partnership with Santa Cruz Irrigation District and Bureau of Reclamation, New Mexico Bureau of Geology and Mineral Resources
Priority	High
Cost Estimate	IFSAR analysis may range from $50,000
Benefits (Avoided losses)	Detect geologic hazard risks in advance so that appropriate mitigation measures can be undertaken
Potential Funding	**State, BOR**
Schedule	**2016-2019**

5. Support Drought-Resilient Land Use Planning Through Implementation of the Sustainable Land Use Development Code

Hazards Mitigated	**Drought**
Project Description, Issue/Background	Support drought-resilient land use planning through implementation of the Sustainable Land Use Development Code. SLDC (SLDC Section 7.13.11). Ordinance 2002-13 applies to all residential and commercial water uses in the County and is intended to limit water wasting actions by means of a schedule of fines for infractions, as well as a listing of County personnel authorized to issue those fines. Outdoor watering or irrigation is prohibited between 11 am and 7 pm from May through September of each year with only a few exceptions. Activities are compiled into: outdoor conservation (irrigation and car washing), indoor conservation (remodeling/construction and leaks) conservation signage, domestic well use, and water harvesting.
Other Alternatives	No action
Related planning mechanisms	Santa Fe County Sustainable Growth Management Plan and Sustainable Land Use Development Code
Responsible Office/ Agency and Partners	Growth Management – Building and Development Services
Priority	Low
Cost Estimate	Staff time
Benefits (Avoided losses)	Drought-resiliency incorporated into future growth and development; limit impacts on water resources
Potential Funding	Can be accomplished in staff budgets
Schedule	Ongoing through 2016-2021

6. Drought Management Planning

Hazards Mitigated	**Drought**
Project Description, Issue/Background	This action would include developing a drought management plan that would formalize the following: 1) Promoting increased water conservation activities during drought 2) Water budgeting 3) Developing drought monitoring indicators and setting thresholds for action based on various indices.
Other Alternatives	**Implementation of annual water restrictions**
Related planning mechanisms	Sustainable Land Use Development Code
Responsible Office/ Agency and Partners	Growth Management – Building and Development Services
Priority	Low
Cost Estimate	$50,000 - $75,000 for consultant
Benefits (Avoided losses)	Drought-resiliency; limit impacts on water resources;
Potential Funding	**State, Federal (Reclamation) grants**
Schedule	**2017-2018**

7. Enhance Earthquake Monitoring Activities

Hazards Mitigated	**Earthquake**
Project Description, Issue/Background	This project would enhance earthquake monitoring activities through coordination with regional entities monitoring seismic activity and analyzing terrain data sets to identify potentially active faults. LIDAR data sets that currently exist could be used to support fault identification and ground deformation analysis
Other Alternatives	**No action**
Related planning mechanisms	
Responsible Office/ Agency and Partners	Growth Management – GIS Division in partnership with: LANL; USGS; Bureau of Reclamation, New Mexico Bureau of Geology and Mineral Resources
Priority	Low
Cost Estimate	**Could be done through coordination of existing resources and staff time.**
Benefits (Avoided losses)	
Potential Funding	**Staff time**
Schedule	**2016-2018**

8. Continue to Implement Sound Floodplain Management Practices Through Participation in the National Flood Insurance Program

Hazards Mitigated **Flood**

Project Description, Issue/Background

The County participates in the National Flood Insurance Program. This project restates the commitment of the County to implement sound floodplain management practices, as stated in the flood damage prevention ordinance. This includes ongoing activities such as enforcing local floodplain development regulations, including issuing permits for appropriate development in Special Flood Hazard Areas and ensuring that this development is elevated to or above the base flood elevation. Floodplain managers will remain current on NFIP policies, and are encouraged to attend appropriate training and consider achieving Certified Floodplain Manager (CFM) status.

This project also includes periodic reviews of the floodplain ordinance to ensure that it is clear and up to date and adequately addresses the level of flood risk identified within the Hazard Mitigation Plan.

Other activities that could be included in this effort are:

- Periodically review and revise ordinance SLDC Chapter 7.18 related to flood prevention and flood control
- Ensure that stop work orders and other means of compliance are being used as authorized by each ordinance;
- Suggest changes to improve enforcement of and compliance with regulations and programs;
- Participate in Flood Insurance Rate Map updates by adopting new maps or amendments to maps;
- Adopt draft Digital Flood Insurance Rate maps when they become effective
- Utilize Digital Flood Insurance Rate maps in conjunction with GIS to improve floodplain management, such as improved risk assessment and tracking of floodplain permits;
- Applying existing LiDAR data to enhance flood mapping efforts
- Promote and disperse information on the benefits of flood insurance, with assistance from partners.

Other Alternatives No action

Related planning mechanisms	Santa Fe County Sustainable Growth Management Plan and Santa Fe Sustainable Land Development Code
Responsible Office/ Agency and Partners	Growth Management – Building and Development Services
Priority	Medium
Cost Estimate	Staff time
Benefits (Avoided losses)	Reduced flood losses through floodplain ordinance enforcement
Potential Funding	Existing staff time
Schedule	Ongoing 2016-2021

9. Stream Bank Stabilization

Hazards Mitigated	**Flood**
Project Description, Issue/Background	The risk assessment conducted during the planning effort identified a number of structures at risk to flooding and also noted the concerns for structure and infrastructure damage due to arroyo erosion/channel migration during high flow events. Additionally, specific problem areas were identified through public outreach meetings. This project would further investigate the needs and feasibility of stream bank stabilization techniques or other protective actions to address problem areas. Areas of interest include: 1) CR84 & 101B Dry Creek Road 2) Arroyo erosion downstream of culverts under Hwy 502 adjacent to CR 101E 3) Hwy 14 & Johnsonville
Other Alternatives	Setbacks or relocation of at-risk infrastructure; buyouts of high risk properties.
Related planning mechanisms	Greenway planning, transportation planning
Responsible Office/ Agency and Partners	Public Works – Roads Maintenance. Partner Agencies include NMDOT; Land Grant collectives
Priority	High
Cost Estimate	Variable depending on specific project
Benefits (Avoided losses)	Reduced impacts to public and private property from flooding and erosion. Reduced damages to road infrastructure and need for detours
Potential Funding	Greenways
Schedule	2016-2018

10. Maximize Opportunities to Mitigate Hazards Associated with Specific Low Water Crossings as Part Of Ongoing County Road Improvements

Hazards Mitigated	**Flood**
Project Description, Issue/Background	Low water crossings can create hazards to motorists when flooded. This project would maximize opportunities to mitigate hazards associated with specific low water crossings as part of ongoing county road improvements or areas of planned development. Opportunities could include building bridges or alternate routes. Problem areas include the CR84 river crossing
Other Alternatives	Continue to use "turn around don't drown signage" and other public education methods
Related planning mechanisms	Transportation Master Plan
Responsible Office/ Agency and Partners	Public Works – Roads Maintenance; Growth Management - Planning
Priority	Medium
Cost Estimate	Variable dependent on specific project areas
Benefits (Avoided losses)	Reduced potential for death or injury during flood events
Potential Funding	General Fund, Federal Lands Access Program
Schedule	2021

11. Analyze Stream and Arroyo Migration Patterns with Available LIDAR Data to Predict Impacts on County Roads and Culverts

Hazards Mitigated	**Flood**
Project Description, Issue/Background	This project would analyze stream and arroyo migration patterns with available LiDAR data to predict impacts on county roads and culverts. Utilize LIDAR surveys conducted in 2001 vs 2014 to assess differences in topography that may be indicative of problem areas.
Other Alternatives	No action
Related planning mechanisms	
Responsible Office/ Agency and Partners	Growth Management - GIS Division/ Public Works – Roads Maintenance
Priority	Medium
Cost Estimate	Low – Initial analysis can be done with in-house staff; if contracted out could range from $25-75,000 depending on the level of sophistication.
Benefits (Avoided losses)	Identify areas of problems prior to high flows to target mitigation alternatives
Potential Funding	Existing staff time
Schedule	2017

12. Achieve and Maintain An Operations Level Radiological / Nuclear Incident Response Capability

Hazards Mitigated	**Hazardous Materials**
Project Description, Issue/Background	The risk assessment identified the potential for a Radiological – Nuclear transportation incident within the County. This action would entail: 1) Achieve and maintain an operations level radiological / nuclear incident response capability, 2) Support / contribute to a regional Haz-Mat team
Other Alternatives	
Related planning mechanisms	Emergency Operations Plan
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management
Priority	High
Cost Estimate	$110,000
Benefits (Avoided losses)	Enhanced preparedness capabilities that could mitigate impacts to first responders and the public.
Potential Funding	Realistic funding to sustain Radiological – Nuclear emergency response program for County Fire Department
Schedule	2016

13. Link Hazardous Materials Annex to the Hazard Mitigation Plan; Participate in Regional Hazardous Materials Response Team

Hazards Mitigated	**Hazardous Materials**
Project Description, Issue/Background	This action entails linking the hazardous materials annex of the County Emergency Operations Plan to the Hazard Mitigation Plan. This would be accomplished by an update of the annex that refers to relevant sections of the HMP including the hazard identification and risk assessment and mitigation strategy. The County would also participate in Regional Hazardous Materials Response Team to enhance preparedness and response capabilities.
Other Alternatives	No action
Related planning mechanisms	Emergency Operations Plan
Responsible Office/ Agency and Partners	Fire Department - Office of Emergency Management
Priority	High
Cost Estimate	Low
Benefits (Avoided losses)	Enhanced preparedness capabilities that could mitigate impacts to first responders and the public.
Potential Funding	Staff time
Schedule	2017

14. Implement a Multi-Weather Sensor and Notification System on The Tesuque Communication Towers

Hazards Mitigated	**High Wind, Tornado**
Project Description, Issue/Background	This project would implement a multi-weather sensor and notification system on the Tesuque Communication Towers. The sensors could detect high winds or tornadic winds that may be capable of causing damage and provide automated notification above certain thresholds.
Other Alternatives	No action
Related planning mechanisms	N/A
Responsible Office/ Agency and Partners	Advanced Communications/Regional Emergency Coordination Center (RECC)
Priority	Low
Cost Estimate	To be determined
Benefits (Avoided losses)	The project would help increase critical infrastructure resiliency through rapid detection and restoration of communication systems.
Potential Funding	General fund; vendors providing communication services
Schedule	2017

15. Encourage Utility Partners to Enhance Tree Trimming Near Power Lines to Reduce Potential For Power Outages and Wildfires

Hazards Mitigated	**High Wind, Wildfire**
Project Description, Issue/Background	Encourage utility partners to enhance tree trimming near power lines to reduce potential for power outages and wildfires. This project would include coordination with utility companies so that trimming efforts could be focused near WUI communities.
Other Alternatives	No action
Related planning mechanisms	CWPP
Responsible Office/ Agency and Partners	Fire Department and Public Works in cooperation with PNM; City of Santa Fe.
Priority	High
Cost Estimate	Low – staff time
Benefits (Avoided losses)	Reduced potential for catastrophic wildfire ignitions near developed areas.
Potential Funding	Utility company fees
Schedule	2017-2020

16. Enhance Geologic Data in Development Zones and Enhance Code Enforcement Activities

Hazards Mitigated	**Land Subsidence, Expansive Soils, landslide**
Project Description, Issue/Background	Enhance geologic data in development zones and enhance code enforcement activities
Other Alternatives	No action
Related planning mechanisms	Sustainable Growth Management Plan; Sustainable Land Use Code
Responsible Office/ Agency and Partners	Growth Management - GIS Division
Priority	low
Cost Estimate	low
Benefits (Avoided losses)	Knowledge of problem areas will inform wise land use decisions and code enforcement.
Potential Funding	Staff time
Schedule	2017

17. Utilize LIDAR Surveys Conducted in 2001 vs 2014 to Assess Differences in Topography That May Be Indicative of Problem Areas Associated with Land Subsidence, Collapsible Soils, Landslides, Channel Migration, Subsurface Volcanic Activity, Earthquake Faults, Etc.

Hazards Mitigated	**Land Subsidence, Landslide, Expansive Soils, Earthquake, Volcano**
Project Description, Issue/Background	Utilize LIDAR surveys conducted in 2001 vs 2014 to assess differences in topography that may be indicative of problem areas associated with land subsidence, collapsible soils, landslides, channel migration, subsurface volcanic activity, earthquake faults, etc.
Other Alternatives	Utilize IFSAR, INSAR data
Related planning mechanisms	
Responsible Office/ Agency and Partners	Growth Management - GIS Division
Priority	Low
Cost Estimate	Low
Benefits (Avoided losses)	Knowledge of problem areas will inform wise land use decisions
Potential Funding	staff time
Schedule	2016

18. Maintain and Update Multi-Hazard Plan Through Structured Process

Hazards Mitigated	**Multi-Hazard; All**
Project Description, Issue/Background	This action entails maintaining and updating multi-hazard plan through structured process and integration into other planning mechanisms. This action would entail following the implementation process outlined in Chapter 7 Implementation and Maintenance, which recommends re-convening the Hazard Mitigation Planning Committee annually or following a hazard event to assess progress on implementation, post-disaster mitigation or funding opportunities, or opportunities to integrate the plan into the update of other planning mechanisms such as the Santa Fe County Sustainable Growth Management Plan.
Other Alternatives	No action
Related planning mechanisms	Santa Fe County Sustainable Growth Management Plan
Responsible Office/ Agency and Partners	County Emergency Management and HMPC
Priority	Low
Cost Estimate	Staff time for maintenance; Approximately $50k for plan update.
Benefits (Avoided losses)	Implementation will result in a more resilient Santa Fe County
Potential Funding	N/A
Schedule	Annually 2016-2021, update plan in 2020-2021

19. Expand NOAA All-Hazard Radios for all Public Buildings

Hazards Mitigated	**Multi-Hazard: High Wind, Winter Storm, Wildfire, Extreme Temperatures, Severe Thunderstorm, Hazardous Materials**
Project Description, Issue/Background	Notification and warning is an essential element of mitigating impacts to human life. This project would expand NOAA All-Hazard Radios for all public buildings.
Other Alternatives	Reverse call-back
Related planning mechanisms	
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management
Priority	Medium
Cost Estimate	Approximately $1,000
Benefits (Avoided losses)	Reduced loss of life or injuries due to increased awareness and self-protective measures
Potential Funding	Federal /State Homeland Security grants
Schedule	2017-2018

20. Enhance Lightning Protection for Critical Infrastructure

Hazards Mitigated	**Severe Thunderstorms**
Project Description, Issue/Background	This project would investigate county owned critical infrastructure (communications towers, buildings, fire stations, etc.) that might be vulnerable to lightning. Lightning rods, grounding or other mitigation techniques would be implemented where applicable.
Other Alternatives	No action
Related planning mechanisms	N/A
Responsible Office/ Agency and Partners	Growth Management - Building and Development Services; Facilities
Priority	Medium
Cost Estimate	Variable depending on project, estimated at $20,000
Benefits (Avoided losses)	Reduced potential for loss of function or fires, damaged equipment.
Potential Funding	General Fund
Schedule	2019

21. Promote Safe Rooms and/or Shelters Near Edgewood

Hazards Mitigated	**Tornado, Winter Storm, High Wind, Severe Thunderstorm, Hazardous Materials,**
Project Description, Issue/Background	The Edgewood area in the southern county is experiencing growth and development and is adjacent to the busy Interstate 40 corridor. This corridor is prone to severe weather events and has a higher likelihood of tornadoes and hazardous materials incidents. This project would identify areas that could be used as shelters for residents and stranded motorists. It would also promote tornado safe rooms in new schools in Edgewood or evaluate the feasibility for retrofitting existing schools with safe rooms.
Other Alternatives	Community-based safe rooms in areas easily accessible to residents in the area.
Related planning mechanisms	
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management. Growth Management - Building and Development Services; Town of Edgewood Police Department. Moriarty-Edgewood School District
Priority	Low
Cost Estimate	Variable from low to designation of existing buildings, to high for a FEMA P-361 compliant tornado safe room.
Benefits (Avoided losses)	Avoided loss of life and injuries from multiple hazards
Potential Funding	Staff time, FEMA HMGP, PDM (would need to pass benefit cost analysis)
Schedule	2016-2017

22. Maintain and Implement the CWPP Including Project Recommendations

Hazards Mitigated	**Wildfire**
Project Description, Issue/Background	This project links the hazard mitigation plan to the Community Wildfire Protection Plan (CWPP). Due to the significance of the wildfire hazard in the County it is important to maintain and implement the CWPP including project recommendations related to hazardous fuels reduction, fuel breaks, and defensible space.
Other Alternatives	
Related planning mechanisms	CWPP
Responsible Office/ Agency and Partners	Fire Department – Wildland Division
Priority	High
Cost Estimate	$50,000 for update; treatments variable
Benefits (Avoided losses)	Reduced potential for catastrophic wildfires by implementation of projects.
Potential Funding	State, USFS, BLM
Schedule	2016-2019; update CWPP every 5 years

23. Expand Hazardous Fuel Mitigation Activities

Hazards Mitigated	**Wildfire, Drought**
Project Description, Issue/Background	This project would expand hazardous fuel mitigation activities in areas adjacent to Wildland Urban Interface communities identified in the County CWPP.
Other Alternatives	No action
Related planning mechanisms	CWPP
Responsible Office/ Agency and Partners	Fire Department. Homeowners associations, federal and state land and fire management agencies.
Priority	High
Cost Estimate	Variable depending on scope and extent of treatment
Benefits (Avoided losses)	Reduced fire suppression, evacuation and post-wildfire community reconstruction costs.
Potential Funding	Continuing county funding and Community Forest Restoration Grants
Schedule	Ongoing with expanded mitigation treatments in 2017-2020

24. Expand Multi-Agency Collaboration to Link Fuel Mitigation Activities

Hazards Mitigated	**Wildfire**
Project Description, Issue/Background	Expand multi-agency collaboration to link fuel mitigation activities, particularly in areas adjacent to WUI communities by working collaboratively with watershed health initiatives including the Santa Fe Fireshed coalition, Forest Stewards Guild, The Nature Conservancy, Rio Grande Water Fund, Forest Gild, City of Santa Fe, New Mexico Forestry Division, USFS, and BLM among others. In January 2016, the Santa Fe City Council adopted the Greater Santa Fe Fireshed Resolution. In February 2016 the Santa Fe Board of County Commissioners adopted a Greater Santa Fe Fireshed Resolution as well. The resolution recognizes the greater Santa Fe Fireshed as being in need of application of fire risk reduction techniques and directs Fire Department staff to identify potential funding sources to pursue risk reduction projects.
Other Alternatives	
Related planning mechanisms	Santa Fe Fireshed restoration strategy
Responsible Office/ Agency and Partners	Fire Department. USFS, BLM, Forest Guardians, Rio Grande Fire and Water Source Protection Collaborative, The Nature Conservancy
Priority	High
Cost Estimate	Coordination is low cost and could lead to leveraging of partner funding for multiple benefits.
Benefits (Avoided losses)	Reduced fire suppression, evacuation and post-wildfire community reconstruction costs.
Potential Funding	USFS Title II, New Mexico Forestry Division, USFS, and BLM among others.
Schedule	Ongoing with expanded mitigation treatments in 2017-2020

25. Firewise / Ready Set Go Workshops

Hazards Mitigated	**Wildfire**
Project Description, Issue/Background	A strong public education program helps the public prepare for emergencies and disasters. Santa Fe County uses a series of different techniques to educate the public: brochures, talks, interviews, websites, etc. This project would implement Firewise / Ready Set Go Workshops in WUI communities to educate homeowners on defensible space techniques and evacuation considerations.
Other Alternatives	No action
Related planning mechanisms	CWPP
Responsible Office/ Agency and Partners	Fire Department. USFS, BLM.
Priority	Medium
Cost Estimate	Staff time
Benefits (Avoided losses)	Public education helps the public to prepare and/or take care of themselves during and emergency or disaster
Potential Funding	Firewise, agency budgets, etc.
Schedule	Implement at least one workshop annually beginning in 2016

26. Improve Public Warning

Hazards Mitigated	**Wildfire, Dam Failure, flood**
Project Description, Issue/Background	Early warning for wildfire and other hazard events is critical so that the public can take protective measures. This project will use multiple forms of technology to target the population in danger including: 1) Invest in Everbridge public notification. 2) IPAWS encoding
Other Alternatives	Code Red and reverse 911
Related planning mechanisms	
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management
Priority	High
Cost Estimate	Variable depending on scope/technology
Benefits (Avoided losses)	Earliest warning possible to get the public out of the way of a wildfire or flood type event; will be able to use the system for other emergencies also Increased responder and public safety
Potential Funding	FEMA, Homeland Security, etc.
Schedule	Research options in 2016 with implementation in 2017-2018

27. Update the Wildland Urban Interface (WUI) ordinance

Hazards Mitigated	**Wildfire**
Project Description, Issue/Background	This project would entail reviewing the Wildland Urban Interface (WUI) Ordinance to determine needs for revisions or improvement and updating accordingly.
Other Alternatives	No action
Related planning mechanisms	Sustainable Land Use Development Code
Responsible Office/ Agency and Partners	Growth Management – Planning; Fire Department
Priority	Medium
Cost Estimate	Low, can be done with staff time
Benefits (Avoided losses)	Reduced losses to future development through ordinance enhancements
Potential Funding	Staff time
Schedule	2018

28. Reduce Flood and Debris Flow Potential Associated with Wildfire Burn Scars

Hazards Mitigated	**Landslide/Debris Flow, Flood**
Project Description, Issue/Background	This project would implement best management practices to reduce flood and debris flow potential following wildfires. For fires on federal lands this would include working and implementing recommendations from the Burned Area Emergency Response Team (BAER).
Other Alternatives	No action
Related planning mechanisms	Watershed plans
Responsible Office/ Agency and Partners	Fire Department – Wildland Division; Burned Area Emergency Response Team (BAER) which typically consists of USFS, BLM, USGS, NRCS).
Priority	Low
Cost Estimate	Variable depending on wildfire extent and intensity
Benefits (Avoided losses)	Avoided damages to roads, property and infrastructure near burn areas. Avoided road closures.
Potential Funding	NRCS – Emergency Watershed Protection Program; Forest Guild
Schedule	2018 and as needed following events

29. Severe Storm Mass Shelter / Care Operations

Hazards Mitigated	**Winter Storm, Extreme Cold, Wildfire**
Project Description, Issue/Background	This project would Identify additional shelter locations and develop a County CERT program to serve as a local shelter – Mass Care Team. This would also include maintaining a stock of Meals Ready to Eat (MRE). Reduce public risk from natural hazards in partnership between community members, local government, emergency management and response agencies to develop a CERT team. During a large-scale disaster, the response of any community's emergency services may be delayed or overwhelmed for a variety of reasons. This leaves the citizens of the community - family, neighbors, and co-workers - to provide for their own well-being and safety until professional responders arrive.
Other Alternatives	
Related planning mechanisms	EOP and related annexes
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management; Red Cross; New Mexico Department of Homeland Security and Emergency Management (DHSEM),
Priority	High
Cost Estimate	Staff time
Benefits (Avoided losses)	Reduced exposure of public during winter storm or extreme cold events. Coordinated locations for the public. Community resiliency.
Potential Funding	Staff time
Schedule	2017

30. Write Agricultural / Food Incident Annex to the County Emergency Operations Plan; Participate with New Mexico Department of Agriculture Response Task Force

Hazards Mitigated	**Agricultural Disease Incident**
Project Description, Issue/Background	1) Write agricultural / food incident annex to the County Emergency Operations Plan; 2) Participate with New Mexico Department of Agriculture Response Task Force 3) Improve preparedness for Zika Virus including public education, mosquito control
Other Alternatives	No action
Related planning mechanisms	EOP
Responsible Office/ Agency and Partners	Fire Department – Office of Emergency Management
Priority	Medium
Cost Estimate	Staff time
Benefits (Avoided losses)	Mitigation of an incident through improved preparedness and effective response.
Potential Funding	Staff time
Schedule	2017

31. Local Emergency Management Program Investment – Enhance Capabilities - Sustainment

Hazards Mitigated	All Hazards
Project Description, Issue/Background	The ten hazards identified in this document mainly represent Natural Hazard Risks. Santa Fe County has identified 35 additional risks related to Technological and Human-Caused Events. The Emergency Management Process -- starting with Mitigation -- should trigger Preparedness activities. When an event occurs, Emergency Management will often coordinate the Response of first responders from multiple agencies. After the event terminates, the final phase will occur: Recovery. In large disasters, Recovery may be the most complex and extended event of the EM Cycle. For some communities, recovery activities continue for years. Since 911, Emergency Management has become the 4th Emergency Service, along with Law Enforcement, Fire, and Emergency Medical Services. Because local government has the primary responsibility for public safety, including emergency response to a disaster or an act of terrorism, Emergency Management is necessarily a core function of local government. In 2016, the National Association of Counties included support of Locally Driven Comprehensive Emergency Management Programs to their policy platforms. The Santa Fe County Office of Emergency Management is located within the Santa Fe County Fire Department. Eighty percent of the Nation's Local Emergency Management Programs are fire-based. Consistent with National Preparedness Goals, our EM Program has developed a number of regionally deployable and mission ready assets. This operational posture makes locating the EM Office within the County Fire Department desirable. However, the Emergency Management function must not lose its place as a core responsibility of County Government. In order to enhance and sustain a comprehensive Emergency Management Program for Santa Fe County, significant gaps must be addressed by sustainable investments. Preparedness of the "Whole Community " for over 45 Hazard Risks requires subject matter expertise, changing situational awareness, partnership building, and operational readiness.

These needs can be mitigated by…

- Additional Staff for Planning, Training/NIMS Compliance, and Mitigation/Recovery activities, as well as
- An Operational and Capital Outlay Budget for the sustainment of the Office of Emergency Management and its deployable assets.
- A dedicated/hardened Emergency Operations Center for effective coordination of complex incidents

Other Alternatives	
Related planning mechanisms	N/A
Responsible Office/ Agency and Partners	Since 911, Emergency Management has become the 4th Emergency Service, along with Law Enforcement, Fire, and Emergency Medical Services.
Priority	Medium
Cost Estimate	To be determined
Benefits (Avoided losses)	A comprehensive and effective emergency management program can lead to improved resiliency including reduced impacts on lives and property and more effective recovery.
Potential Funding	General funds, SHSG, legislative initiatives
Schedule	2016-2020

6 PLAN ADOPTION

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, county commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from Santa Fe County, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. Santa Fe County has adopted this Hazard Mitigation Plan by passing a resolution. A copy of the resolution is included in Appendix C.

7 PLAN IMPLEMENTATION AND MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This chapter provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

7.1 Implementation

Once adopted, the plan faces the truest test of its worth: implementation. While this plan contains many worthwhile actions, the County will need to decide which action(s) to undertake first. Two factors will help with making that decision: the priority assigned the actions in the planning process and funding availability. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the benefits to each program and the Santa Fe County community and its stakeholders. This effort is achieved through the routine actions of monitoring meeting agendas for hazard mitigation related initiatives, coordinating on the topic at meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the County will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

7.1.1 Role of Hazard Mitigation Planning Committee in Implementation and Maintenance

With adoption of this plan, the County will be responsible for the plan implementation and maintenance. Santa Fe County, led by the Office of Emergency Management (OEM), will reconvene the HMPC for plan implementation and maintenance. This HMPC will be the same committee (in form and function, if not actual individuals) that developed this HMP and will also be responsible for the next formal update to the plan in five years. The HMPC will:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended changes to the Santa Fe County Commissioners; and
- Inform and solicit input from the public.

The HMPC will not have any powers over County staff; it will be purely an advisory body. The primary duty is to see the plan successfully carried out and to report to the County Commissioners and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the County website (and others as appropriate).

7.2 Maintenance

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

7.2.1 Maintenance Schedule

The Santa Fe County OEM is responsible for initiating plan reviews and consulting with the heads of participating departments. In order to monitor progress and update the mitigation strategies identified in the action plan, Santa Fe County OEM and the standing HMPC will conduct an annual review of this plan and/or following a hazard event. An annual mitigation action progress report will be prepared by the HMPC and kept on file to assist with for future updates. The annual review will be conducted by re-convening the HMPC in November of each year.

This plan will be updated, approved and adopted within a five-year cycle as per Requirement §201.6(c)(4)(i) of the Disaster Mitigation Act of 2000 unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. The County will inquire with DHSEM and FEMA for funds to assist with the update. It is recommended to begin seeking funds in 2019 as most applicable grants have multiple years to expend the funds. Funding sources may include the Emergency Management Performance Grants, Pre- Disaster Mitigation, Hazard Mitigation Grant Program (if a presidential disaster has been declared), and Flood Mitigation Assistance grant funds. The next plan update should be completed and reapproved by DHSEM and FEMA Region VI within five years of the FEMA final approval date. The planning process to prepare the update should begin no later than 12 months prior to that date.

7.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of new or altered hazards
- Increased vulnerability as a result of new development.

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the County will adhere to the following process:

- A representative from the responsible office identified in each mitigation measure will be responsible for tracking and reporting on an annual basis to the department lead on action status and provide input on whether the action as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities.

- If the action does not meet identified objectives, the lead will determine what additional measures may be implemented, and an assigned individual will be responsible for defining action scope, implementing the action, monitoring success of the action, and making any required modifications to the plan.

Changes will be made to the plan to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as the HMPC deems appropriate and necessary, and as approved by the Santa Fe County Commissioners. In keeping with the five-year update process, the HMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the governing council.

7.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other County plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As described in this plan’s capability assessment, the County already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- County Sustainable Growth Management Plan
- County Sustainable Land Development Code
- County Emergency Operations Plan and THIRA
- Community Wildfire Protection Plan
- Transportation Master Plan
- Capital improvement plans and budgets
- Recovery planning efforts
- Watershed planning efforts
- Wildfire planning efforts on adjacent public lands
- Master planning efforts
- Greenway or river corridor planning efforts

- Other plans, regulations, and practices with a mitigation aspect

HMPC members involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc, as appropriate. As described in Section 7.1 Implementation, incorporation into existing planning mechanisms will be done through the process of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes;
- Ensuring that the related planning process cross-references the hazard mitigation plan, where appropriate, and
- Monitoring community budget meetings for other community program opportunities.

Here are a couple examples of opportunities to cross reference the hazard mitigation plan in other planning efforts.

- The Hazardous Materials annex when updated could reference the risk assessment and related mitigation actions in the HMP.
- The Sustainable Land Use Code is going before the County Commissioners for the 6 month review of the draft in July 2016. There could be an opportunity to cross reference the HMP in the Code before it is finalized.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through these other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

7.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

When the HMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC plans to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. Public notice will be posted and public participation will be invited, at a minimum, through available website postings and press releases to the local media outlets, primarily newspapers. As part of this effort, at least one public meeting will be held and public comments will be solicited on the plan update draft.

Santa Fe County Hazard Mitigation Plan

APPENDIX A

Planning Process Documentation

2016 Santa Fe County Multi-Hazard Mitigation Plan Development

Background Information

What is Hazard Mitigation?

The Federal Emergency Management Agency (FEMA) defines hazard mitigation as, "any sustained action taken to reduce or eliminate long-term risk to life and property from natural hazards." Another way to understand hazard mitigation is as the prevention component of the emergency management process.

Emergency Management Cycle

- Preparedness activities are the emergency plans, training, drills, and exercises that individuals, communities and first responders participate in on almost daily basis. These are things done to get ready for an emergency or disaster before it happens.
- Response is the short-term, emergency actions taken to address the immediate impacts of a hazard.
- Recovery is the longer-term process of restoring the community back to normal or pre-disaster conditions.
- Mitigation activities are actions that will reduce or eliminate losses, for anticipated future events. Mitigation can reduce or eliminate the need for an emergency response and greatly reduce the recovery period.

Many types of mitigation actions are things done on a daily basis without much forethought such as purchasing insurance to protect a vehicle investment, putting on your seatbelt, or putting in gutters around a roof to better direct rain runoff. The same concepts apply to community level hazard mitigation planning. Mitigation planning is a process for county and local governments to identify community-level policies and actions that will reduce the impacts of natural hazards.

Why is Hazard Mitigation Important?

Most people who live or work in Santa Fe County have been affected by hazards in one way or another. Some of the hazards that can affect the County include flash flooding, wildfire, drought, severe weather, and mud flows. Santa Fe County has had much experience with disasters and emergencies in recent past. A highlighted few include: multi-year drought in 2012, and significant flooding in 2013 and 2014 that resulted in presidential disaster declarations. In addition to these large events, almost every year there are smaller, isolated weather events that cause localized property damage and losses significant to the people affected. The planning process will evaluate the potential for future damaging events and work toward solutions to help mitigate their impacts in the future.

Hazard Mitigation Plans

The rising costs associated with disaster response and recovery has caused federal, state, and local governments to focus on addressing natural hazards before they occur. The acts of "Mother Nature" cannot be prevented, but through the hazard mitigation planning process the impacts can be identified, which can lead to strategies to reduce and sometimes prevented the impacts altogether. A community comes together as a team (Hazard Mitigation Planning Committee, HMPC) in a facilitated forum to gather data that is then organized into a plan which identifies goals, objectives and actions pertaining to mitigating impacts from identified natural hazards. As the plan is developed, the HMPC reviews the data for accuracy and the public at large has an opportunity to comment and have their comments incorporated before a final draft is completed. FEMA realizes the importance of mitigation planning and offers incentives to communities that develop one. By following FEMA guidelines for a plan approval process, participating communities can be eligible for grant funding intended for mitigation projects. It is an opportunity for communities to take advantage of funds they would not have been able to tap into previously.

Plan Development Process

Santa Fe County Emergency Management is taking the lead on the update with professional planning assistance from Amec Foster Wheeler. Amec Foster Wheeler will facilitate the planning process, collect necessary data, and perform other technical services, including updating the risk assessment and plan document.

A planning team will be organized, and will meet on a regular basis, working through varying levels of review, revision, and update of the following elements of the plan:

- Identify hazards that may impact or have impacted the County;
- Profiles of hazard events;
- Assessment of the vulnerability to those hazards;
- Assessment of the County's capabilities to mitigate the hazards;
- Mitigation goals;
- Specific mitigation actions and projects;
- Implementation strategy for the plan;
- Plan maintenance and update process;
- Plan approval and adoption.

The planning team will include representatives from various County Departments. Stakeholders include representatives from state and federal agencies, local municipalities and pueblos.

The process began with a kickoff meeting of the Hazard Mitigation Planning Committee in late October 2015. The plan will be developed in the first half of 2016, with a draft for public review anticipated in July 2016.

How Can You Get Involved?

Members of the public have a very important role in this process. The planning team regards broad public participation in the planning process as an essential strategy for developing a plan that will be effective, supported by residents of the County, and ultimately implemented. The process will provide a range of opportunities for the County and its citizens, public officials, and stakeholder groups to participate and give input in the plan update. A series of regional public workshops is planned, with the first workshop in the northern county planned for February 11th. Interested stakeholders should pay attention to the Santa Fe County Emergency Management website for updates on the process.

For more information on the plan or the planning process, please contact:

Santa Fe County Emergency Management	**Amec Foster Wheeler project manager**
Martin Vigil Assistant Chief/ Emergency Manager Ph (505) 992-3072 mavigil@santafecountynm.gov	Jeff Brislawn Amec Foster Wheeler Ph (303) 820-4654 jeff.brislawn@amecfw.com

From: Brislawn, Jeff P
Sent: Tuesday, January 26, 2016 3:04 PM
To: 'william.borthwick@state.nm.us'; 'john.kretzmann@state.nm.us'; 'charles.thompson@state.nm.us'; 'davel@nmbg.nmt.edu'; 'Stephen.K.Scissons@usace.army.mil'; 'kduran@espanolanm.gov'; 'administrator@edgewood-nm.gov'; 'kparkinson@amcounty.net'; 'dbervin@sandovalcountynm.gov'; 'jsanchez@tcnm.us'; 'beverley.simpson@lacnm.us'; 'rclark@bernco.gov'; 'sbaros@edac.unm.edu'; 'AMSanchez@rio-arriba.org'
Cc: 'Martin A. Vigil'; 'Kyle.karsjen@amecfw.com'
Subject: Santa Fe County Hazard Mitigation Plan in Development
Attachments: Santa Fe County Mitigation Plan Backgrounder.pdf

Dear Hazard Mitigation Stakeholder:

Santa Fe County is in the process of developing a Multi-Hazard Mitigation Plan to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000). The primary purpose of the Hazard Mitigation Plan is to reduce or eliminate long-term risk to people and property from natural and human-caused hazards and their effects on the County planning area. The plan's scope focuses on the unincorporated County and will allow the County to become eligible for future federal mitigation grant funding and identify mitigation actions that will it more disaster resilient. The emphasis of DMA 2000 is on creating an ongoing, community-wide planning process that involves the Hazard Mitigation Planning Committee, the public and other key stakeholders. The Santa Fe County Office of Emergency Management is taking the lead on the project in coordination with a Hazard Mitigation Planning Committee (HMPC) comprised of various County departments and other stakeholders. Professional planning assistance is being provided by Amec Foster Wheeler. Attached is a document that provides more background on the plan.

As part of the planning process we are reaching out to other agencies, neighboring jurisdictions, and stakeholders to raise awareness of this effort and provide an opportunity for input. Another objective of this outreach is to coordinate with those who may bring additional information to the planning process regarding hazard issues or mitigation efforts within the County. Any information, studies, or related plans or hazard mitigation projects which might inform the plan and supplement the work of the Hazard Mitigation Planning Committee would be welcomed. Additionally we invite your participation at our committee and public meetings throughout the planning process. Let me know if you would like to be added to an email distribution so that you can stay informed of the planning process and upcoming meetings.

The project was initiated with a kickoff meeting in late October 2015. Our next planning meetings will include an HMPC meeting on Wednesday, February 10th, 2-4pm, at the Santa Fe County Public Safety Building, 35 Camino Justicia, Santa Fe, NM 87508. The purpose of the meeting is to discuss the results of a hazard identification and risk assessment that has been conducted by Amec Foster Wheeler. The HIRA development process has identified areas vulnerable to various natural and man-made hazards. This is the first step towards development of a mitigation strategy for the County.

In addition there will be a public meeting in the northern region of the County on February 11th, 2- 4 pm at the Pojoaque Fire Station 17919 US 84/285, Santa Fe NM 87506. This will be the first in a series of public meetings that will be held between now and July, when a draft of the plan is targeted for public review prior to finalization and adoption.

As the planning consultant project manager with Amec Foster Wheeler I can be contacted at 303-820-4654 or jeff.brislawn@amecfw.com. Martin Vigil, Santa Fe County Emergency Manager, is the lead coordinator on this project and can be contacted at 505-992-3072 or mavigil@santafecountynm.gov.

Regards,
Jeff

Jeff Brislawn
Hazard Mitigation Lead/Associate
Amec Foster Wheeler
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SANTA FE COUNTY HAZARD MITIGATION PLAN

KICKOFF MEETING

Friday, October 23, 2015 9:00am-Noon
Santa Fe County Public Safety Building
35 Camino Justicia, Santa Fe, NM 87508

- **Opening Remarks and Introductions**
- **Mitigation, Mitigation Planning, and the Disaster Mitigation Act Requirements**
- **Role of the Hazard Mitigation Planning Committee**
- **Objectives and Schedule for the Plan Development**
- **Review of Identified Hazards**
- **Coordinating with Other Agencies\Related Planning Efforts\Recent Studies**
- **Planning for Stakeholder and Public Involvement**
- **Information Needs/Next Steps**
- **Questions and Answers/Adjourn**

Santa Fe County
Hazard Mitigation Plan Development

Summary of the Kickoff and Hazard Identification Meeting
Hazard Mitigation Planning Committee Meeting #1
October 23, 2015
9:00am to 12:00pm
Santa Fe County Public Safety Building, 35 Camino Justicia

Introductions and Opening Remarks

Martin Vigil with Santa Fe County Emergency Management began the meeting with welcoming remarks and an introduction of Jeff Brislawn from Amec Foster Wheeler, the consulting firm hired to facilitate the planning process and develop the plan. Martin asked everyone around the room to introduce themselves. Nine persons representing a mix of Santa Fe County, the City of Santa Fe and the New Mexico Department of Homeland Security and Emergency Management were present and documented on a sign in sheet. An agenda and data collection guide were provided as handouts.

Mitigation, Disaster Mitigation Act (DMA) Requirements, and the Planning Process

A PowerPoint presentation was presented by Jeff Brislawn, the project manager from Amec Foster Wheeler. The presentation described the objectives and goals for developing a new Santa Fe County Hazard Mitigation Plan. Jeff outlined the nine-step planning process that will be followed. The plan is intended to identify hazards, assets at risk, and ways to reduce impacts through long-term, sustainable mitigation projects. The plan will also create eligibility for FEMA mitigation grant funding.

Multi-Jurisdictional Participation and the Role of the Hazard Mitigation Planning Committee (HMPC)

This meeting is the first meeting of the Santa Fe County Hazard Mitigation Planning Committee (HMPC) during the plan development process. A definition of participation in the planning process was provided that includes:

- Attend and participate in HMPC meetings
- Provide available data requested of the HMPC coordinator/Amec Foster Wheeler
- Provide hazard and vulnerability details specific to the County
- Develop problem statements, based on risk assessment
- Provide input on local mitigation strategy (action items and projects)
- Advertise and assist with public input process
- Review and comment on plan drafts
- Coordinate formal adoption

Discussion of Objectives and Schedule for the Plan Development

Goals of the process were discussed that included:

- Develop the County's Multi-Hazard Mitigation Plan per the DMA requirements

- Coordinate with existing related plans, where available
- Develop mitigation strategies as appropriate
- Engage governmental and non-governmental stakeholders, tribes, and the public
- Integrate risk information, including flood hazard and wildfire hazard data

The plan will be developed over the next eight months, with at least two more meetings of the HMPC. An email group will be developed for the HMPC for sharing information on upcoming meetings. Amec Foster Wheeler will be drafting the risk assessment in the next couple of months, with input and data from the HMPC. The first draft for HMPC review is targeted for April, followed by a public review draft in May. A final draft for State DHSEM and FEMA review is targeted to be complete by July of 2016. Based on the length of typical reviews, the final approved plan is anticipated to be ready for adoption around November 2016. The FEMA Plan Review Tool will be used throughout the process to ensure compliance with the DMA requirements.

The next meetings of the HMPC are targeted for January and February/March, with specific dates to be determined. Jeff noted that the schedule was aggressive but could be accomplished as long as information requests deadlines are adhered to and other factors, such as hazard events, do not interfere.

Review of Identified Hazards

A list of potential natural hazards was discussed, based on hazards identified in the county's Threat and Hazard Identification and Risk Assessment (THIRA), the New Mexico State Hazard Mitigation Plan and other applicable sources. The focus of the plan will be on natural hazards, since man-made hazards are not required by DMA 2000 regulations; however, some man-made hazards such as hazardous materials, for example, were identified as a serious hazard issue. The hazards discussed for the plan include:

- Dam Failure
- Drought
- Earthquake
- Expansive Soils
- Extreme Temperatures
- Flood/Flash Flood
- High Wind
- Landslide/Mudslide/Rockfall
- Land Subsidence
- Severe Winter Storm
- Thunderstorm (including Lightning and Hail)
- Tornado
- Volcano
- Wildland Fire

Human caused hazards:

- Hazardous Materials Incidents

Additional hazards suggested by the group for consideration included

- Agricultural Disease

This list was agreed upon as a good starting point. Some hazards may drop off the list if no issues or hazard areas are identified within the County. For example, subsidence (collapse or depressions in the land surface) is dependent on specific geologic conditions, groundwater withdrawal, or the presence of underground mining, and may not be a serious issue in the county. The County THIRA was discussed which identifies additional man-caused hazards, evaluates nine core capabilities to manage hazards, and includes a gap analysis. The hazard mitigation plan and THIRA will be linked. Space weather should be mentioned in the plan as a potential concern, but will not have its own hazard profile. Climate change/climate variability/climate adaptation was discussed and will be noted as a contributing factor in hazard probability/intensity but is not part of the scope of the plan.

The group discussed how wildfires have historically been the top priority hazard. Floods from runoff in burn scar areas have been increasingly problematic. There is a growing concern around dam safety; the Santa Cruz dam was noted as a concern due to its age (built in 1920's), type of construction, and number of people living in the inundation zone in the Chimayo Valley. The earthquake hazard associated with the Rio Grande Rift Zone has been the subject of recent studies and HAZUS earthquake modeling by the Earth Data Analysis Center at the University of New Mexico in coordination with DHSEM. Soil liquefaction due to earthquakes could be a concern. An average of three tornadoes a year occur in the County. The Valles Caldera is a regional volcanic hazard that is highly monitored. The State had an extreme cold incident that affected natural gas transmission in 2011 and had widespread impacts. The potential for a radiological/nuclear hazardous materials incident is one of the highest in the nation with the nearby National Labs, Waste Isolation Pilot Plant and associated high volume of weapons and materials transport. The Buckman facility was noted as the largest hazardous materials fixed facility in the County. Agricultural disease may be an issue in the eastern and southern parts of the County.

Coordination with other Agencies, Related Planning Efforts, and Recent Studies

A slide in the PowerPoint presentation (slides 12 and 13) noted the agencies that will be coordinated with during the planning process. Additional agencies recommended for inclusion in the mitigation planning process include:

- County Public Information Officer
- County Risk Management
- Forest Gild (wildfire mitigation)
- The Nature Conservancy
- Cattle Growers Association
- Agricultural Extension
- Gas and Electric Utilities
- Acequia associations

A discussion on data sources to support the hazard identification and risk assessment was held. Identified sources included:

- County THIRA
- State THIRA
- Flood or drainage studies

- Local GIS data resources

Coordination with related planning efforts is a key aspect of building resiliency and a requirement under the DMA. Related plans that should be coordinated or referenced during the HMP development include:

- County Transportation Plan in Progress
- Sustainable Land Development Code is being updated and is in draft form
- Community Wildfire Protection Plans
- MPO Long Range Transportation Plan (in development)
- 2014 City of Santa Fe Hazard Mitigation Plan
- Pojoaque Pueblo Hazard Mitigation Plan (update in process)

Planning for Continued Public and Stakeholder Involvement

A Public Participation Plan will be developed to outline the process for public and stakeholder engagement, and to identify upcoming opportunities where a flyer or public survey related to the planning effort could be distributed. A 'whole community' approach will be utilized. Per the DMA requirements, this includes an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, as well as other interests to be involved in the planning process. While the plan will be a single-jurisdictional county plan, the City of Santa Fe and the incorporated towns of Espanola and Edgewood will be invited as a stakeholder. This will also include outreach to the Pojoaque, Nambe, San Ildefonso and Tesuque Pueblos.

Four regional meetings will be held as part of the planning process; a forum to discuss flood issues in the northern County is already in place. A discussion was held on how to coordinate this planning process with other public outreach efforts. Jeff described how it can be challenging to get people to attend public meetings. Jeff noted that public surveys (both online and hardcopy) have been utilized for other hazard mitigation planning efforts with success and will send an example. Jeff will also develop a backgrounder flyer that can be used for web posting and hardcopy distribution.

Data Collection Needs/Next steps

A data collection guide was distributed to members of HMPC that is designed to facilitate gathering information on hazards, past events, vulnerable assets, and capabilities. Jeff recommended that County staff complete the form, reflecting input from several departments such as public works, road and bridge, planning, building, etc. The HMPC was asked to return to Jeff Brislawn by November 20, 2015. The group discussed a follow-up meeting with key County staff to go through the data collection guide worksheets on November 6th at 9:00 am in the Fire Administration building. Amec Foster Wheeler will begin work on the risk assessment.

Adjourn

The meeting adjourned at 12:00pm.
Summary prepared by Jeff Brislawn, Amec Foster Wheeler, November 4, 2015.

SIGN-IN SHEET

SANTA FE COUNTY HAZARD MITIGATION PLAN PROJECT

HMPC Meeting #1 (Kickoff and Hazard Identification) October 23, 2015

Santa Fe County Public Safety Building 35 Camino Justicia, Santa Fe, NM

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
Jeff Brislawn	Jeff.brislawn@amecfw.com	303-704-5506	AMEC Foster Wheeler Plan Consultant	Project Manager
Martin Vigil	mavigil@santafecountynm.gov	505-992-3072	Santa Fe County OEM	Director - Asst Chief
Tony Flores	tflores@santafecountynm.gov	505-986-6216	Santa Fe County Manager's Office	Deputy County Manager
Natanya Garnenez	natanya.garnenez@amec.com	(505) 264-0046	Amec Foster Wheeler, ABQ ofc.	Staff Engr
David Sperling	dsperling@santafecountynm.gov	992-3076	SFCFD	Fire Chief
Kevin Dodge	kevin.dodge@state.nm.us	505-476-9609	DHSEM	Mitigation Specialist
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Hazard Mitigation Plan

Data Collection Guide

for

Hazard Mitigation Planning Committee (HMPC)

Prepared by

Amec Foster Wheeler

October 2015

Overview

The contents of this workbook have been designed to assist participating local government entities in collecting necessary background information to support the hazard mitigation planning process pursuant to the Federal Disaster Mitigation Act (DMA) of 2000. This includes a hazard identification and vulnerability assessment, an assessment of current hazard mitigation capabilities, and an identification of potential mitigation projects that, if undertaken, could prevent or reduce future losses.

The essential information needed to support the planning process includes background information about the entity; plans, technical studies, and data related to hazards and risks; current governing codes, ordinances, regulations, and procedures whose intent is to minimize future losses; and an assessment of the entity's technical and organizational capabilities to perform hazard mitigation/loss prevention functions.

The planning process is heavily dependent on existing data to be supplied by each of the participants represented on the Hazard Mitigation Planning Committee (HMPC). The DMA plan development process does not require the development of new data, but requires ***existing data only***.

The goal of this process is to produce a hazard mitigation plan that meets Santa Fe County's needs, as well as the requirements of DMA 2000 and that contains a list of projects that may be eligible for streamlined federal mitigation funding pre or post disaster.

Participation

The DMA planning regulations and guidance stress that each entity seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Detail areas within the planning area where the risk differs from that facing the entire area;
- Identify specific projects to be eligible for funding; and
- Have the governing board formally adopt the plan.

For HMPC members, 'participation' means the planning committee representatives will:

- Attend and participate in HMPC meetings;
- Provide available data that is requested of the HMPC coordinator;
- Review and provide/coordinate comments on the draft plans;
- Advertise, coordinate and participate in the public input process; and
- Coordinate the formal adoption of the plan by the governing board.

Data Collection Guide

This guide contains an explanation of the types of hazard mitigation/loss prevention data that is needed for the hazard mitigation planning process. This guide identifies specific requirements for the Risk Assessment Process, which includes the Hazard Identification, Vulnerability, and Capability Assessments as well as defines requirements for development of the Mitigation Strategy.

The worksheets have been developed to assist with the data collection. These need to be completed by each new jurisdiction participating on the HMPC and will serve two purposes:

- They will help facilitate the collection of the necessary information.
- They will function as evidence of "participation" in the planning process.

Data collection guides are due on November 20th, 2015 to Jeff Brislawn (contact information below).

Project Reference

Santa Fe County Point of Contact:
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Assistant Chief and Director of Emergency Management
Santa Fe County Fire Department
35 Camino Justicia, Santa Fe, NM 87508
Ph 505-992-3072; mavigil@santafecountynm.gov

Amec Foster Wheeler Project Manager
Jeff Brislawn
Hazard Mitigation Lead/Sr Associate
1002 Walnut Street Suite 200, Boulder, CO 80302
Ph 303-820-4654; jeff.brislawn@amecfw.com

The Risk Assessment Process

The risk assessment process includes three components: hazard identification, vulnerability assessment, and capability assessment. Data needs and worksheets for each of the risk assessment components are included in this guide.

Santa Fe County Multi-Hazard Mitigation Plan
Worksheet #1: Hazard Identification

Department/Jurisdiction: ______________________________

Prepared by/Phone/Email: ______________________________

Use this worksheet to identify possible hazards that may impact your jurisdiction. Please rank according to the guidelines that follow the table. Use copies of Worksheet #2: Historic Hazard Event to provide evidence to justify your conclusions.

Hazard	Geographic Extent	Probability of Future Occurrence	Potential Magnitude/ Severity	Overall Significance
Dam Failure				
Drought				
Earthquake				
Expansive Soils				
Extreme Heat				
Flood/Flash Flood				
High Wind				
Landslide/Mudslide/Rockfall				
Land Subsidence				
Severe Winter Storm				
Thunderstorm (including Lightning and Hail)				
Tornado				
Volcano				
Wildland Fire				
HazMat Incident				

Geographic Extent

Negligible: Less than 10 percent of planning area or isolated single-point occurrences
Limited: 10 to 25 percent of the planning area or limited single-point occurrences
Significant: 25 to 75 percent of planning area or frequent single-point occurrences
Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Potential Magnitude/Severity

Negligible: Less than 10 percent of property is severely damaged, facilities and services are unavailable for less than 24 hours, injuries and illnesses are treatable with first aid or within the response capability of the jurisdiction.
Limited: 10 to 25 percent of property is severely damaged, facilities and services are unavailable between 1 and 7 days, injuries and illnesses require sophisticated medical support that does not strain the response capability of the jurisdiction, or results in very few permanent disabilities.
Critical: 25 to 50 percent of property is severely damaged, facilities and services are unavailable or severely hindered for 1 to 2 weeks, injuries and illnesses overwhelm medical support for a brief period of time, or result in many permanent disabilities and a few deaths.
Catastrophic: More than 50 percent of property is severely damaged, facilities and services are unavailable or hindered for more than 2 weeks, the medical response system is overwhelmed for an extended period of time or many deaths occur.

Probability of Future Occurrences

Unlikely: Less than 1 percent probability of occurrence in the next year, or has a recurrence interval of greater than every 100 years.
Occasional: Between a 1 and 10 percent probability of occurrence in the next year, or has a recurrence interval of 11 to 100 years.
Likely: Between 10 and 90 percent probability of occurrence in the next year, or has a recurrence interval of 1 to 10 years
Highly Likely: Between 90 and 100 percent probability of occurrence in the next year, or has a recurrence interval of less than 1 year.

Overall Significance

Low: Two or more of the criteria fall in the lower classifications or the event has a minimal impact on the planning area. This rating is also sometimes used for hazards with a minimal or unknown record of occurrences/impacts or for hazards with minimal mitigation potential.
Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is also sometimes utilized for hazards with a high impact rating but an extremely low occurrence rating.
High: The criteria consistently fall along the high ranges of the classification and the event exerts significant and frequent impacts on the planning area. This rating is also sometimes utilized for hazards with a high psychological impact or for hazards that the jurisdiction identifies as particularly relevant.

Santa Fe County Multi-Hazard Mitigation Plan
Worksheet #2: Historic Hazard Event

Name of Department/Jurisdiction: ____

Please fill out one sheet for each significant hazard event with as much detail as possible. Attach supporting documentation, photocopies of newspaper articles, or other original sources.

Type of event	
Nature and magnitude of event	
Location	
Date of event	
Injuries	
Deaths	
Property damage	
Infrastructure damage	
Crop damage	
Business/economic impacts	
Road/school/other closures	
Other damage	
Insured losses	
Federal/state disaster relief funding	
Opinion on likelihood of occurring again	
Source of information	
Comments	

Prepared by: ______________________________________

Phone: ______________________________________

Email: ______________________________________

Please return worksheets by mail, email, or fax to:
Jeff Brislawn
1002 Walnut Street, Boulder CO 80302
Fax (303) 442-0616 Phone (303) 820-4654
Email: jeff.brislawn@amecfw.com

Santa Fe County Multi-Hazard Mitigation Plan
Worksheet #3: Vulnerability Assessment

Name of Department/Jurisdiction: ____

The purpose of this worksheet is to assess the vulnerable buildings, populations, critical facilities, infrastructure, and other important assets in your community by using the best available data to complete the table and questions that follow. Use the table on the next page to compile a detailed inventory of specific assets at risk including critical facilities and infrastructure; natural, cultural, and historical assets; and economic assets as defined below. These may include hospitals, fire stations, or historic buildings. Attach supporting documentation, such as photographs, reports, or plans if possible. In the hazard specific column of the asset inventory table, indicate if there is a specific hazard to which the asset is at risk.

Critical Facilities

FEMA generally defines four kinds of critical facilities:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic, and/or water-reactive materials
- Hospitals, nursing homes, and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a hazard event
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for emergency response activities before, during, and after a hazard event
- Public and private utility facilities that are vital to maintaining or restoring normal services to hazard areas before, during, and after a hazard event

FEMA's HAZUS-MH loss estimation software uses the following three categories of critical assets. 'Essential facilities' are those that if damaged would have devastating impacts on disaster response and/or recovery. 'High potential loss facilities' are those that would have a high loss or impact on the community. Transportation and lifeline facilities are third category of critical assets; examples are provided below.

Essential Facilities	High Potential Loss Facilities	Transportation and Lifeline
▪ Hospitals and other medical facilities ▪ Police stations ▪ Fire station ▪ Emergency Operations Centers	▪ Power plants ▪ Dams/levees ▪ Military installations ▪ Hazardous material sites ▪ Schools ▪ Shelters ▪ Day care centers ▪ Nursing homes ▪ Main government buildings	▪ Highways, bridges, and tunnels ▪ Railroads and facilities ▪ Bus facilities ▪ Airports ▪ Water treatment facilities ▪ Natural gas facilities and pipelines ▪ Oil facilities and pipelines ▪ Communications facilities

Natural, Cultural, and Historical Assets

Natural resource assets may include wetlands, threatened and endangered species, or other environmentally sensitive areas. Historical assets include state and federally listed historic sites.

Economic Assets

Economic assets at risk may include major employers or primary economic sectors, such as agriculture, whose losses or inoperability would have severe impacts on the community and its ability to recover from disaster.

Asset Inventory

Name of Asset	Type*	Replacement value	Occupancy/ capacity	Hazard Specific issues

*EI: Essential Infrastructure; VF: Vulnerable Facilities; HM: Hazardous Materials Facilities; NA: natural assets

Additional Vulnerability Questions

Describe any hazard-related concerns or issues regarding the vulnerability of special needs populations, such as the elderly, disabled, or low-income.	
Describe growth and development trends and future growth areas and how they relate to hazard areas and vulnerability concerns/issues.	
List specific problem areas – e.g. areas with poor stormwater drainage, at-risk facilities or infrastructure, high risk WUI areas etc.	

Prepared by: ______________________________

Phone: ______________________________

Email: ______________________________

Please return worksheets by mail, email, or fax to:
Jeff Brislawn
1002 Walnut Street, Boulder CO 80302
Fax (303) 442-0616 Phone (303) 820-4654
Email: jeff.brislawn@amecfw.com

Santa Fe County Multi-Hazard Mitigation Plan
Worksheet #4: Capability Assessment

Name of Department/Jurisdiction: ____

Capabilities are the programs and policies currently in use to reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete this worksheet and provide supporting documentation if possible.

Regulatory

The following planning and land management tools are typically used by local jurisdictions to implement hazard mitigation activities. Please indicate which your jurisdiction has in place. If your jurisdiction does not have this capability or authority, please indicate if a higher level of government has the authority. Also use the comments column to indicate how we can obtain a copy of the plan or document (i.e. available on the web (include address), will put on ftp, will e-mail or mail, will fax).

Regulatory Tool (ordinances, codes, plans)	Yes/No	Comments
Comprehensive plan		
Zoning ordinance		
Subdivision ordinance		
Growth management ordinance		
Floodplain ordinance		
Other special purpose ordinance (stormwater, steep slope, wildfire)		
Building code		
Fire department ISO rating		
Erosion or sediment control program		
Stormwater management program		
Site plan review requirements		
Capital improvements plan		
Economic development plan		
Local emergency operations plan		
Other special plans		
Flood insurance study or other engineering study for streams		
Elevation certificates (for floodplain development)		
Other		

Administrative/Technical

Identify the technical and personnel resources responsible for activities related to hazard mitigation/loss prevention within your jurisdiction. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, please indicate so in the comments column.

Personnel Resources	Yes/No	Department/Position	Comments
Planner/engineer with knowledge of land development/land management practices			
Engineer/professional trained in construction practices related to buildings and/or infrastructure			
Planner/engineer/scientist with an understanding of natural hazards			
Personnel skilled in GIS			
Full time building official			
Floodplain manager			
Emergency manager			
Grant writer			
Other personnel			
GIS Data Resources (Hazard areas, critical facilities, land use, building footprints, etc.)			
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning, text messages)			
Other			

Fiscal

Identify whether your jurisdiction has access to or is eligible to use the following financial resources for hazard mitigation

Financial Resources	Accessible/Eligible to Use (Yes/No)	Comments
Community Development Block Grants		
Capital improvements project funding		
Authority to levy taxes for specific purposes		
Fees for water, sewer, gas, or electric services		
Impact fees for new development		
Incur debt through general obligation bonds		
Incur debt through special tax bonds		
Incur debt through private activities		
Withhold spending in hazard prone areas		
Other		

Additional Capabilities Questions

Does your community have any hazard-related certifications, such as Storm Ready certification or Firewise Communities certification?	
Describe any past or ongoing public education or information programs, such as for responsible water use, earthquake or fire safety, household preparedness, or environmental education.	
Describe any other past or ongoing projects or programs designed to reduce disaster losses. These may include projects to protect critical facilities.	

Prepared by: ______________________

Phone: ______________________

Email: ______________________

Please return worksheets by mail, email, or fax to:
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SANTA FE COUNTY HAZARD MITIGATION PLAN

RISK ASSESSMENT and GOALS MEETING

Wednesday, February 10, 2016 2:00-4:00pm
Santa Fe County Public Safety Building
35 Camino Justicia, Santa Fe, NM 87508

- **Introductions**
- **Review of the Planning Process**
- **Review of Identified Hazards**
- **Vulnerability Assessment Overview by Hazard**
- **Capability Assessment Overview**
- **Developing Goals for the Mitigation Plan**
- **Update on Public Involvement Activities/public meeting**
- **Next Steps**
- **Questions and Answers/Adjourn**

Summary of the Santa Fe County Multi-Hazard Mitigation Plan
Risk Assessment and Goals Meeting

February 10th, 2016
2-4 PM
Santa Fe County Public Safety Building, 35 Camino Justicia, Santa Fe NM

Introductions and Opening Remarks

Martin Vigil, Santa Fe County Office of Emergency Management, and Jeff Brislawn of AMEC Foster Wheeler, the consulting firm hired to facilitate the plan update process, began the meeting with welcoming remarks. Jeff asked everyone around the room to introduce themselves. Seven persons representing Santa Fe County and the City of Santa Fe were present and documented on a sign in sheet. An agenda, goals update worksheet, risk summaries overview sheet, and hard copies of the maps developed for the plan update were provided as handouts.

Review of Mitigation, Disaster Mitigation Act (DMA) Requirements, and the Planning Process

A PowerPoint presentation was presented by Jeff Brislawn, the project manager from AMEC Foster Wheeler. Jeff outlined the ten step planning process being followed and discussed the project status.

Risk Assessment Presentation and Discussion

Jeff and Kyle Karsjen outlined the general risk assessment requirements before beginning a detailed discussion of each hazard. They presented details on each hazard that will be included in the draft updated risk assessment chapter. Refer to the Santa Fe County MHMP Risk Assessment PowerPoint presentation and draft Hazard Identification and Risk Assessment (HIRA - forthcoming) chapter for specific details on each hazard.

Several valuable details were learned during the risk assessment conversation among participants. Highlights of the discussion are noted by hazard in the table below.

Hazard or Topic	Meeting Discussion
Drought	• Research a large fire in Santa Fe County in the late 1970s • Anecdotal evidence of impacts on recreation and tourism from drought, but no hard data. There have been impacts to hunting and fishing and closure of national forests caused by wildfire. • Trying to pull collaborators together to study fire risk in watersheds – based on implemented model in Taos, Sangre de Cristo mountain regions
Flood	• Glorieta Conference Center was identified as being a shelter and within the 100 year floodplain. HMPC noted it is NOT a shelter – this is old data (ownership changed)
Wildfire	Tumbleweeds have caused issues. Pile up and cause fuel loads. Catch fire and catch power poles on fire.
Severe Winter Storm	• HMPC noted this hazard has had more impacts than NCDC data suggests. • A winter weather event is recorded when it has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis. Normally, a significant winter storm would pose a threat to life or property. • 1.5-2ft of snow experienced in Edgewood and southern County a couple days after Christmas 2015. • Ag impacts – cattle – experienced in above event. • County EM has lot of detailed data from 2006-07, worst recent event. • Review challenges associated with medical staff with road closures/Interstate closures.
High Wind	• List MPH in the document as well as knots. • Incident count seems low, as there are many days of high wind each spring. Low count probably due to source. • There was a tree blown down across road in early Feb 2016.
Extreme Temperatures	• The 2011 natural gas shortage incident was analyzed by gas industry; event was an unusual series of events; industry has made efforts to mitigate a future incident.
Severe Thunderstorm	• Amount of recorded incidents with lightning seems low – single storm in 2015 had 1800 strikes, per Martin. Might have started some fires.
Tornado	• Review previous occurrences for a tornado in 1971. • Martin said the NWS suggests an average of 3 a year.

	• Sandia Mountains block radar signatures, which may result in fewer reports of incidents. • Dust devils are a regular occurrence but usually in undeveloped areas.
Earthquake	The HMPC was not aware of the 5 M 3.6-3.9 earthquakes listed as occurring in 2015. Amec FW to check source of info.
Other Geological Hazards	• Discussed the prevalence of land subsidence in the county and how to include it in the hazard analysis. Mention, but note to revisit in future updates as more data becomes available. • For volcano, the group noted that the vent in the caldera has major amounts of observation equipment in it – being watched by LANL.
Dam Failure	Earthen (non-jurisdictional) dams are likely not included in the database used to map dams – put a statement in the document about earthen dams and their potential impacts.
Agriculture Disease	• Concerns? Disease coming over southern border. State has been looking into issues.
HazMat	• Hearing of higher levels of waste coming down from Raton. Some materials not disclosed. • If possible, can hazardous materials incidents be mapped? Will look into. • The number of incidents seems to be very low, though this could be due to limited sources. State Police may have more data. • 2 hazardous materials incidents on 41 by Clark Hill were recalled by committee.
Overall exposure	• 148,164 people in the county vulnerable to natural hazards of some kind – need to break out unincorporated population. • 750 critical facilities; 346 in unincorporated areas • Estimated total structure value: $12B; $4.6B in unincorporated areas • Estimated total structure contents value: $21B; $7B in unincorporated areas
Critical Facilities	• 3 categories – essential facilities, high potential loss, and transportation and lifelines • A more comprehensive inventory has been compiled in GIS as part of the plan update effort.

<u>Risk Summary Review</u>

Jeff reviewed a handout with specific risk summaries for each hazard. This is a draft document for HMPC reference. The intent is to summarize the key issues that may also provide the basis and need for mitigation actions.

Capability Assessment Review

Jeff briefly reviewed highlights of existing capabilities in the county to mitigate hazards, including numbers of National Flood Insurance Policies, county planning and zoning regulations, and the county Community Wildfire Protection Plan. The group noted that the CWPP is currently being updated.

Plan Goals and Objectives Update

The HMPC Reviewed a handout *Formulating and the Mitigation Strategy* that included a list of typical goal statements for hazard mitigation plans, drawn from FEMA guidance and other plans, and the New Mexico State hazard Mitigation Plan. The group will meet separately and identify goals and objectives for the plan prior to the next HMPC meeting.

Planning for Public Involvement

Public involvement will include regional public workshops and advertisement of the draft updated plan for review and comment. The first public meeting will be held February 11^{th} in the northern part of the county at the Pojoaque Fire Station. Additional public meetings will be held in late March.

Plan Timeline/Next steps

Jeff summarized the next steps in the process. Amec Foster Wheeler will finalize HIRA and share with HMPC in the next couple weeks.

- HMPC homework:
  - Review the handout *Formulating and the Mitigation Strategy* and provide suggestions on the worksheet for goals.
  - Review the HIRA and provide feedback
  - Provide any feedback on the risk summaries/problem statements
  - Start formulating ideas for mitigation projects

The next and final HMPC planning meeting will be held March 30^{th} from 2-5 PM at the Santa Fe County Public Safety Building to develop mitigation actions for the plan. Jeff emphasized that this is an important meeting and will form the basis for the mitigation action plan. A calendar update will be sent out to save the date. The meeting materials will also be shared electronically, including the presentation and worksheets.

SIGN-IN SHEET
SANTA FE COUNTY HAZARD MITIGATION PLAN PROJECT
HMPC Meeting #2 (Risk and Goals meeting) February 10, 2016
Santa Fe County Public Safety Building 35 Camino Justicia, Santa Fe, NM

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
JEFF BRISLAWN	Jeff.brislawn@amecfw.com	303-704-5506	Amec Foster Wheeler	Project Manager
Vicki Lucero	vlopez@santafecountynm.gov	(505) 986-6222	Growth Management	Building & Development Services Manager
David Silver	dmsilver@santafenm.gov	505 955 6537	City of Santa Fe	Emergency Mgr
Ray Matthew	rmatthew@santafecountynm.gov	505 955-2775	SFC Planning Division	Transportation Planner
MARTIN VIGIL				
Robert Martinez	robmtz@santafecountynm.gov	992-3015	SFC/PW	Deputy Director
DAVID SPERLING	dsperling@santafecountynm.gov		SFCFD	Fire Chief
Debra Garcia	dgarcia@santafecountynm.gov	995-2753	GM/GIS	GIS Analyst
KYLE KARSJEN	kyle.karsjen@amecfw.com	303-820-4661	Amec Foster Wheeler	Planner

SANTA FE COUNTY HAZARD MITIGATION PLAN

MITIGATION STRATEGY MEETING

Wednesday, March 30, 2016 2:00-5:00pm
Santa Fe County Public Safety Building
35 Camino Justicia, Santa Fe, NM 87508

- **Opening remarks and introductions**
- **Review of the planning process and key issues from the risk assessment and capability assessment**
- **Developing goals for the Mitigation Plan**
- **Review of possible mitigation activities and alternatives**
- **Discuss criteria for mitigation action selection and prioritization**
- **Brainstorming Session: Development of mitigation actions (group process)**
- **Prioritize mitigation actions (group process)**
- **Discuss plan implementation and maintenance**
- **Discuss next steps and public involvement/public meeting**
- **Questions and Answers/Adjourn**

Santa Fe County
Hazard Mitigation Plan

Summary of Mitigation Strategy Meeting

March 30th, 2016
2:00 – 5:00 PM
Santa Fe County Public Safety Building, 35 Camino Justicia, Santa Fe, NM 87508

Introduction and Opening Remarks

Jeff Brislawn, project manager with Amec Foster Wheeler, initiated the meeting with a discussion of the agenda for the afternoon. Jeff asked everyone around the room to introduce themselves; eight persons from various County departments were in attendance and documented on a sign in sheet. Handout materials were provided.

Jeff presented the PowerPoint slide deck that outlined the meeting agenda and discussion topics.

Review of the Planning Process and key issues from the risk assessment

Jeff reviewed the planning process that has taken place so far. The process is currently in Phase III – Develop a Mitigation Plan. Jeff also reviewed the findings of the process up to the point of the meeting, including the hazard identification and risk assessment and the capability assessment. Jeff presented a slide that summarized the hazard significance ratings. The group recommended revising some of the hazard significance ratings to reflect the risk assessment results. The changes included:

- Volcanoes: Changed from High to Low
- Extreme Temps: Changed from High to Medium
- Earthquake: Changed from High to Medium
- Agricultural Disease Incident: Changed from High to Medium
- Tornadoes was changed from Low to Medium

Jeff reminded the group that a handout provided at the last meeting summarized the key issues from the risk assessment. He also suggested the HMPC utilize the draft risk assessment to stimulate ideas on mitigation actions and reminded the group that feedback on the draft was due April 8th.

Plan Goals

Jeff facilitated a discussion that resulted in broad mitigation goals developed for the plan. The group was presented some sample goals from similar plans, including the State of New Mexico hazard mitigation plan. The group decided that the goals of the state plan would provide a good basis, with some modifications. Based on the discussion the draft goals for the hazard mitigation plan are:

- Reduce the number of injuries and fatalities from hazards.
- Reduce the amount of property damage, both public and private, from hazards.
- Minimize recovery time for both community function and the natural environment after natural hazard events.
- Enhance communication, collaboration and integration among county, federal, state, and tribal agencies in regards to hazard mitigation.

Jeff explained that he would provide the draft goals for review and feedback before finalizing.

Review of Possible Mitigation Activities and Alternatives

Jeff presented information on typical mitigation activities and alternatives and referred to handouts with further details and guidance. Jeff outlined potential project criteria and action requirements, including the requirements of the Disaster Mitigation Act of 2000. According to FEMA Region VI plan reviewers each hazard must have at least two true mitigation action (not preparedness) pertaining to them.

Coordination with Other Plans

The group also discussed the importance of coordinating the mitigation plan with other planning processes, and vice versa. The group discussed opportunities to cross reference the hazard mitigation plan in other planning efforts. These included:

- The Hazardous Materials annex of the Emergency Operations Plan, which could reference the risk assessment and related mitigation actions in the HMP.
- The Sustainable Land Use Code is going before the County Commissioners for the 6 month review of the draft in July. There could be an opportunity to cross reference the HMP in the Code before it is finalized.

New Mitigation Action Brainstorming

After a short break the group proceeded to brainstorm possible mitigation projects and categorize them by hazard. The HMPC members were provided with several lists of alternative multi-hazard mitigation actions. To facilitate the process, the HMPC referred to a matrix of typical mitigation alternatives organized by CRS category for the hazards identified in the plan, in addition to a handout that explains the categories and provided examples. Another reference document titled “Mitigation Ideas” developed by FEMA was distributed to the HMPC via an online link. This reference lists the common alternatives for mitigation by hazard. Jeff reviewed ideas for possible mitigation activities and alternatives based on the risk assessment, including issues that have arisen during the planning process and public meetings. A facilitated discussion then took place to examine and analyze the alternatives. With an understanding of the alternatives, several mitigation actions were proposed. HMPC members wrote project ideas on large sticky notes. Each proposed action was written on a large sticky note and posted on flip chart paper underneath the hazard it addressed. The result was a number of project ideas with the intent of mitigating the identified hazards.

Following the new project development the next step is to flesh out the specifics of the different projects. The HMPC should use the 'New Mitigation Action Worksheet' to fill out the details of new projects. The group agreed to have a second meeting on April 20th at 1:30 to identify points of contact and flush out the details needed for each proposed project. This worksheet will be sent electronically with the identified projects filled out. Amec Foster Wheeler needs the worksheets back by April 26th to stay on schedule.

Plan Implementation and Maintenance and Public Involvement

Jeff covered the steps for plan implementation. These can be found on slide 25 in the PowerPoint and will be detailed in Chapter 7 in the plan. Two final regional meetings will be held. More details on the meeting will be forthcoming. There will also be a public comment period when the plan is posted for review on the Internet, prior to it being finalized. Typically a two to three week comment period is used, but sometimes local policies may dictate the length of a minimum public review period.

Next Steps

HMPC comments on draft HIRA due	Apr 8
New mitigation actions due from HMPC	Apr 26
Final public meetings	TBD Apr/May
HMPC draft	May 5
HMPC comments by	May 19
Public review draft	Jun 3
Public comments due	Jun 24
Plan to state/FEMA	July 15
Conditional Approval	September
Local adoption	October
Target for approved, adopted plan	November

Wrap up and Adjourn

The meeting adjourned at 5:05 PM.

SIGN-IN SHEET
SANTA FE COUNTY HAZARD MITIGATION PLAN PROJECT
HMPC Meeting #3 (Mitigation Strategy meeting) March 30, 2016
Santa Fe County Public Safety Building 35 Camino Justicia, Santa Fe, NM

Name	Email Address	Phone	Department/ Organization/ Affiliation	Title
Robert Martinez	robmtz@santafecountynm.gov	992-3015	Public Works	Deputy Director
Vicki Lucero	vlopez@santafecountynm.gov	986-6222	Growth Management	Building & Development Services Manager
Debra Garcia	dgarcia@santafecountynm.gov	995-2753	GIS Dept	GIS Analyst
Ray Matthew	rmatthew@santafecountynm.gov	995-2775	Planning	Transportation Planner
DAVID SPERLING	dsperling@santafecountynm.gov	992-3096	SFCFD	Fire Chief
Gabe Gonzales	gmgonzales@santafecountynm.gov	986-2455	SFSC	CAPTAIN / SFSO
ERLE WRIGHT	ewright@ "	986-6350	GMD/GIS	DATA INTEGRATION ADMIN
MARTIN VIGIL				

Example Mitigation Action Items by Community Rating System categories and Hazards Identified in the Santa Fe Hazard Mitigation Plan

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm	Volcan oes
PREVENTION									
Building codes and enforcement		■	■	■	■	■	■	■	
Comprehensive Watershed Tax		■							
Density controls	■	■	■	■			■		
Design review standards		■	■	■		■	■		
Easements		■	■	■			■		
Environmental review standards		■	■	■		■	■		
Floodplain development regulations	■	■	■						
Hazard mapping	■	■	■	■			■		
Floodplain zoning	■	■	■						
Forest fire fuel reduction							■		
Housing/landlord codes			■		■				
Slide-prone area/grading/hillside development regulations				■			■		
Manufactured home guidelines/regulations		■			■	■			
Minimize hazardous materials waste generation			■						
Multi-Jurisdiction Cooperation within watershed	■	■							
Open space preservation	■	■		■			■		
Performance standards	■	■		■	■	■	■	■	
Periodically contain/remove wastes for disposal			■						
Pesticide/herbicide management regulations			■						
Special use permits	■	■	■	■			■		
Stormwater management regulations		■	■						
Subdivision and development regulations	■	■	■	■		■	■		
Surge protectors and lightning protection					■				

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm	Volcan oes
Tree Management					■		■	■	
Transfer of development rights		■		■			■		
Utility location			■	■	■			■	
PROPERTY PROTECTION									
Acquisition of hazard prone structures	■	■		■			■		
Facility inspections/reporting	■	■	■			■			
Construction of barriers around structures	■	■	■						
Elevation of structures	■	■							
Relocation out of hazard areas	■	■	■	■			■		
Structural retrofits (e.g., reinforcement, floodproofing, bracing, etc.)		■	■	■	■	■	■	■	
PUBLIC EDUCATION AND AWARENESS						■			
Debris Control		■		■					
Flood Insurance	■	■							
Hazard information centers	■	■	■	■	■	■	■	■	
Public education and outreach programs	■	■	■	■	■	■	■	■	■
Real estate disclosure	■	■	■	■	■	■	■	■	
Crop Insurance					■	■			
Lightning detectors in public areas					■				
NATURAL RESOURCE PROTECTION									
Best Management Practices (BMPs)		■	■	■	■		■		
Forest and vegetation management	■	■		■	■		■	■	
Hydrological Monitoring	■	■	■	■	■				
Sediment and erosion control regulations	■	■	■	■					
Stream corridor restoration		■		■					
Stream dumping regulations		■	■						

Alternative Mitigation Actions	Dam Failure	Floods	Hazardous Materials	Landslides/ Debris Flows/ Rockfalls; soil hazards; subsidence	Weather Extremes (Tornado, hail, lightning, wind, temps, drought)	Earth quakes	Wildfires	Severe Winter Storm	Volcan oes
Urban forestry and landscape management		■		■	■		■	■	
Wetlands development regulations		■	■	■			■		
EMERGENCY SERVICES									
Critical facilities protection	■	■	■	■	■	■	■	■	■
Emergency response services	■	■	■	■	■	■	■	■	■
Facility employee safety training programs	■	■	■	■	■	■	■	■	■
Hazard threat recognition	■	■	■	■	■	■	■	■	■
Hazard warning systems (community sirens, NOAA weather radio)	■	■	■	■	■	■	■	■	■
Health and safety maintenance	■	■	■	■	■	■	■	■	■
Post-disaster mitigation	■	■	■	■	■	■	■	■	■
Evacuation planning	■	■	■	■			■		■
STRUCTURAL PROJECTS									
Channel maintenance		■		■					
Dams/reservoirs (including maintenance)	■	■							
Isolate hazardous materials waste storage sties			■						
Levees and floodwalls (including maintenance)		■							
Safe room/shelter					■	■		■	
Secondary containment system			■						
Site reclamation/restoration/revegetation		■		■					
Snow fences								■	
Water supply augmentation					■				

Mitigation Action Selection and Prioritization Criteria

Does the proposed action protect lives?

Does the proposed action address hazards or areas with the highest risk?

Does the proposed action protect critical facilities, infrastructure, or community assets?

Does the proposed action meet multiple objectives (multi-objective management)?

STAPLE/E

Developed by FEMA, this method of applying evaluation criteria enables the planning team to consider in a systematic way the social, technical, administrative, political, legal, economic, and environmental opportunities and constraints of implementing a particular mitigation action. For each action, the HMPC should ask, and consider the answers to, the following questions:

***S**ocial*

Does the measure treat people fairly (different groups, different generations)?

***T**echnical*

Will it work? (Does it solve the problem? Is it feasible?)

***A**dministrative*

Is there capacity to implement and manage project?

***P**olitical*

Who are the stakeholders? Did they get to participate? Is there public support? Is political leadership willing to support it?

***L**egal*

Does your organization have the authority to implement? Is it legal? Are there liability implications?

***E**conomic*

Is it cost-beneficial? Is there funding? Does it contribute to the local economy or economic development? Does it reduce direct property losses or indirect economic losses?

***E**nvironmental*

Does it comply with environmental regulations or have adverse environmental impacts?

Santa Fe County Seeks Public Input on Local Hazard Mitigation Plan - Message (HTML)

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Santa Fe County Seeks Public Input on Local Hazard Mitigation Plan

To Brislawn, Jeff P

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Santa Fe County Seeks Public Input on Local Hazard Mitigation Plan

Santa Fe County Emergency Management is hosting a meeting on Thursday, February 11, 2016 from 2 p.m. – 4 p.m. at the Pojoaque Fire Station (17919 US 84/285, Santa Fe, NM) to present information and obtain public input on reducing risk to natural disasters in the County, including floods, wildfires, winter storms and other hazards. Public input on the draft risk assessment and ideas for potential mitigation projects are being sought at this meeting.

The meeting is part of the Santa Fe County Local Hazard Mitigation Planning Project. This plan is being developed by a Hazard Mitigation Planning Committee comprised of representatives from various County departments and key stakeholders. The intent of the plan is to reduce the vulnerability of people and property in the County from the impacts of natural hazards and to become eligible for certain mitigation grant funding from the Federal Emergency Management Agency (FEMA).

All interested parties are invited and encouraged to attend and learn more about hazards and the proactive approaches that are being proposed to reduce their impact before they occur again.

Feedback from the meeting will be incorporated into the draft plan, as appropriate, which will be made available for public review and comment in July 2016. For more information on this project, contact Martin Vigil at (505) 992-3072 or mavigil@santafecountynm.gov.

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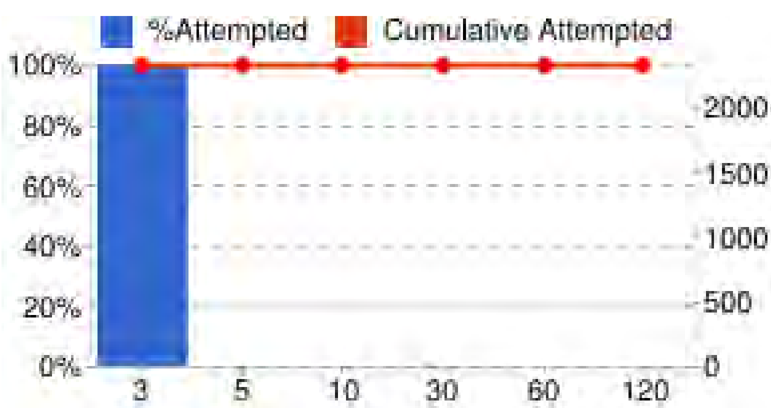

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10	100%
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County looking to mitigate natural disasters, but local officials more worried about the man-made kind

Todd G. Dickson/Mountain View Telegraph Mar 30, 2016 (0)

As part of a renewed preparedness effort in Santa Fe County, a public input meeting Wednesday on developing a hazard mitigation plan drew mainly law enforcement and fire officials, who urged officials to focus on realistic concerns.

Noting the plan touched on everything from earthquakes to volcanoes, Edgewood Police Chief Fred Radosevich said a more likely incident would be something such as a spill of dangerous material from an overturned truck on Interstate 40.

“My biggest fear is if that happens, what do you do?” he said.

With 40,000 vehicles traveling I-40 each day, Radosevich said shutting it down because of even a heavy snowstorm can create nightmares for communities along the highway such as Edgewood.

Jeff Brislawn, a planning consultant for the county, said the plan will address these kinds of concerns in the hazmat incident section. Part of the mitigation plan's purpose is to leverage Federal Emergency Management Agency funding, and Brislawn acknowledged FEMA tends to focus on natural hazards more than man-made threats.

Martin Vigil, Santa Fe County's emergency manager, said meeting FEMA application requirements requires that all these different kinds of threats be looked at, but the main focus of the final mitigation plan will be shaped by the county's actual needs. Winter storms, wildfires and dam failures are the three major concerns he's hearing so far from officials around the county, Vigil said.

Radosevich acknowledged wildfires is a recurring concern, but said the area is so frequently in a "red flag" high fire hazard status that people get complacent.

Even though areas don't frequently encounter some of these hazards, that doesn't mean they don't happen here, Vigil said. He used the example of a Los Alamos official who would joke with him about how the town's elevation spared them flooding issues until it was hit hard by monsoon rains in 2013.

In researching the county's experiences with different kinds of incidents, Bislawn said a tornado did cut a swath across the southern part of the county in 1956.

Radosevich said he didn't want local officials putting in a lot of effort preparing for incidents that have low likelihood of occurring here while being unprepared for more likely disasters, such as a big accident on I-40.

A draft of the mitigation plan should be posted on the county's website by May or June with another public comment period to follow before it adopted.

Please complete this questionnaire and return to:
Attn: Kyle Karsjen
email: kyle.karsjen@amecfw.com
Mail: Amec Foster Wheeler
1002 Walnut Street, Suite 200
Boulder, CO 80302

Santa Fe County Multi-Hazard Mitigation Plan

We need your input!!

Use this sheet to make any comments on the draft Santa Fe County Multi-Hazard Mitigation Plan.

Comments can also be submitted by email to kyle.karsjen@amecfw.com

All questions and comments are welcome. Please provide by **April 30th, 2016**

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Please leave this sheet with a staff member, fax, email or mail it to us.

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SANTA FE COUNTY HAZARD MITIGATION PLAN
C/O AMEC FOSTER WHEELER
1002 WALNUT STREET, SUITE 200
BOULDER, CO 80302

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A draft of the mitigation plan should be posted on the county's website by May or June with another public comment period to follow before it adopted.

From: Santa Fe County
To: Brislawn, Jeff P
Subject: Santa Fe County Seeks Public Input on Local Hazard Mitigation Plan
Date: Wednesday, February 03, 2016 9:14:00 AM

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Santa Fe County Seeks Public Input on Local Hazard Mitigation Plan

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Santa Fe County Hazard Mitigation Planning Process

Santa Cruz Irrigation District – Coordination Meeting

2/11/2016

The Santa Fe County Office of Emergency Management, the Santa Cruz Irrigation District, Rio Arriba County Emergency Management and Amec Foster Wheeler held a coordination meeting regarding specific risks in and around the Santa Cruz Dam and Chimayo Valley. Topics of conversation included the history and capabilities of the dam, potential projects for dam improvements, effects of a dam failure to downstream development, and jurisdictional issues that preclude coordination on safety measures. Discussion also related to holding a tabletop exercise with key players concerning dam safety and the ability to coordinate and respond during an emergency. Discussion also included concerns from the District regarding High Hazard earthen dams that are owned by the Pojoaque Valley Irrigation District. Originally built for flood control these dams have silted in, are experiencing erosion and recreational vehicle impacts, and the arroyos below them are experiencing increased encroachment of development. They are located in Rio Arriba County but drain into Santa Fe County and Chimayo Valley.

Santa Fe County Hazard Mitigation Plan

Public Meeting Summary – North Region

Pojoaque Fire Station, 17919 US-84/285, Santa Fe, NM

2/11/2016

Introduction

- Martin Vigil (Santa Fe County Emergency Manager) and Jeff Brislawn (Project Manager with consulting firm Amec Foster Wheeler) kicked off the meeting at 2 PM. Thirteen persons were present with the majority representing concerned citizens. The Pueblo of Pojoaque, City of Santa Fe Fire Department, Pojoaque Valley Irrigation District, the Pojoaque Basin Water Alliance and a county commissioner were also represented. Jeff began with a presentation that went over the project scope, the hazard mitigation planning process and timeline, and the work completed so far. A list of hazards addressed in the plan was presented and the group was asked what hazards presented the greatest concern. This led to further discussion summarized by hazard below.

Hazards

Flooding

- The group identified several flooding problem areas, including areas of Christmas Lane and roads in Chupadero.
- The group identified examples of specific private property damage caused by drainage, including runoff and erosion issues. The group questioned who had liability for this damage – is it a property owner issue or a county issue? The group discussed areas of flooding they said were being exacerbated by plugged culverts near Hwy 502. Another area of concern was the CR 84 crossing on Tesuque – silting up about ¼ mile east was contributing to flooding and impacting homes in the area. Another area was on CR 78 where funding to mitigate and help landowners was needed.
- The group identified that flooding and flash flooding issues are intensified by human activity including growth in the Pojoaque River Basin.

Dam Failure

- Has the State Engineer been engaged in the process? Jeff reported that they had.
- Attendee discussed his personal interactions with the Dam Safety Bureau about dam safety issues.
- Closer monitoring of the Nambe Falls dam should be considered in the planning effort, including using remote sensing technology such as INSAR to monitor potential geological instability.
- Martin Vigil noted that dam failure is the number one concern from a publc safety perspective. Issues and items already in the works related to this hazard include:
    - A need for identification of inflow, overtopping, and outflow sensors
    - Gaps in community warning and tecnhology
    - Contributed to cleaning up deficiencies noted in Emergency Action Plans for Santa Cruz and Nambe Falls dams.

    - Conducted a functional exercise of the EAP for Nambe Falls dam in 2013 involving Bureau of Reclamation and Bureau of Indian Affairs among others.

Wildfire

- The group acknowledged the wildfire mitigation work already completed in the Pueblo of Pojoaque.
- The group recommended that during the CWPP update, all jurisdictions collaborate on long-term, meaningful wildfire mitigation.
- In the context of wildfire, there is a lack of building code enforcement resources and buildup of fuels on properties; this can be expanded to most hazards.
- The group identified the need for a better system than continually repairing damaged water diversion systems. The current system is based around destruction of the diversions, rebuilding them and then waiting for them to be destroyed again.
- The group identified gaps in community warning for wildfire as a potential issue.
- The group identified tumbleweeds as a fuel source for wildfire.
- The group identified the amount of drought-caused dead trees in the bosque in Chupadero as a wildfire issue and falling tree hazard.
- Burning in irrigation ditches can become a wildfire issue, as well as fuel growth around ditches.
- The group identified that bosques are not noted on the CWPP wildfire risk map and that they can be prone to fire starts. How does this affect the overall perception of wildfire risk in the county? Are there boundary or jurisdictional issues that are precluding identification of true risk? Focus on collaboration between the tribes, the communities and the counties to reduce wildfire risk in the bosques.
    - Jeff noted that the CWPP focused on communities at risk but the wildfire section in the HMP could note that there is risk in the bosque areas that may not be represented in the CWPP communities.

<u>Other Comments</u>

- Is the New Mexico DOT part of the planning team? If not, they should be. Jeff and Martin explained they had been identified as a stakeholder but were still in the process of identifying a specific person. Martin noted that the mitigation strategy will focus on what the county has the ability to implement.
- The Aamodt water system is a huge endeavor that could have long-ranging impacts on the county and its water systems. The group recommending contacting the US BOR about the related EIS that is in process. A county contact was suggested. The group raised concern that pipeline and pumping infrastructure may cross arroyos could be prone to flood and erosion. Large tank infrastructure may exacerbate runoff.
- The group identified that many of the roads in the county are too narrow, which could affect the ability to move emergency equipment on them.
- Certain roads in the county could use guardrails in critical locations, and bike lanes or lane dividers; the group recommended an evaluation of the safety aspects of road conditions. State highway 592, 285/84 no divider parts of Pojoaque stretch, some deaths have occurred.
- Drinking water quality needs to be monitored, especially in relation the Aamodt water system.
- The group asked about the ranking of hazards – Jeff explained the ranking system and how it is based on Amec Foster Wheeler research and Hazard Mitigation Planning Committee input.

- The group identified a lack of more than one evacuation route out of Chupadero. The group recommended discussing this with the Pueblos.
- The meeting adjourned at 3:45 pm.
- Following the meeting Martin Vigil, Jeff Brislawn, and Kyle Karsjen conducted a site visit to the arroyo flowing under Highway 502 adjacent to CR 101E with the homeowner who raised the flood and erosion issue. A representative of the Land Grant collective was also present. Observations at the site included:
    - Five culverts in a series route flow under the highway; in a 2013 flood three were plugged. This forced water into the 2 westernmost culverts which likely contributed to higher flows and erosion on the western bank of the arroyo where severe erosion has occurred on the landowner's property.
    - Culverts were clear but stream bed armoring under the westernmost culverts downstream side was eroded away and needed maintenance.
    - The angle of the culverts appears to force flows on the western side of the arroyo.
    - Continued high flows could erode further residential property downstream, potentially putting structures at risk in the future.
    - The homeowner noted she had made attempts to reach out to NMDOT but had not received a response.

Santa Cruz Irrigation District

Sign in 2-11-16

Name	Title	Email	Phone
Allen Sanchez	Rio Arriba Co EM	amsanchez@rio-arriba.org	505-747-194
Charlie Escuibal	Santa Cruz Dam Tender		505-753-2195
Gallegos, Ronald J	SCID Vice chair	jorhead3033@yahoo.com	505-901-9272
Josie E. Luján	SCID		351-4376
MARTIN VIGIL	SFCo. OEM	mavigil@santafecounty.n...	5
Kyle Karsjen	Amec Foster Wheeler		992-3072
Jeff Brislawn	Amec Foster Wheeler		

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SANTA FE COUNTY
LOCAL HAZARD MITIGATION PLAN PROJECT
Public Meeting – North Region, Pojoaque Fire Station (17919 US-84/285)
February 11th, 2016

Name	Email Address	Address	Phone	Jurisdiction/ Department/Organization/ Affiliation/Citizen
Devin Bent	devin.bent@gmail.com	193 County Rd 113	505-699-9042	retired
John Gutting	jgutting@q.com	Box 1791 SFE. 87504	505-983-2797	retired
Carla Jaquez	cj505nm@gmail.com	1581B Hwy 502 Santa Fe NM 87506	505-795-5506	Retired
DAVID DOGRUEL	ddograel@earthlink.net	11 W GUTIERREZ # 3458 SF 87506	505-665-3965	SFCFD / POJOAQUE DIST
Orlando Romero	ochecomm@gmail.com	P.O. Box 3256 SF	699-7763	SFe County
Alfredo Roybal	AJRoybal55@gmail.com	19-A Rancho Las Lagunas SF, NM 87506	470-5630	PVID
Carlos Ortiz	carlos_janet_ortiz@yahoo.com	88 County Rd 84 SFNM 87506	577-1769 455-7520	Retired Citizen
paul white	paulwhitesf@gmail.com	94 camino chupadero SF NM 87506	988 1082	PBWA SFBWA Chupadero
Porfirio Chavarria	pnchavarria@santafenm.gov	PO Box 909, Santa Fe NM, 87504	505.955.3110	City of Santa Fe Fire Dept.
Gabriel M Montoya Sr	gabe@pojoaque.org	39 Camino Del Rincon Suite 6	505-629-7912	Pueblo of Pojoaque
KYLE KARSJEN	kyle.karsjen@amecfw.com	Boulder, CO	303-820-4661	AMEC FOSTER WHEELER
JEFF BRISLAWN	jeff.brislawn@amecfw.com	Boulder, CO	303-820-4654	AMEC FOSTER WHEELER
MARTIN VIGIL	mavigil@santafecountynm.com	Public Safety Building 35 Camino Justicia	505-992-3072	SF COUNTY OEM

Thu 3/24/2016 9:04 AM

Santa Fe County <Santa.Fe.Cty@public.govdelivery.com>

Public Input Meeting on Santa Fe County Local Hazard Mitigation Plan

To Brislawn, Jeff P

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Public Input Meeting on Santa Fe County Local Hazard Mitigation Plan

Santa Fe County Emergency Management is hosting a meeting to present information and obtain input on reducing risk to natural disasters in the County, including floods, wildfires, winter storms and other hazards. The meeting is on Tuesday, March 29, 2016 from 2 p.m. – 4 p.m. at the Edgewood Fire Station #1, #1 Municipal Way, Edgewood, NM.

The meeting is part of the Santa Fe County Local Hazard Mitigation Planning Project. This plan is being developed by a Hazard Mitigation Planning Committee comprised of representatives from various County departments and key stakeholders. The intent of the plan is to reduce the vulnerability of people and property in the County from the impacts of natural hazards. Another benefit is to become eligible for certain mitigation grant funding from the Federal Emergency Management Agency (FEMA).

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Feedback from the meeting will be incorporated into the draft plan, as appropriate, which will be made available for public review and comment in July. For more information on this project, contact Martin Vigil at (505) 992-3072 or mavigil@santafecountynm.gov .

Contact: Martin Vigil
Santa Fe County Emergency Management
(505) 992-3072

Santa Fe County Hazard Mitigation Plan

Public Meeting Summary – South Region

3/29/16 Edgewood Fire Station #1, Edgewood, NM

Introduction

- Martin Vigil (Santa Fe County Emergency Manager) and Jeff Brislawn (Project Manager with consulting firm Amec Foster Wheeler) kicked off the meeting at 2:15 PM. Ten persons were including a reporter from a local newspaper, two members of the Edgewood Police Department. The remaining attendees were members of the Santa Fe County Fire Department. Jeff began with a presentation that went over the project scope, the hazard mitigation planning process and timeline, and the work completed so far. A list of hazards addressed in the plan, followed by slides that summarized hazard vulnerability. The group was asked what hazards presented the greatest concern. This led to further discussion summarized below.

Comments/discussion

- The group noted flooding problems nearly annually along Dinkle Road near Rainbow and Amparian Rds.
- The Edgewood PD noted that the plan should focus on the more likely hazards and questioned including volcanoes and abandoned mines as hazards. Jeff and Martin explained that abandoned mines were identified as a potential issue but will not be profiled in the plan. Low probability but high consequence events such as volcanoes and earthquakes are included as they are also part of the State's mitigation plan and the potential exists for damaging events
- Jeff noted that the plan is following FEMA's process to meet Disaster Mitigation Act requirements but will be tailored to the specific issues of the County.
- Edgewood PD noted that high winds, dust storms, severe thunderstorms, hazardous materials transportation incidents and winter storms were the biggest concerns in their area.
- Edgewood PD noted that Red Flag warnings have become so routinely disseminated by the National Weather Service that they fail to get much attention.
- Edgewood PD noted that 40,000 vehicles travel on nearby on Interstate 40 and a high percentage are semis; it's suspected that many of these have hazardous materials but no one really knows.
- Martin noted that a recovery plan was needed for the county and asked about the need for additional snow fences in some areas.
- The meeting adjourned at 3:40 pm.

SIGN-IN SHEET
SANTA FE COUNTY
LOCAL HAZARD MITIGATION PLAN PROJECT
Public Meeting – South Region, Edgewood Fire Station #1 (#1 Municipal Way, Edgewood, NM)
March 29th, 2016

Name	Email Address (OPTIONAL)	Address (OPTIONAL)	Phone (OPTIONAL)	Jurisdiction/ Department/Organization/ Affiliation/Citizen
Jeff Brislawn	Jeff.brislawn@amecfw.com	1002 Walnut St Suite 200 Boulder CO 80302	303-704-5506	Consultant to County on Hazard Mit. Plan
Jerod Kuchan	jkuchan@pd.edgewood-nm.gov	18 Municipal Way Edgewood, NM 87015	(505)281-5717	Edgewood Police Dept.
Fred Radosevich	fradosevich@pd.edgewood-nm.gov	18 Municipal Way Edgewood NM 87015	505-281-5717	Edgewood PD
Todd Dickson	tdickson@mvtelegraph.com	2815 Old Route 66, Moriarty 87035	505-823-7104	Newspaper
[illegible]	jonathan [illegible] 99@Gmail		270-4703	SFCFD
JJ Arnold				SFCFD
Scott Borlow				SFCFD
Martin Vigil				OEM
Alicia Storer				OEM
B. Smith				SFCFD

APPENDIX B HMPC and Stakeholder Contact List

Affiliation	Department / Organization	Name	Phone	Email
County Staff Title				
Santa Fe County, Director, Assistant Chief	Fire Department, Office of Emergency Management	Martin Vigil	505.992.3072	mavigil@santafecountynm.gov
Santa Fe County, Deputy County Manager	Management Office	Tony Flores	505.986.6216	tflores@santafecountynm.gov
Santa Fe County, Fire Chief	Fire Department	David Sperling	505.992.3076	dsperling@santafecountynm.gov
Santa Fe County, Public Works Director	Public Works	Michael Kelley	505.992.3023	mkkelley@santafecountynm.gov
Santa Fe County, Deputy Public Works Director	Public Works – Road Maintenance	Robert Martinez	505.992.3015	robmtz@santafecountynm.gov
Santa Fe County	Public Works – Open Space & Trails	Collee Baker		cbaker@santafecountynm.gov
Santa Fe County, Transportation Planner	Growth Management – Planning Division	Ray Matthew	505.995.2775	rmatthew@santafecountynm.gov
Santa Fe County, Data Integration Administrator	Growth Management – GIS Division	Erle Wright	505.986.6350	ewright@santafecountynm.gov
Santa Fe County, GIS Analyst	Growth Management – GIS Division	Debra Garcia	505.995.2753	dgarcia@santafecountynm.gov
Santa Fe County, Director	Administrative Services – Risk Management	Jeff Trujillo	505.992.6571	jtruj@santafecountynm.gov
Santa Fe County, Floodplain Administrator	Growth Management – Building and Dev. Svcs	Vicki Lucero	505.986.6222	vlopez@santafecountynm.gov
Santa Fe County, Sheriff	Sheriff	Robert A. Garcia		ragarcia@santafecountynm.gov
Santa Fe County, Captain	Sheriff	Gabe Gonzales	505.986.2485	gmgonzales@santafecountynm.gov
Santa Fe County, Director	Community Services – Health Services	Rachel O'Connor		roconnor@santafecountynm.gov
Santa Fe County, Public Information Officer	Management Office	Kristine Mihelcic		kbustos@santafecountynm.gov
Santa Fe County	Public Works – Utilities	Claudia Borchert		cborchert@santafecountynm.gov

Affiliation	Department / Organization	Name	Phone	Email
State Stakeholders				
Stakeholder – State Gov, Mitigation Specialist	NM - DHSEM	Kevin Dodge	505.476.9609	Kevin.dodge@state.nm.us
Stakeholder – State Gov, EMS – A	NM - DHSEM	Donald Mathzasen	505.476.0869	Donald.mathzasen@state.nm.us
Stakeholder – State Gov, State Floodplain Coordinator	NM - DHSEM	Bill Borthwick	505.476.9617	William.borthwick@state.nm.us
Stakeholder – State Gov, Abandoned Mine Land Program	NM – Energy, Minerals & Natural Resources – Mining & Minerals	John Kretzmann	505.476.3423	John.kretzmann@state.nm.us
Stakeholder – State Gov, Hydrogeologist	New Mexico Bureau of Geology & Minerals Resources	Alex Rinehart		arinehart@nmbg.nmt.edu
Stakeholder – State Gov	New Mexico Bureau of Geology & Minerals Resources	Dan Koning		dkoning@nmbg.nmt.edu
Stakeholder – State Gov	NM – Office of State Engineer – Dam Safety	Charles Thompson		Charles.thompson@state.nm.us
Stakeholder – State Gov /University	New Mexico Institute of Mining & Technology, Bureau of Geology & Mining	Dr. David Love		davel@nmbg.nmt.edu
Federal Stakeholders				
Federal	USACE – Silver Jackets	Stephen Scissons		Stephen.k.scissons@usace.army.mil
Neighboring Jurisdictions				
Stakeholder – Local Gov	City of Santa Fe OEM	David Silver	505.955.6537	dmsilver@santafenm.gov
Stakeholder – Local Gov	City of Espanola	Kelly Duran	505.747.6013	kduran@espanolanm.gov
Stakeholder – Local Gov	Town of Edgewood	Steve Sheperd or K Davis	505.286.4518	kdavis@edgewood-nm.gov
Stakeholder – Local Gov	San Miguel County	Kurt Parkinson		kparkinson@amcounty.net
Stakeholder – Local Gov	Sandoval County	Dave Bervin		dbervin@sandovalcountynm.gov
Stakeholder – Local Gov	Rio Arriba County	Allen Sanchez		AMSanchez@rio-arriba.org

Affiliation	Department / Organization	Name	Phone	Email
Stakeholder – Local Gov	Torrance County	Javier Sanchez		jsanchez@tcnm.us
Stakeholder – Local Gov	Los Alamos County	Beverly Simpson	505.662.8283	Beverley.simpson@lacnm.us
Stakeholder – Local Gov	Bernalillo County	Richard Clark		rclark@bernco.gov
Stakeholder – Tribal Gov, Governor	Pojoaque Pueblo	Joseph M. Talachy	505.455.4500	
Stakeholder – Tribal Gov, Governor	Nambe Pueblo	Phillip A. Perez	505.455.2036	
Stakeholder – Tribal Gov, Governor	San Ildefonso Pueblo	James R. Mountain	505.455.2273	
Stakeholder – Tribal Gov, Governor	Tesuque Pueblo	Frederick Vigil	505.955.7732	
Business & Industry Stakeholders				
Stakeholder, Dam Tender	Santa Cruz Irrigation District	Charlie Esquibal	505.753.2195	
Stakeholder	Santa Cruz Irrigation District	Josie Lujan	505.351.4376	
Stakeholder, Vice Chair	Santa Cruz Irrigation District	Ron Gallegos	505.901.9272	Jarhead3033@yahoo.com
Stakeholder	Pojaque Valley Irrigation District / Santa Fe Pojaque Soil Conservation District	Alfredo Roybal	505.470.5630	Ajroybal55@gmail.com
Non Profits / Universities				
University	University of New Mexico – Earth Data Analysis Center	Shirley Baros	505.277.3622	sbaros@edac.unm.edu
Non Profit	Forest Stewards Guild (wildfire mitigation)	Matt Piccarello	505-983-8992	matt@forestguild.org
Consultant Team				
Amec Foster Wheeler, Boulder office	Project Manager	Jeff Brislawn	303.820.4654	jeff.brislawn@amecfw.com
Amec Foster Wheeler, Boulder office	Planner/EM Specialist	Kyle Karsjen	303.443.7839	Kyle.karsjen@amecfw.com
Amec Foster Wheeler, Boulder office	GIS Specialist	Mack Chambers	303.443.7839	Mack.chambers@amecfw.com
Amec Foster Wheeler, Albuquerque office	Environmental Planner	Jessica Bennett	505.796.7279	Jessica.bennet@amecfw.com

Appendix C ADOPTION RESOLUTION

A model resolution is provided below:

Resolution # ______

Adopting the Santa Fe County Hazard Mitigation Plan

Whereas, Santa Fe County recognizes the threat that hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments;

Whereas, an adopted local Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple FEMA pre- and post-disaster mitigation grant programs; and

Whereas, Santa Fe County fully participated in the FEMA-prescribed mitigation planning process to prepare this hazard mitigation plan; and

Whereas, the New Mexico Department of Homeland Security and Emergency Management and Federal Emergency Management Agency Region VI officials have reviewed the Santa Fe County Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body;

Whereas, Santa Fe County desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Santa Fe County Hazard Mitigation Plan;

Whereas, adoption by Santa Fe County demonstrates the County's commitment to fulfilling the mitigation goals and objectives outlined in this Hazard Mitigation Plan.

Whereas, adoption of this legitimacies the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the County Commissioners adopts the Santa Fe County Hazard Mitigation Plan as an official plan; and

Be it further resolved, Santa Fe County will submit this adoption resolution to the New Mexico Department of Homeland Security and Emergency Management and Federal Emergency Management Agency Region VI officials to enable the plan's final approval in accordance with the requirements of the Disaster Mitigation Act of 2000.

Passed:__________________
(date)

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Certifying Official