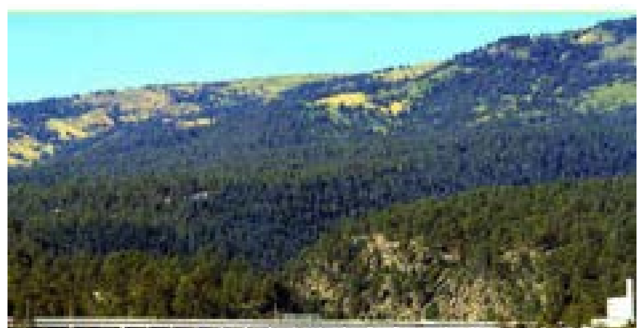
Los Alamos County

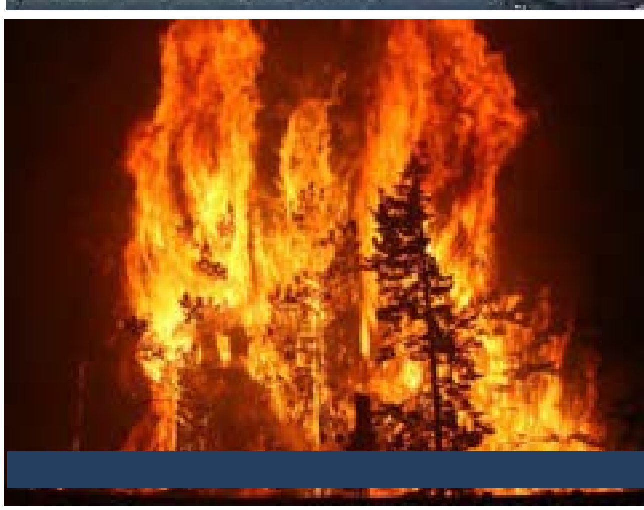
LOS ALAMOS

where discoveries are made

Local Hazard Mitigation Plan

Comprehensive Update January 2024





Executive Summary

The purpose of hazard mitigation is to reduce or eliminate long-term risk to people and property from hazards. Los Alamos County developed this Local Hazard Mitigation Plan (LHMP) update 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 Los Alamos 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:

Mission Statement and Goals:

To develop sustainable communities to preserve life, protect property, the environment, and the economy from natural hazards by improving the communities' capabilities to prevent losses.

Goal 1: Minimize Risk from Natural Hazards

Goal 2: Improve & Sustain Capacity to Mitigate Hazard/Disaster Impacts Goal 3:

Improve and Sustain Emergency Management Capabilities

This plan was originally developed in 2006 and was comprehensively updated in 2014-2015 and again in 2022-2023.

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1 INTRODUCTION

Purpose

Los Alamos County prepared this Local Hazard Mitigation Plan (LHMP) update in 2022-2023 to the previous Los Alamos County Multi-Hazard Mitigation Plan approved by the Federal Emergency Management Agency (FEMA) in 2016. The purpose of this plan is 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 Los Alamos County's continued 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.

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 Los Alamos 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 update 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 Los Alamos 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 entire jurisdiction of Los Alamos County, including the unincorporated townsites of Los Alamos and White Rock. The planning area has been affected by hazards in the past and is thus committed to reducing future impacts from hazard events and maintaining eligibility for mitigation-related federal funding.

Plan Organization

The Los Alamos County Local Hazard Mitigation Plan update 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

2 COMMUNITY PROFILE

Community Profile

The County of Los Alamos is located in northern New Mexico. It is approximately 35 miles northwest of Santa Fe. The County sits on the Pajarito Plateau, nestled on the east-facing slopes of the Jemez Mountains and surrounded by Bandelier National Monument, the Valles Caldera National Preserve, the Rio Grande, and historic pueblo lands.

Location and Geography

The County of Los Alamos, which includes the townsites of Los Alamos and White Rock, is located in northern New Mexico, and geographically isolated from its neighbors. It is approximately 35 miles northwest of Santa Fe, the capital of New Mexico. The town-site is built on a series of fingers of land (mesas) separated by deep canyons. The canyons are a result of water runoff from the Sierra de los Valles, a branch of the Jemez Mountains, one of the southernmost extensions of the Rocky Mountains. Most of the Los Alamos townsite is located on the top of the mesas, with an elevation around 7,500 feet above sea level. The White Rock community sits at the base of the mesas around 7,000 feet, overlooking the Rio Grande valley.

Land Ownership and Population

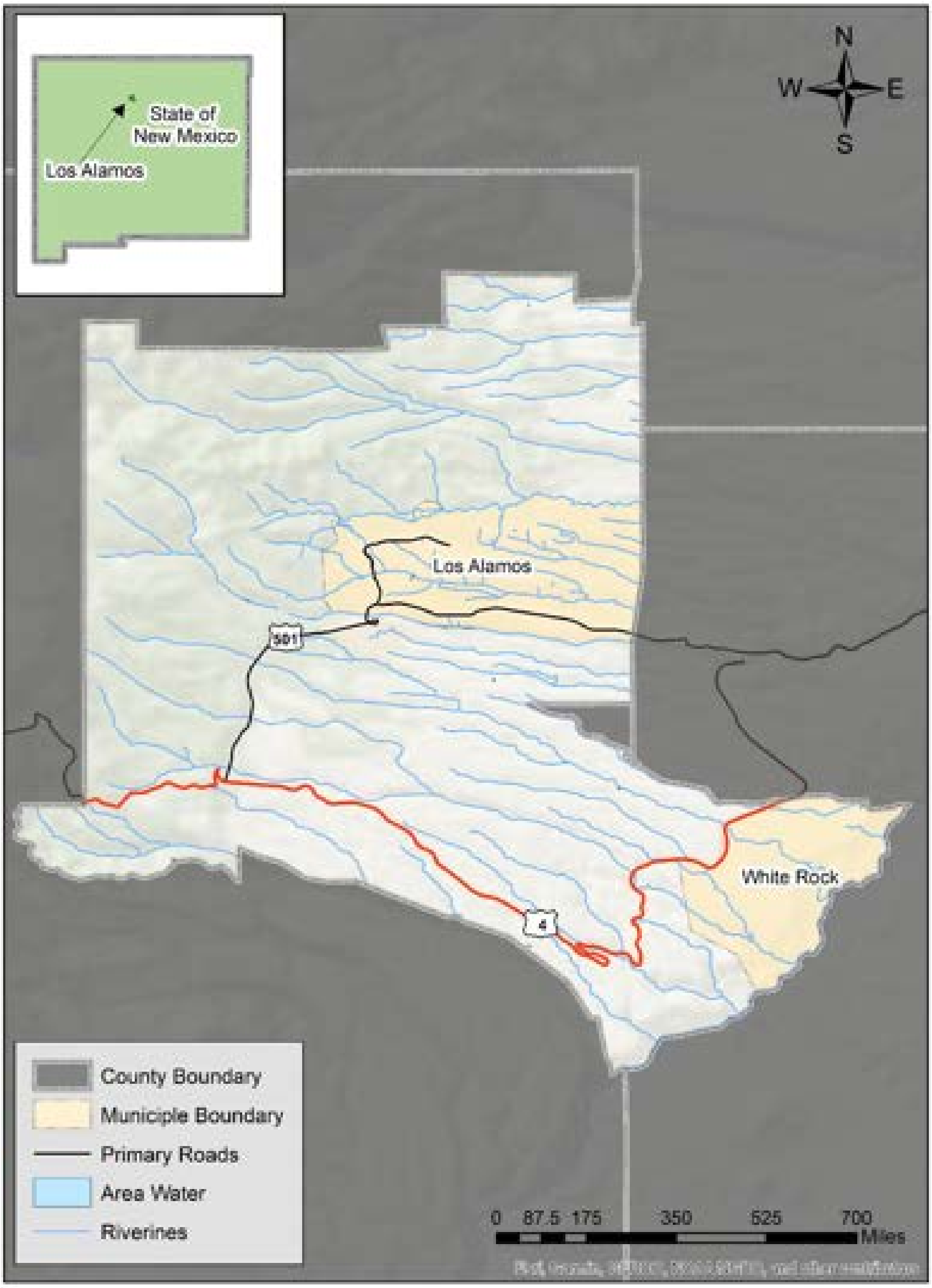
The County covers approximately 109 square miles, of which 41.3% is National Forest Service, 33.4% is the Department of Energy –Los Alamos National Laboratory, 16.3% is County and private, and 9% is the Bandelier National Monument. The County owns only 6,043 acres, 8.6% of the 69,979 acres of land comprising the total of LAC. Because most of the land in the County is federally owned (87%), the population density per square mile of land area is high: in the 2010 Census 164.4, and the 2020 Census 178. The townsites of Los Alamos and White Rock have a combined population of 19,031.

Table 2.1 Los Alamos County Land Ownership

Owner	Acres	Square Miles
BIA	15.09	0.02
LAC	6,081.43	9.5
USFS	28,609.62	44.7
NPS	6,652.84	10.4
Private	3,670.07	5.73
School	219.14	0.34
LANL/DOE	24,533.31	38.33

TOTAL	**69,781.49**	**109.03**

Figure 2.1 Los Alamos County Base Map



History

The Laboratory, now called the Los Alamos National Laboratory (LANL), was established in 1943. Before then, the land was used for the Los Alamos Ranch School, a preparatory school for boys. By the 1930s, the school had become an exclusive preparatory school. In 1942, Dr. J. Robert Oppenheimer, chosen to lead the Manhattan Project, needed an isolated location with housing for 30 scientists. After spending several summers as a young man in the Jemez Mountains, Oppenheimer decided to use the Los Alamos Ranch School. The federal government condemned the school in 1943 and by the end of the war the population of Los Alamos had grown to nearly 5,000 people. Congress made the Laboratory a permanent facility under control of the Atomic Energy Commission (AEC). The government remained in control of the town and Laboratory and access to the area was tightly controlled. In 1946, the Zia Company was created to construct, maintain and run the community's operation which had previously been managed by the Army.

In 1949, the New Mexico Legislature created the County as a separate political subdivision from three other existing counties. The town remained closed to outsiders until 1957. In 1958, the government began selling residential lots to the public. On December 10, 1968, the County was incorporated. Most of the Laboratory's technical sites and offices were moved out of the townsite area to "across the bridge," the south side of Los Alamos Canyon. Since that time, in gradual stages, the federal government has slowly relinquished its control over community operations.

LASL (now LANL) and the federal government through the Department of Energy/National Security Administration (DOE/NNSA) have a substantial interest to ensure the safety of the environment, property and residents of Los Alamos County. Los Alamos County, LANL and DOE/NNSA all benefit from this collaborative relationship.

Economy

U.S. Census estimates show economic characteristics for the County. These are shown in Table 2.2.

Table 2.2 Los Alamos County Civilian Employed Population 16 years and Over

Industry	Estimated Employment	Percent
Management	956	9.3%
Business and Financial	600	5.8%
Computer and Mathematical	962	9.4%
Architecture and Engineering	1,068	10.4%
Life, Physical, and Social Science	1,931	18.8%
Community and Social Service	101	0.9%
Legal	113	1.1%
Educational and Library	601	5.9%
Arts, Design, Entertainment, Sports, and Media	368	3.6%
Healthcare Practitioners	477	4.6%
Healthcare Support	110	1.1%
Firefighters and Protective Service	161	1.6%
Law Enforcement	144	1.4%
Food Preparation and Serving	393	3.8%
Building and Grounds Cleaning	197	1.9%
Personal Care and Service	179	1.7%
Sales	313	3.0%
Office and Administrative Support	659	6.4%
Farming, Fishing, and Forestry	7	0.0%
Construction and Extraction	288	2.8%
Installation, Maintenance, and Repair	227	2.2%
Production	261	2.5%
Transportation and Material Moving	125	1.2%

Source: uspopulation.org

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.

Background on Mitigation Planning in Los Alamos County

The Los Alamos County Multi-Hazard Mitigation Plan was originally developed in 2004-2006 and contained a risk assessment of identified hazards for the Los Alamos County planning area and a mitigation strategy to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA in 2006, much progress has been made by Los Alamos County on implementation of the mitigation strategy. The Los Alamos County Office of Emergency Management recognized the need and importance of this plan and was responsible for initiating the plan's original development and 2013-2015 update process, which included securing internal funding. The County contracted with Integrated Solutions Consulting to facilitate the 2022-2023 plan update :

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;
Support objectives under the National Flood Insurance Program's Community Rating System and the Flood Mitigation Assistance program;
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 and update the hazard mitigation plan.

What's New in the Plan Update

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

This LHMP update involved a comprehensive review and update of each section of the 2016 plan and includes an assessment of the success of the County in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Much of the 2016 plan has been revised and updated to be in conformance with FEMA's 2023 Plan Review Tool and Plan Review Guidelines. Only certain information and data still relevant from the 2016 plan was carried forward as applicable into this LHMP update. The plan update reflects the 2022-2023 planning process as described further in the next section; details on the planning process followed in the original plan development have been removed but can be referenced in the 2016 plan.

Also to be noted, Section 7 Implementation and Maintenance of this plan update addresses key requirements for plan updates, including:

Consideration of changes in vulnerability due to action implementation;
Documentation of success stories where mitigation efforts have proven effective;
Documentation of areas where mitigation actions were not effective;
Documentation of any new hazards that may arise or were previously overlooked;
Incorporation of new data or studies on hazards and risks;
Incorporation of new capabilities or changes in capabilities;
Incorporation of growth and development-related changes to inventories; and
Incorporation of new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this plan were also addressed during this Plan update process.

The impacts and mitigation opportunities from this event is incorporated into this update. Chapter 5 addresses progress in local mitigation efforts, changes in priorities, and new mitigation actions identified during the update process.

Local Government Participation

This LHMP update is a single-jurisdictional plan that covers Los Alamos County. The townsites of Los Alamos and White Rock are included as unincorporated communities within the County but are not separate municipalities. 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);
Detail where within the planning area the risk differs from that facing the entire area;
Identify potential mitigation actions; and
Formally adopt the plan.

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

Providing facilities for meetings;
Attending and participating in the HMPC meetings;
Collecting and providing other requested data (as available);
Managing administrative details;
Making decisions on plan process and content;
Identifying mitigation actions for the plan;
Reviewing and providing comments on plan drafts; including annexes
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.

The County is seeking FEMA approval, and 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.

The 10-Step Planning Process

The process for updating the Los Alamos 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:

Organize Resources;
Assess Risks;
Develop the Mitigation Plan; and
Implement the Plan and Monitor Progress.

The sections that follow describe each planning step in more detail.

Table 3.1. Mitigation Planning Processes Used to Develop and Update the Los Alamos County Local Hazard Mitigation Plan

FEMA 4 Phase Guidance		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 3.4.1
	Task 2. Involve the public	3: Create an Outreach Strategy y 44 CFR 201.6(b)(1)	Chapter 3, Section 3.4.1
	Task 3. Coordinate with Other Agencies	4: Review Community Capabilities 44 CFR 201.6(b)(2) & (3)	Chapter 3, Section 3.4.1 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 4.1-4.2
	Task 5. Assess the problem		Chapter 4, Section 4.3
Phase III: Update 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 5.4
	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

Phase 1: Organize Resources

Planning Step 1: Organize the Planning Effort

With Los Alamos County's commitment to update the plan, Integrated Solutions Consulting worked with the Los Alamos County Office of Emergency Management (OEM) to establish the framework and organization for the update process. Organizational efforts were initiated with the County to inform and educate the plan participants of the purpose and need for updating the countywide hazard mitigation plan. An initial meeting was held 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 for this plan update were extended to key county departments, representatives from special districts for the county and townsites, as well as to other federal, tribal, state, and local stakeholders, including representatives from the public, that might have an interest in participating in the planning process. Representatives from the County and HMPC members to the 2016 plan were used as a starting point for the invite list, with additional invitations extended as appropriate throughout the planning process. The list of initial invitees is 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, special district, and other government and stakeholder representatives, developed the plan with leadership from the County OEM and facilitation by Integrated Solutions Consulting The HMPC also included other agency and public stakeholders with an interest in hazard mitigation. Included in the stakeholders invitees list, are those agencies responsible for regulating and implementing mitigation activities and development, those with the authority to implement activities are located within the Los Alamos County Planning Department and were included in the planning process. For each identified project/action item the responsible agency for implementation is included within the mitigation strategy for each identified mitigation action/project. The following participated on the HMPC:

Los Alamos County

Los Alamos County Fire Department
Los Alamos County Police Department, Office of Emergency Management
Los Alamos County Information Technology/Geographic Information Systems (GIS)
Los Alamos County Department of Parks, Recreation and Open Space
Los Alamos County – Public Information Officer
Los Alamos County Department of Public Utilities
Los Alamos County Department of Public Works
Los Alamos Public Schools
Los Alamos County, Risk Management

Other Government and Stakeholder Representatives

Los Alamos National Laboratory, Engineering Services
Los Alamos National Laboratory, Emergency Operations
National Park Service

A list of participating HMPC representatives for the County is included in Appendix A. Note that the above list of HMPC members also includes several other government and stakeholder representatives that contributed to the planning process. Specific participants from these other agencies are also identified in Appendix A.

The planning process officially began with a kick-off meeting held on September 28, 2022. The meeting covered the scope of work and an introduction to the Hazard Mitigation Planning Requirements. Participants were provided an overview of hazard mitigation planning, what to expect in the plan update process, roles and expectations, public and stakeholder involvement, initial data requests and a project timeline.

During the planning process, the HMPC communicated through virtual meetings, email, telephone conversations and a stakeholder workshop.

The HMPC met three times during the planning period (September 2022-February, 2023). The purposes of these meetings are described in Table 3.2. Agendas for each of the meetings are included in Appendix A.

Table 3.2. HMPC Meetings

Meeting Type	Meeting Topic	Meeting Date(s)
HMPC #1 Kick-off Meeting	Introduction to the planning process Roles and Expectations Organize Resources: the role of the HMPC, planning for public involvement, coordinating with other agencies/stakeholders Introduction to Hazard Identification	28-Sept-22
Workshop 1	Mitigation Overview/Recap Hazard Summary Worksheet Review Mitigation Goals Mitigation Strategies Review Ongoing Mitigation Actions/Projects Identify New Mitigation Actions	8-Feb23
Workshop 2	Mitigation Overview/Recap Hazard Summary Worksheet Review Mitigation Goals Mitigation Strategies Review Ongoing Mitigation Actions/Projects Identify New Mitigation Actions	9-Feb-23

Planning Step 2: Involve the Public

Early discussions with the Los Alamos County OEM established the initial plan for public 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 DMA and the hazard mitigation planning process for the Los Alamos County Planning Area and to invite the public to participate in an upcoming public meeting. 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; development of a backgrounder for the County webpage and associated website postings; stakeholder and public meetings; and the collection of public and stakeholder comments on the draft plan.

A community survey was developed and distributed via county websites and social media platforms. The public was encouraged to participate in the survey and provide feedback to assist on driving the plan update process with hazards to be mitigated and general mitigation and preparedness feedback. The public survey was opened from November 1-18, the survey received 245 responses form the public. For full survey responses and questions please see appendix A.

Formal public meetings were held to solicit public and stakeholder input prior to finalizing the updated plan. Public Outreach for the February 8th and 9th 2023 Public Meetings on the Hazard Mitigation Plan included a news release was issued January 27, 2023 to local media announcing the meeting. The press release was also posted to the County's intranet (internal posting for employees), on the News section of the County's webpage. The news release was also sent to all County Boards and Commissions via email. Three members of the public attended the meetings, the County PIO and a member of the HMPC showed up for the meeting. All press releases and website postings are on file with the Los Alamos County OEM (see Figure 3.1 for an example of a press release) and in Appendix A. Other outreach on the plan is noted in Table 3.3. A draft of the plan was made available on the County website for a 14 day public comment period. Where appropriate, stakeholder and public comments and recommendations were incorporated into the final plan, including the sections that address mitigation goals and strategies.

Underserved and Equitable Communities:

Throughout the planning process the HMPC made all possible efforts to reach out to all members of the community to ensure the underserved portions of the community were provided an opportunity to participate in both in person public meeting as well as the online survey. To ensure that all community members were provided an opportunity to provide feedback in the planning process the HMPC included the draft HMP document to members of the "Los Alamos Racial Equity and Inclusivity Task Force" for dissemination throughout the community, as part of the public comment period prior to submittal of the HMP for State and FEMA review. Comments were incorporated into the document where appropriate. Racial Equity and Inclusivity Task Force - Los Alamos County (losalamosnm.us)

Table 3.3. Public and Stakeholder Meetings

Meeting Topic	Meeting Date	Meeting Locations
Presentation of HMP update and overview of local mitigation actions	Feb 8th, 2023	Fuller Lodge, Los ALamos
Presentation of Draft LHMP, Hazards and Mitigation Actions HMP update and overview of local mitigation actions	Feb 9 2023	White Rock Fire Station

Figure 3.1. Example of Press Release Used to Involve the Public

LOS ALAMOS DAILY POST

Official Newspaper of Record in Los Alamos County

Member National Newspaper Association

Member New Mexico Press Association

Front | News | Sections | Letters | Columns | Classifieds | Legals | FAQ | Advertise | About/Contact

County Hazard Mitigation Survey Launches Today

Submitted by Carol A. Clark on November 1, 2022 - 7:46 pm

HAZARD MITIGATION SURVEY OPEN NOW

TAKE THE SURVEY

Help communicate preparedness needs and risk perceptions

November 1-18

www.lacnm.com/HazardSurvey

LOS ALAMOS
Office of Emergency Management

Search the Daily Post

In And Around Town

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Figure 3.2. Los Alamos County Hazard Mitigation Plan Webpage

County Hazard Mitigation Survey Launches Today

Submitted by Carol A. Clark on November 1, 2022 - 7:46 pm

COUNTY News:

Los Alamos County Emergency Management (EM) Division is conducting a study to better understand the preparedness needs and risk perceptions of those who live and work in the County as part of the Hazard Mitigation Plan update process.

To do so, a questionnaire has been created, and EM encourages the entire community to participate. The Hazard Mitigation Survey is open to the public today, Nov. 1-18.

The purpose of hazard mitigation planning is to identify policies and actions that can be implemented before a disaster occurs to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to break the cycle of disaster damage, reconstruction, and repeated damage.

"Understanding community perceptions when assessing potential risks will help us prioritize and plan mitigation projects accordingly," explains Cody Ulrich, Los Alamos County Emergency Management Specialist.

The questionnaire should only take about 10 minutes to complete. All responses will be kept confidential, and the community's participation is strictly voluntary. The public's input will enable the County to better serve the community through the Hazard Mitigation Plan update process.

Members of the public with any questions, contact Cody Ulrich at 505.662.8290.

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. In addition to the engagement of Los Alamos National Laboratory the following groups were invited to participate in the planning

process based on their involvement in hazard mitigation planning, their landowner status in the County, and/or their interest as a neighboring jurisdictions.

New Mexico Division of Homeland Security and Emergency Management
New Mexico State University
University of New Mexico Earth Data Analysis Center
Santa Clara Pueblo (neighboring pueblo)
San Ildefonso Pueblo (neighboring pueblo)
Rio Arriba County Emergency Management (neighboring County)
Los Alamos National Laboratory
National Park Service – Bandelier National Monument
FEMA Region VI
Department of Energy/National Nuclear Security Agency
National Weather Service

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. LANL was actively engaged throughout the process and incorporated a seismic monitoring effort into the Plan's mitigation strategy. FEMA Region VI provided a courtesy review on the Plan's draft risk assessment. The University of New Mexico's Earth Data Analysis Center provided input to the Plan's earthquake vulnerability assessment with HAZUS modeling. The above stakeholders were made aware of the effort and were provided opportunities for input but in some instances no additional input was received, which was the case for the neighboring pueblos and Rio Arriba County.

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 regional 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.

Individuals solicited (via a direct email, with a link to the plan on the County website) as part of this targeted outreach for input on the draft plan included: National Weather Service, American Red Cross, Santa Clara Pueblo, San Ildefonso Pueblo, NMDHSEM, USACE, and NM Fire. Appendix A includes documentation of these email solicitations.

The HMPC also used technical data, reports, and studies from the following agencies and groups:

LANL
DHSEM
US Fish and Wildlife Service
New Mexico Drought Task Force
State and Federal Historic Preservation Districts
New Mexico State Department of Highways
New Mexico State Forestry Service
New Mexico Institute of Mining and Technology
University of New Mexico Earth Data Analysis Center
U.S. Geological Survey
National Weather Service

Appendix B References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

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. Los Alamos County uses a variety of comprehensive planning mechanisms, such as comprehensive plans and ordinances, 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
LAC Community Wildfire Protection Plan 2016	Incorporated into Risk and Vulnerability Assessment and Mitigation Strategy; goals and objectives referenced during goals update process, resulting in modified objectives aligning both plans.
LAC Open Space Management Plan 2015	Incorporated by reference in Mitigation Strategy
LANL Forest Management Plan 2014	Incorporated into Risk and Vulnerability Assessment
2018 State of New Mexico Natural Hazard Mitigation Plan	Used as reference for Risk and Vulnerability Assessment. Goals referenced during mitigation goals update.
LAC Comprehensive Plan 2019	Informed Risk and Vulnerability Assessment, use of White Rock and Los Alamos townsite land use maps.
LAC Snow and Ice Control Plan 2010-2011	Noted in capabilities assessment
LAC Community Trail Plan 2013	Reviewed for relevant links
LAC Utility Curtailment Plan	Noted in capabilities assessment
LAC Sustainability Plan 2017	Noted in capabilities assessment

A key example of coordinating with other planning efforts is the coordination of this LHMP with the Community Wildfire Protection Plan and the Open Space Management Plan. Both of these plans address wildfire mitigation, one of the most significant hazards affecting the County. A successful mitigation strategy requires that these planning efforts be coordinated. 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. Appendix B References provides a detailed list of references used in the preparation of this plan update. Specific references relied on in the development of this plan are also sourced throughout the document as appropriate.

Phase 2: Assess Risks

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

Integrated Solutions Consulting 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 updating hazards and vulnerabilities where the risk varied across the planning area. Updated Geographic Information Systems (GIS) data were used to display, analyze, and quantify hazards and vulnerabilities. The HMPC also updated the plan's 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.

Phase 3: Develop the Mitigation Plan

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

Integrated Solutions Consulting facilitated meetings with the HMPC that included a description of the purpose and process of developing planning goals and objectives, 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, Integrated Solutions Consulting produced a complete first draft of the plan. This complete draft was distributed electronically to the HMPC and the LEPC 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. Integrated Solutions Consulting 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, contingent upon final adoption by the Los Alamos County Council.

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 Los Alamos County Council using the sample resolution contained in Appendix C.

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 manager 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 Los Alamos County Planning Area whose goals and interests interface with hazard mitigation. Coordination with these other planning efforts, as addressed in Planning Step 3, is paramount to the ongoing success of this plan and mitigation in Los Alamos 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.

Implementation and Maintenance Process: 2023

The 2006 Los Alamos County Multi-Hazard Mitigation Plan included a process for implementation and maintenance, which is excerpted below. This process as set forth in the 2006 plan was generally followed, with some variation. The plan was not updated within the five year period due to other priorities, including Emergency Management and other department personnel being engaged with the response and recovery efforts from the 2011 Las Conchas wildfire, 2013 Flooding events and the 2022 Cerro Pelado wildfire.

2023 Implementation & Maintenance Process Excerpt

"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. This monitoring and updating will take place through a semi-annual review by the LAC OEM, an annual review through the Mitigation Coordinating Committee, and a 5-year written update to be submitted to the state and FEMA Region VI, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame.

In order to best evaluate any changes in vulnerability as a result of Plan Implementation, the Mitigation Coordinating Committee will follow 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 Mitigation Coordinating Committee on the status of a given project and provide input on whether the project as implemented meets the defined objectives and is likely to be successful in reducing vulnerabilities;
If the project does not meet identified objectives, the committee will determine what additional measures may be implemented and an assigned individual will be responsible for defining project scope, implementing project; monitoring success of project, and making any required modifications to the Plan; and
Updating of the plan will be by written changes and submissions, as the Committee deems appropriate and necessary, and as approved by the County Councilors."

4 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 LHMP update involved a comprehensive review and update of each section of the 2016 risk assessment. As part of the risk assessment update, new data was used, where available, and new analyses were conducted. This risk assessment builds upon the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002)*, which breaks the assessment down to a four-step process:

Identify Hazards
Profile Hazard Events
Inventory Assets
Estimate Losses

The 2023 FEMA *Local Mitigation Planning Handbook* recommends a similar, four step process for conducting a risk assessment:

Describe Hazards;
Identify Community Assets
Analyze Risks
Summarize Vulnerability

Data collected through this process has been incorporated into the following sections of this chapter: Section 4.1: Hazard Identification: Natural Hazards identifies the natural hazards that threaten the Planning Area and describes why some hazards have been omitted from further consideration. Section 4.2: Hazard Profiles 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). Section 4.3:

Vulnerability Assessment assesses the Planning Areas' exposure to natural hazards; considering assets at risk, critical facilities, and future development trends (2023 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 Los Alamos County Planning Area (Planning Area), including the county and the unincorporated communities of Los Alamos and White Rock. In addition to standard analyses, data provided via FEMA through the National Risk Index (NRI) is provided below. In some instances where hazard analyses data is difficult to quantify the NRI data can be considered best available data for analyses purposes.

FEMA NRI RISK SCORES

The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather. Because not all hazards are applicable to the County, only those hazards with a defined risk to the County are included.

The National Risk Index leverages available source data for Expected Annual Loss due to these 18 hazard types, Social Vulnerability, and Community Resilience to develop a baseline relative risk measurement for each United States county and Census tract. These measurements are calculated using average past conditions, but they cannot be used to predict future outcomes for a community. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

Social Vulnerability

Social Vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.
Per the FEMA National Risk Index, Los Alamos County has a Social Vulnerability Rating of "Relatively Moderate" and a Social Vulnerability Score of "37.01" (source: FEMA National Risk Index, 2023h).
The "Social Vulnerability Score" and "Rating" represent the relative level of a community's social vulnerability compared to all other communities at the same level. A community's Social Vulnerability Score is also proportional to a community's risk. A higher Social Vulnerability Score results in a higher Risk Index Score (FEMA National Risk Index, 2023h).

Social vulnerability is also one of five components included in the formulation of the "National Risk Index Score", in addition to community resilience, estimated annual loss (EAL) based on exposure, annualized frequency, and historic Loss Ratio (HLR) factors (source: FEMA National Risk Index, 2023h).

Community	Social Vulnerability Score	Rating
Los Alamos County, NM	1.21	Very Low

Community Resilience

Community Resilience measures a community's ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions.

Community	Community Resilience Score	Rating
Los Alamos County, NM	97.71	Very High

Expected Annual Loss

Community	Expected Annual Loss Score	Rating
Los Alamos County, NM	19.44	Very Low

Overall NRI Score

Community	FEMA National Risk Index Score	Rating
Los Alamos County, NM	11.49	Very Low

*OVERALL RISK SCORE (COUNTY)

Hazard Event	Probability Factor	Sum of Weighted Extent Factors	Sum of Weighted Vulnerability Factors	Sum of Weighted Impact Factors	Consequence Score	Total Risk Score (Probability x Consequence)
Dam Failure	1	4	6	17	27	17
Drought	2	8	10	21	39	43
Earthquake	2	12	12	28	52	55
Floods: 100/500 year	2	8	9	27	44	48
Floods: Localized Stormwater/Flash Flooding	2	8	6	15	29	33
Landslide (includes Rockfall)	3	8	14	25	47	72
Severe Weather: High Winds (] Lightning,	3	8	13	27	48	73

Hail.						
Severe Weather: Winter Storm and Severe Cold	3	12	17	36	65	95
Wildfire	1	12	10	24	46	27
Volcanoes	2	8	15	24	47	51

For a full listing of hazard rankings and methodologies please click the below link:

LosAlamos_RankingSpreadsheet_5.22.23.xl

Hazard Identification: Natural Hazards

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 Los Alamos County HMPC conducted a hazard identification study to determine the hazards that threaten the Planning Area. This section details the methodology and results of this effort.

Methodology and Results

Using existing natural hazards data and input gained through planning meetings, the HMPC agreed upon a list of natural hazards that could affect Los Alamos County. Hazards data from the New Mexico Department of Homeland Security and Emergency Management (NMDHSEM), FEMA, the National Oceanic and Atmospheric Administration (NOAA), 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 in Table 4.1, listed alphabetically were identified and investigated for this plan update. As a starting point, the updated 2018 New Mexico State Hazard Mitigation Plan was consulted to evaluate the applicability of hazards of concern to the State to the Planning Area. The State Plan includes three hazards not considered to be a concern to Los Alamos County based on local geography, geology, climatology and hazard history; these include extreme heat, expansive soil and land subsidence.

Building upon this effort, hazards from the past plan were also identified, and comments explain how hazards were updated from the previous plan. All hazards from the 2016 plan were profiled in this plan. The Comment column in Table 4.1 explains how hazards were updated from the previous plan.

Table 4.1. Hazard Identification and Comparison

2023 Hazards	2016 Hazards	Comment
Dam Failure	Dam Failure	More detailed analysis was performed, using inundation information from the County.
Drought	Drought	History updated; Similar analysis was performed
Earthquake	Earthquakes	LANL seismic risk studies incorporated
Floods	Floods	Greater analysis was performed using the 2011 Los Alamos County DFIRM; Added additional detail on Localized Stormwater/Flash Flooding
Landslide (includes Rockfall)	Rockfall	Landslide was added and a GIS analysis was performed.
Severe Weather: Lightning	Severe Weather: Heavy rains/thunderstorm/wind/lightning	This was broken out as a separate hazard. Events updated.
Severe Weather: Thunderstorm (includes Hail and Monsoon)	Severe Weather: Heavy rains/thunderstorm/wind/lightning	Events updated; Similar analysis was performed
Severe Weather: Wind	Severe Weather: Heavy rains/thunderstorm/wind/lightning	This was broken out as a separate hazard. Events updated.
Severe Weather: Winter Storm and Severe Cold	Severe Weather : Winter Storms	This was broken out as a separate hazard. Events updated.
Wildfire	Wildfires	Greater analysis was performed using the CWPP data
Volcanoes	Volcanoes	Similar analysis was performed

The worksheet below was completed by the County with input from the HMPC to identify, profile, and rate the significance of identified hazards. All of these hazards have a detailed hazard profile and are analyzed further in Section 4.3 Vulnerability Assessment.

Table 4.2. Los Alamos County Hazard Identification Worksheet

Hazard	Spatial Extent	Probability of Future Occurrences	Magnitude/Severity	Significance
Dam Failure	Limited	Low	Medium	Medium
Drought	Extensive	Medium	Low	Low
Earthquake	Extensive	Low	High	Medium-High
Floods: 100/500 year	Limited	Low	Medium	Medium
Floods: Localized Stormwater/Flash Flooding	Significant	High	Medium	High
Landslide (includes Rockfall)	Limited	Medium	Low	Medium
Severe Weather: High Winds (includes Straight Line Winds and Microbursts)	Extensive	High	Low	Low
Severe Weather: Lightning	Limited	High	Low	Medium
Severe Weather: Thunderstorm (includes Hail and Monsoon)	Extensive	High	Medium	Medium
Severe Weather: Winter Storm and Severe Cold	Extensive	High	Low	Low
Wildfire	Significant	High	High	High
Volcanoes	Extensive	Low	High	Low

Spatial Extent
Limited: Less than 10% of planning area
Significant: 10-50% of planning area
Local ***Extensive***: 50-100% of planning area

Probability of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance.

Significance
Low: minimal potential impact Medium: moderate potential impact High: widespread potential impact

Disaster Declaration History

One method to identify hazards based upon past occurrence is to look at what events triggered federal and/or state 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 localand state government's capacity is exceeded, a federal disaster declaration may be issued allowing for the provision of federal disaster assistance.

Los Alamos County has experienced seven federal disaster declarations, four emergency declarations and one fire management declaration since 1950. Three of the federal declarations were associated with flood events, while three were related to wildfire and one was the global COVId-19 pandemic. Of the emergency declarations, two were for wildfire, one was for the evacuation from Hurricane Katrina, and one was for drought. A summation of federal disaster declarations is shown in Table 4.3. Figure 4.1 shows the billion dollar disasters throughout the United States for just the year 2022 to highlight the growing number of costly disasters nationwide.

Table 4.3 Los Alamos County Federal and State Disaster Declaration History

Disaster Declaration	Hazard Type	Incident Period	Declaration Date	Declaring Agency
DR-4652	New Mexico Wildfires Flooding, Mudflows and Straight-line Winds	4/5/2022-7/23/2022	5/4/2022	Federal
DR-4529	New Mexico Covid-19 Pandemic	1/20/2020-5/11/2023	4/5/2020	Federal
DR-4152	Severe Storms, Flooding, and Mudslides	9/9/2013-9/22/2013	10/29/2013	Federal
DR-4079	Flooding	6/22/2013-7/12/2013	8/24/2013	Federal
DR-4047	Flooding	8/19/2011-8/24/2011	11/23/2011	Federal
FM-2933	Los Conchas Fire	6/26/2011-8/25/2011	6/26/2011	Federal
EM-3229	Hurricane Katrina Evacuation	8/29/2005-10/1/2005	9/7/2005	Federal
DR-1329	Cerro Grande Wildfire	5/5/2000-6/9/2000	5/13/2000	Federal
EM-3154	New Mexico Wildfire (this would become the Cerro Grande fire above)	5/5/2000-7/7/2000	5/10/2000	Federal
EM-3128	New Mexico Extreme Fire Hazard	6/29/1998-10/15/1998	7/2/1998	Federal
EM-3034	New Mexico Drought	3/2/1977	3/2/1977	Federal

Source: FEMA

Figure 4.1. Billion Dollar disasters 2022 in the US and Los Alamos County

Source: NOAA

Hazard Profiles

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.

The hazards identified in Section 4.1 Hazard Identification Natural Hazards, are profiled individually in this section. In general, information provided by planning team members is integrated into this section with information from other data sources. These profiles set the stage for Section 4.3 Vulnerability Assessment, where the vulnerability is quantified for each of the priority hazards. Each hazard is profiled in the following format:

Hazard/Problem Description—This section gives a description of the hazard and associated issues followed by details on the hazard specific to the Los Alamos County Planning Area. Where known, this includes information on the hazard extent, seasonal patterns, speed of onset/duration, and magnitude and/or any secondary effects.

Previous Occurrences—This section contains information on historical incidents, including impacts where known. The extent or location of the hazard within or near the Los Alamos County Planning Area is also included here. Available hazard data and historical incident worksheets were used to capture information from the HMPC on previous occurrences.

Frequency/Likelihood 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 (e.g., three droughts over a 30-year period equates to a 10 percent chance of a experiencing a drought in any given year). The likelihood of future occurrences is categorized into one of the following classifications:

Low: Occurs less than once every 10 years or more
Medium: Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

The following sections provide profiles of the natural hazards that the HMPC identified in Section 4.1 Hazard Identification. Given that most disasters that affect the Planning Area are directly or indirectly related to severe weather events, this section begins with severe weather hazards, and the other hazard profiles follow alphabetically.

Severe Weather: General

Severe weather is generally any destructive weather event, but usually occurs in the Los Alamos

County Planning Area as localized storms that bring heavy rain, hail, lightning, and strong winds.

The National Oceanic and Atmospheric Administration's National Climatic Data Center (NCEI) has been tracking severe weather since 1950. Their Storm Events Database contains data on the following: all weather events from 1993 to current (except from 6/1993-7/1993); and additional data from the Storm Prediction Center (1950-1992), thunderstorm winds (1955-1992), and hail (1955-1992). This database contains 181 severe weather events that occurred in Los Alamos County between January 1, 1950, and July 31, 2022. Table 4.4 summarizes these events.

NCEI

Table 4.4 NCEI Severe Weather Reports for Los Alamos County, 1950-2022

Hazard	Occurrences	Injuries	Fatalities	Property Damage	Crop Damage
Drought	47	0	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	$0	$0
Flash Flood	13	0	0	$9,610,000	$0
Hail	33	0	0	$110,000	$0
Heavy Snow	53	0	0	$135,000	$0
High Wind	24	0	0	$48,000	$0
Thunderstorm Wind	2	0	0	$0	$0
Wildfire	8	0	0	1,517,005,000	$0
Totals	**181**	**0**	**0**	**$1,526,908,000**	**$0**

Source: NCEI
*Note: Losses reflect totals for all impacted areas

The HMPC supplemented NCEI data with data from SHELDUS (Spatial Hazard Events and Losses Database for the United States). SHELDUS is a county-level data set for the United States that tracks 18 types of natural hazard events along with associated property and crop losses, injuries, and fatalities for the period 1960-2012. Produced by the Hazards Research Lab at the University of South Carolina, this database combines information from several sources (including the NCEI). The database includes every loss causing and/or deadly event between 1960 through 1979 and from 1995 onward. Between 1980 and 1995, SHELDUS reflects only events that caused at least one fatality or more than $50,000 in property or crop damages. For events that covered multiple counties, the dollar losses, deaths, and injuries were equally divided among the affected counties (e.g., if four counties were affected, then a quarter of the dollar losses, injuries, and deaths were attributed to each county). From 1995 to 2008 all events that were reported by the NCEI with a specific dollar amount are included in SHELDUS.

It is important to note that SHELDUS data was available at no charge until 2012. Since then the data has become prohibitively expensive, and has not been updated in this plan beyond 2012. However, SHELDUS data sometimes includes impacts and damages not included by other data sources, including NCEI. It helps to paint a more complete picture of specific hazard impacts in Los Alamos County; for this reason, the data is still included in the assessment.

SHELDUS contains information of 78 severe weather events that occurred in Los Alamos County between 1960 and 2012. These events are shown and summarized in Table 4.5.

Table 4.5 SHELDUS Severe Weather Report for Los Alamos County 1960-2012

Hazard	Occurrences	Injuries	Fatalities	Property Damage	Crop Damage
Flooding	4	0	0	$9,610,000	$0
Hail	9	0	0	$120,706	$1,563
Hail - Lightning	1	0	0	$5,000	$0
Hail – Wind	1	0.08	0	$2,000	$200
Lightning	3	3	1	$50,000	$0
Severe Storm/Thunder Storm - Winter Weather	1	0	0	$0	$3,846
Wildfire	4	0	0	$1,506,142,857	$0
Wind	27	0.18	0	$72,435	$0
Wind - Winter Weather	5	0	0	$19,926	$0
Winter Weather	23	0.74	1.11	$453,880	$209,619
Totals	**78**	**4**	**2.11**	**$1,516,476,804**	**$215,228**

Source: SHELDUS
*Events may have occurred over multiple counties, so damage may represent only a fraction of the total event damage and may be not specific to Los Alamos County

The NCEI and SHELDUS tables above summarize severe weather events that occurred in Los Alamos County. Only a few of the events actually resulted in state and federal disaster declarations. As noted previously these different data sources sometimes capture different events during the same time period, and often display different information specific to the same events. While the HMPC recognizes these inconsistencies, they see the value this data provides in depicting the County's big picture hazard environment.

For this plan, severe weather is discussed in the following subsections:

High Winds (includes Straight Line, Microbursts, and Tornadoes)
Lightning
Thunderstorms (includes Hail and Monsoon)
Winter Storms and Severe Cold

Risk Index

Hazard	FEMA Risk Index Score	Rating
Strong Wind	11.49	Very Low

Expected Annual Losses

Hazard	Score	Expected	Exposure	Frequency	Historic	Expected

		Annual Loss			Loss Ratio	Annual Loss Rating
Strong Wind	7.7	$14k	$.23T	.2 Events/year	Relatively Low	Very Low

Severe Weather: High Winds (includes 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, tropical storms and nor'easters. 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 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. 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, we use the Beaufort Wind Scale (Table 4.6) because it is specifically adapted to wind effects on land.

Table 4.6 Beaufort Wind Scale

Force	Wind (Knots)	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	4-6	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Whole trees moving, resistance felt walking against wind

8	34-40	Gale	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	Slight structural damage occurs.
10	48-55	Storm	Trees broken or uprooted, "considerable structural damage"
11	56-63	Violent Storm	Widespread structural damage.
12	64+	Hurricane	Considerable and widespread damage to structures.

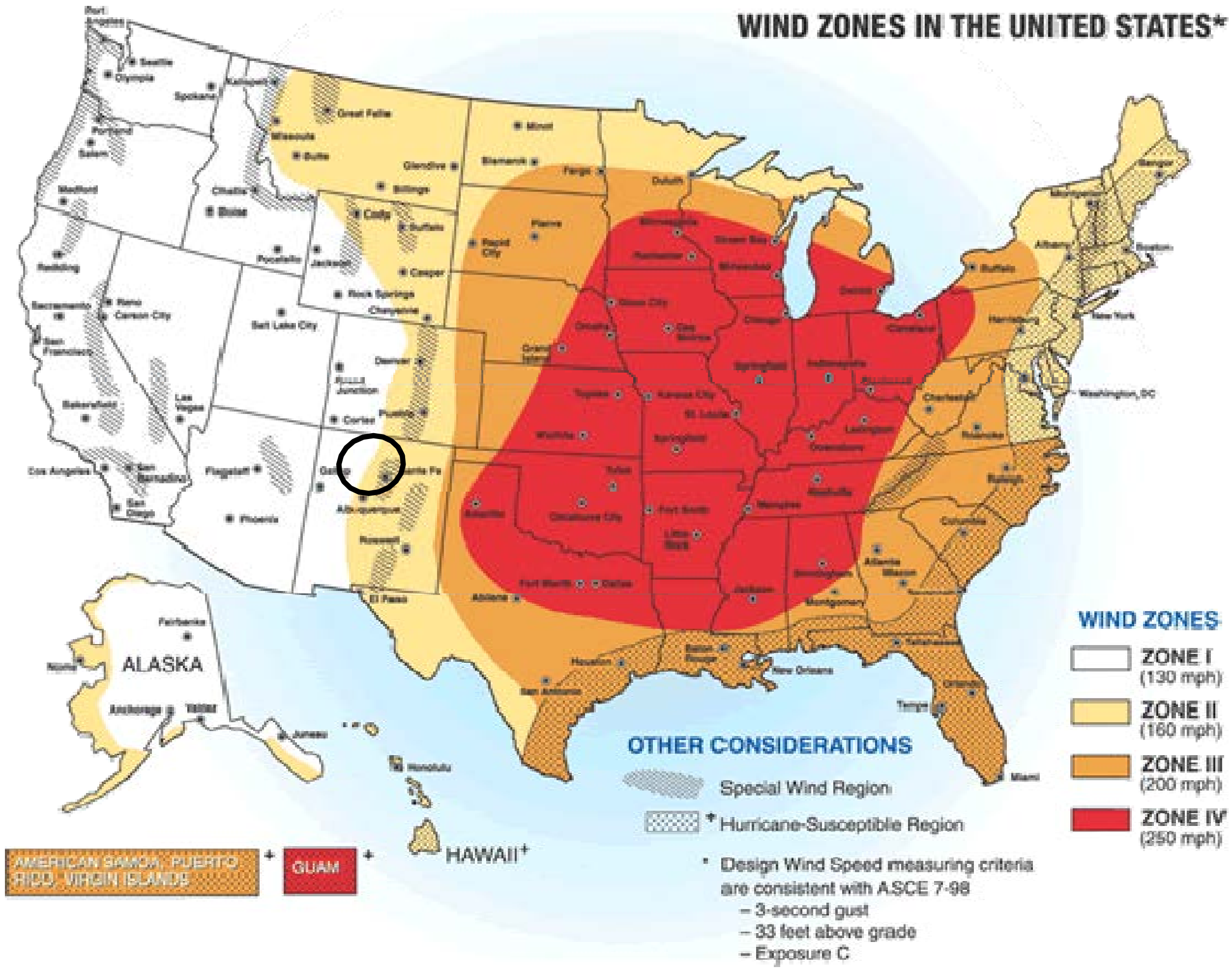
Source: NOAA

All areas of the state can experience all 12 Beaufort categories. Winds in Los Alamos County are typically straight-line winds. Straight-line winds are generally any thunderstorm wind that is not associated with rotation (i.e., is not a tornado). 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.

Straight-Line Winds

Figure 4.2 depicts wind zones for the United States. The approximate location of Los Alamos County is circled in black. The map denotes that the majority of the Planning Area falls into Zone I, which is characterized by high winds of up to 130 mph. Portions of the County are also located in Zone II, which is characterized by high winds of up to 160 mph, and adjacent to a Special Wind Region

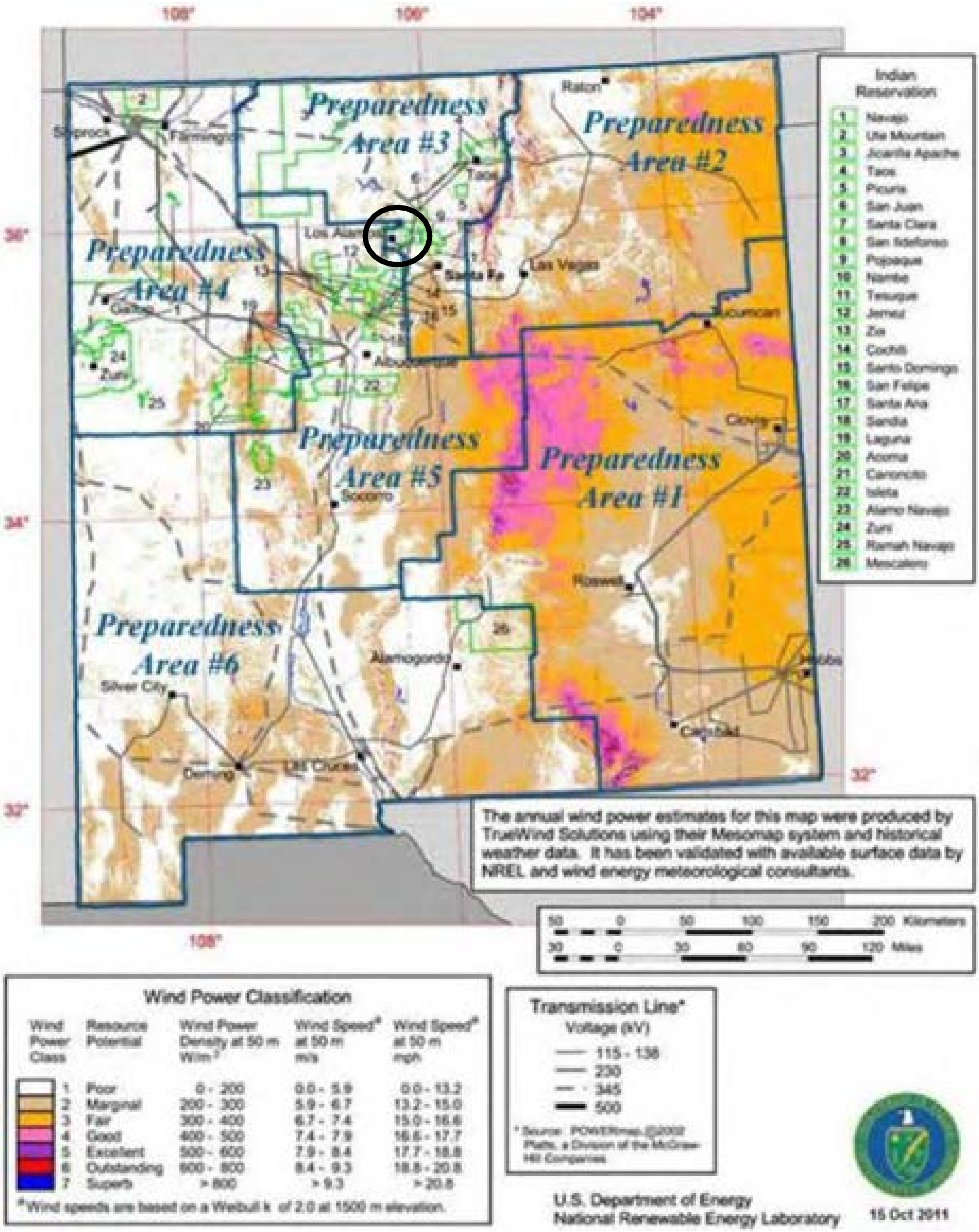
Figure 4.2. Wind Zones in the United States



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 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 resource map shows estimates of wind power density at 50 m above the ground. Los Alamos County, located in NM Preparedness Area 3, is circled in black.

Figure 4.3. Average Wind Speeds by NM Preparedness Area



* Los Alamos County highlighted by black oval Source:
New Mexico Hazard Mitigation Plan 2018

Microbursts

Los Alamos County is subject to high winds from microbursts as well. A **microburst** is a small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 2.5 miles across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground (NOAA, 2023).

Changes in Development and Impact of Future Development: There is no impact based on current development trends.

Effects of Climate Change on Severity of Impacts: With increasing global surface temperatures, the potential for storm intensity will likely increase. As more water vapor is evaporated into the atmosphere, it becomes fuel for more powerful storms to develop (USGS, 2023)

Previous Occurrences

Table 4.9 depicts the total number of high wind events reported and recorded by SHELDUS in the planning region. A total of 33 events have been recorded since 1960.

Table 4.9 SHELDUS Wind Events in Los Alamos County 1960 to 2012

Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
2/9/1960	Wind	0	0	$1,563	$0
3/22/1964	Wind	0	0	$83	$0
5/23/1965	Hail - Wind	0.08	0	$2,000	$200
4/12/1967	Wind	0	0	$152	$0
4/13/1967	Wind	0	0	$152	$0
12/13/1967	Wind - Winter Weather	0	0	$152	$0
4/14/1970	Wind	0	0	$56	$0
5/22/1972	Wind	0	0	$50	$0
12/5/1972	Wind	0	0	$1,563	$0
4/2/1974	Wind	0	0	$1,563	$0
4/17/1974	Wind	0	0	$500	$0
1/28/1975	Wind - Winter Weather	0	0	$152	$0
2/22/1977	Wind	0.15	0	$152	$0
12/5/1977	Wind	0	0	$500	$0
6/22/1980	Wind	0	0	$500	$0
2/10/1981	Wind - Winter Weather	0	0	$152	$0
3/29/1982	Wind	0.03	0	$1,562	$0
4/1/1982	Wind	0	0	$5,000	$0

4/2/1982	Wind	0	0	$10,000	$0
12/25/1982	Wind - Winter Weather	0	0	$3,846	$0
2/14/1987	Wind	0	0	$1,563	$0
12/12/1987	Wind - Winter Weather	0	0	$15,625	$0
3/11/1991	Wind	0	0	$15,000	$0
3/11/1991	Wind	0	0	$1,515	$0
11/10/1995	Wind	0	0	$2,000	$0

Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
3/23/1996	Wind	0	0	$7,692	$0
4/2/1998	Wind	0	0	$1,353	$0
4/7/1999	Wind	0	0	$6,667	$0
7/20/2000	Wind	0	0	$10,000	$0
6/6/2007	Wind	0	0	$278	$0
3/30/2009	Wind	0	0	$1,875	$0
4/26/2009	Wind	0	0	$100	$0
10/25/2010	Wind	0	0	$1,000	$0
Total		**0.26**	**0**	**$94,366.00**	**$200.00**

Source: SHELDUS

Table 4.10 depicts the total number of high wind events reported and recorded by NCEI in the planning region. A total of 27 events have been recorded since 1950.

Table 4.10 NCEI Wind Events in Los Alamos County 1950 to 2022

Date	Wind Speed	Injuries	Fatalities	Property Damage	Crop Damage
12/6/1977	Unknown	0	0	$0	$0
7/13/1990	58 mph	0	0	$0	$0
4/29/2010	63 mph	0	0	$0	$0
10/25/2010	58 mph	0	0	$3,000	$0
6/19/2011	59 mph	0	0	$0	$0
12/31/2011	58 mph	0	0	$0	$0
1/22/2012	72 mph	0	0	$0	$0
3/18/2012	63 mph	0	0	$0	$0
4/26/2012	62 mph	0	0	$0	$0
1/11/2013	58 mph	0	0	$0	$0
10/10/2013	58 mph	0	0	$0	$0
2/19/2014	61 mph	0	0	$0	$0
3/27/2014	41 mph	0	0	$0	$0
4/26/2014	59 mph	0	0	$0	$0
12/22/2014	67 mph	0	0	$0	$0
11/11/2015	63 mph	0	0	$0	$0
3/2/2016	59 mph	0	0	$0	$0
3/22/2016	67 mph	0	0	$10,000	$0
11/17/2016	60 mph	0	0	$0	$0

3/6/2017	73 mph	0	0	$0	$0
3/18/2018	65 mph	0	0	$0	$0
4/12/2018	63 mph	0	0	$0	$0
4/17/2018	61 mph	0	0	$0	$0
4/17/2018	60 mph	0	0	$0	$0
4/19/2018	65 mph	0	0	$35,000	$0
4/10/2019	63 mph	0	0	$0	$0
Total		**0**	**0**	**$48,000**	**$0**

Source: NCEI

Although there was no NCEI or SHELDUS record of tornado, the NCEI reported that on August 5, 2013 a funnel cloud was reported over White Rock. Additionally, NCEI reported that on May 22, 2013, a dust devil struck the County. Warm, dry, and unstable conditions with a very weak layer of mid-level moisture produced a destructive dust devil over Los Alamos. This dust devil produced damage to Barranca Mesa Elementary school. The roof of the gymnasium was torn off and dropped onto the library and playground area. $30,000 in damages was reported.

Likelihood of Future Occurrences

High –High winds are an annual occurrence in the County.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change will increase the incidence of extreme weather and precipitation events and change weather patterns. Some types of weather are easy to attribute to climate change. However, there are many questions and factors yet to be resolved about wind with some studies suggesting climate change may even reduce wind speeds. Uncertainty remains high as it relates to climate change and its impact on this hazard. Further analysis and studies need to be conducted, specifically for this region.

Severe Weather: Lightning

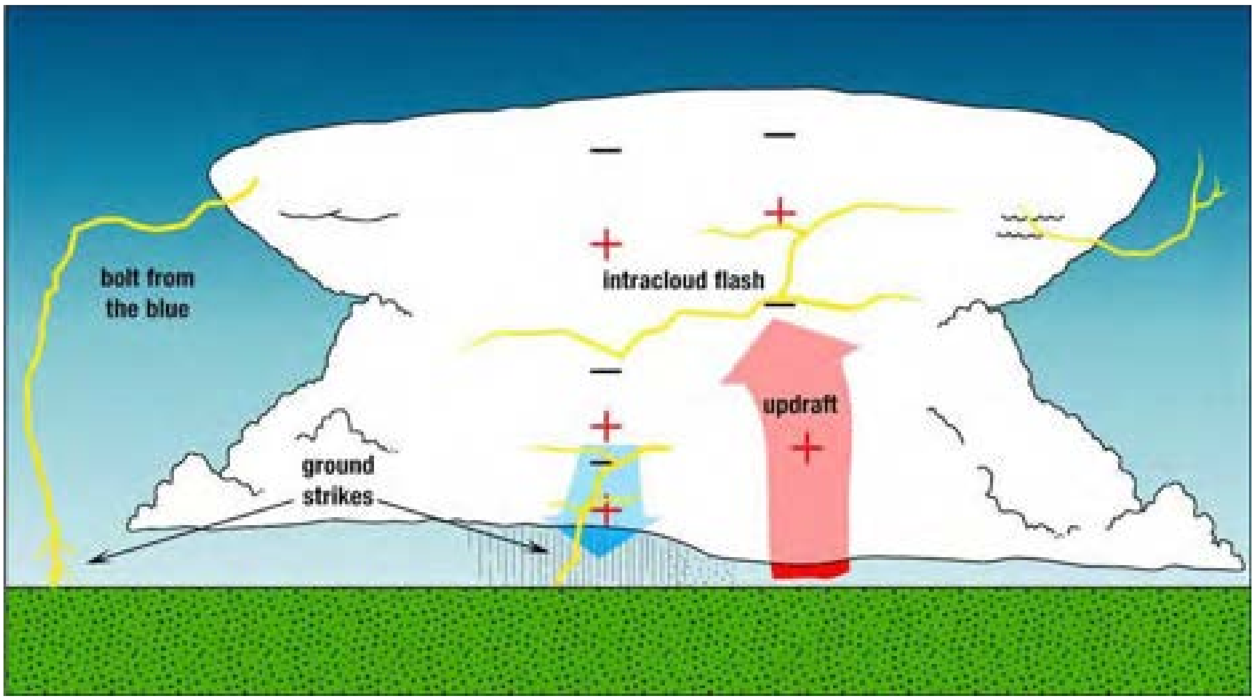
Hazard/Problem Description

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. Or, damage may be indirect, when the current passes through or near an object, which generally results in less damage.

Intra-cloud lightning is the most common type of lightning. This occurs between oppositely charged centers within the same cloud. Usually it takes place inside the cloud and looks from the outside of the cloud like a diffuse brightening that flickers. However, the flash may exit the boundary of the cloud, and a bright channel, similar to a cloud-to-ground flash, can be visible for many miles.

Cloud-to-ground lightning is the most damaging and dangerous type of lightning, though it is also less common. 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 (see Figure 4.4). 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 4.4. Cloud to Ground Lightning



Source: National Weather Service

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:

Figure 4.5. Lightning Activity 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 cloudto 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

Los Alamos County is at risk to experience lightning in any of these categories.

Location

Lightning can strike/occur anywhere within Los Alamos County, the entire planning area is equally susceptible to a lighting event.

Previous Occurrences

Lightning in Los Alamos County occurs on a yearly basis everywhere in the county. Not all lightning causes damages. Specific events were detailed by the SHELDUS database (see Table 4.11). No lightning specific events were recorded in the NCEI database.

Table 4.11 SHELDUS Incidences of Lightning in Los Alamos County from 1960 to 2012

Hazard Begin Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
5/28/1972	Lightning	0	0	$5,000	$0
8/15/1963	Lightning	3	0	$0	$0
7/8/1976	Lightning	0	1	$0	$0
8/13/1987	Lightning	0	0	$50,000	$0
Totals		**3**	**1**	**$55,000**	**$0**

Source: SHELDUS

Lightning in Los Alamos County is one of the causes of wildfires.

NCEI Incidences of Lightning in Los Alamos County from 1950 to 2022

Hazard Begin Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
8/19/2016	Lightning	0	0	$0	$100
Totals		**0**	**$0**	**$0**	**$100**

Risk Index

Hazard	FEMA Risk Index Score	Rating
Lightning	47.7	Relatively Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Lightning	61.0	$.12M	$.23T	53.5 Events/year	Relatively Moderate	Relatively Low

Likelihood of Future Occurrences

High– Lightning is a well-documented seasonal occurrence that will continue to impact the Los Alamos County Planning Area.

Effects of Climate Change Probability of Future Events and Severity of Impacts

Climate change will increase the incidence of extreme precipitation events and change weather patterns. Climate change is expected to result in an increase in the frequency of lightning (Nature Journal, 2023).

Severe Weather: Thunderstorms (includes Hail and Monsoon)

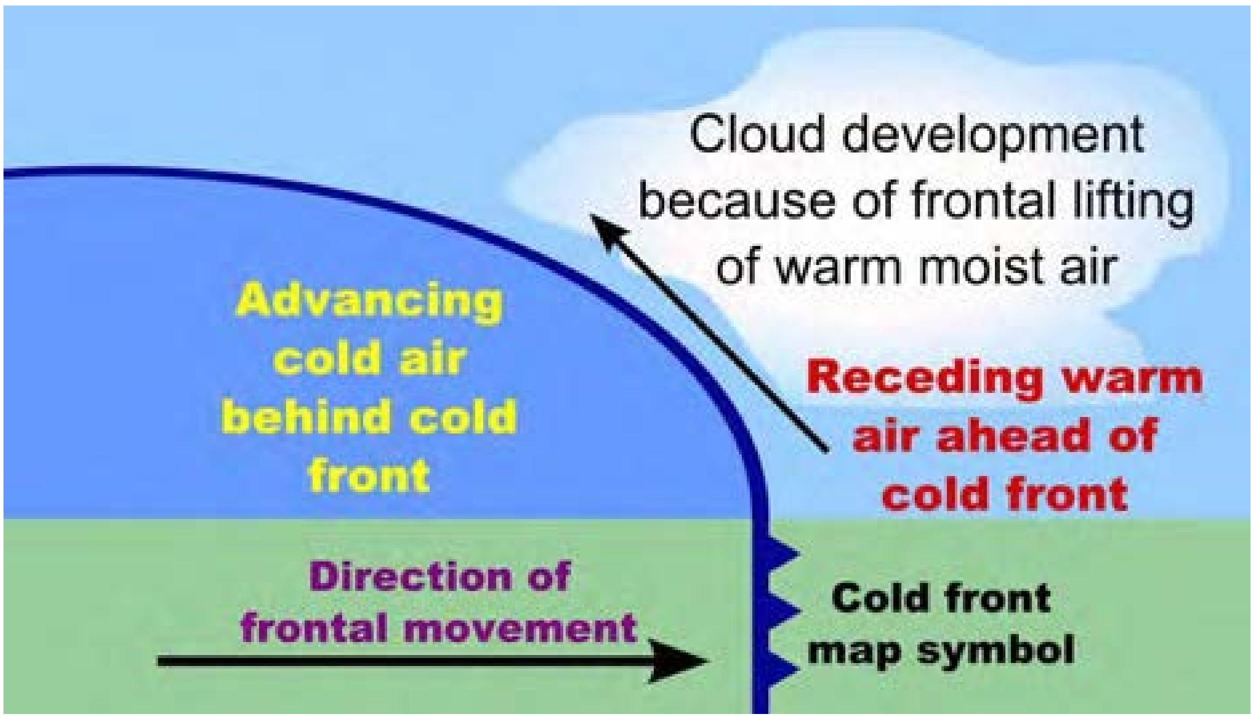
Hazard/Problem Description

Storms in the Los Alamos 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. 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, Los Alamos experiences 61 thunderstorm days a year, about twice the national average.

Thunderstorms and Monsoon

Thunderstorms result from the rapid upward movement of warm, moist air (see Figure 4.6). They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, its 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.

Figure 4.6. Formation of a Thunderstorm



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

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 Mohave 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 Los Alamos. The monsoons are significant to Los Alamos County (LAC) for two reasons. First, on the positive side, the monsoons can temper the fire season. Second, since the Cerro Grande and Los Conchas fire, much of the flooding in LAC is directly related to monsoon thunderstorms and the associated precipitation running off the burned areas. The runoff causes flooding and erosion and creates an ongoing maintenance need to maintain clear passage of runoff through culverts.

Location

Thunderstorms can occur anywhere within Los Alamos County; the entire planning area is equally susceptible to thunderstorm events.

Previous Occurrences

Thunderstorms in Los Alamos County occurs on a yearly basis everywhere in the county. Not all cause damage. Specific events were detailed by the NCEI database (see Table below).

NCEI Incidences of Thunderstorms in Los Alamos County from 1950 to 2022

Hazard Begin Date	Hazard Type Combo	Magnitude	Injuries	Fatalities	Property Damage	Crop Damage
12/06/1977	Thunderstorm Wind	0 mph	0	0	$0	$0
07/13 / 1990	Thunderstorm Wind	58 mph	0	0	0	$0
Totals			**0**	**$0**	**$0**	**$0**

Likelihood of Future Occurrences

High–Thunderstorms will continue to impact the Los Alamos County Planning Area.

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 Los Alamos 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.

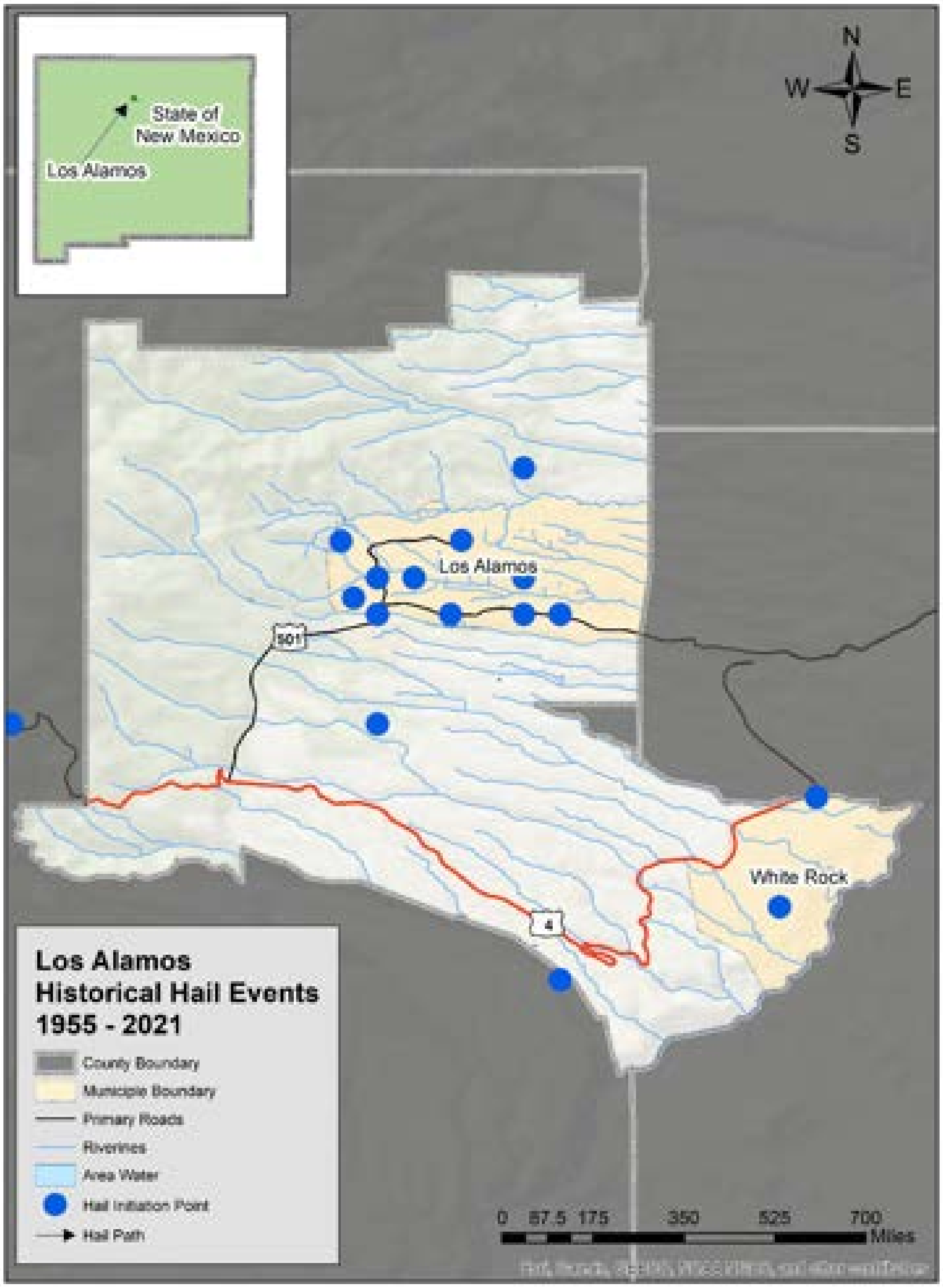
The National Weather Service classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.12 indicates the hailstone measurements utilized by the National Weather Service. Los Alamos County could be vulnerable to any size hail, based on the conditions of the storm; based on an average of 26 NCEI-recorded hailstorms in Los Alamos County, the average hailstone size is between 1 and
1.5 inches, with the county never seeing a hailstone with a diameter over two inches. **Table 4.12 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

Historic Hail Events Los Alamos County: 1950-2021


State of
New Mexico
Los Alamos
N
W
E
S
Los Alamos
501
White Rock
4
Los Alamos
Historical Hail Events
1955 - 2021
County Boundary
Municiple Boundary
Primary Roads
Riverines
Area Water
Hail Initiation Point
Hail Path
0 87.5 175 350 525 700
Miles

Risk Index

Hazard	FEMA Risk Index Score	Rating
Hail	16.4	Very Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Hail	23.9	$23k	$.23T	0.9 Events/Year	Relatively Low	Very Low

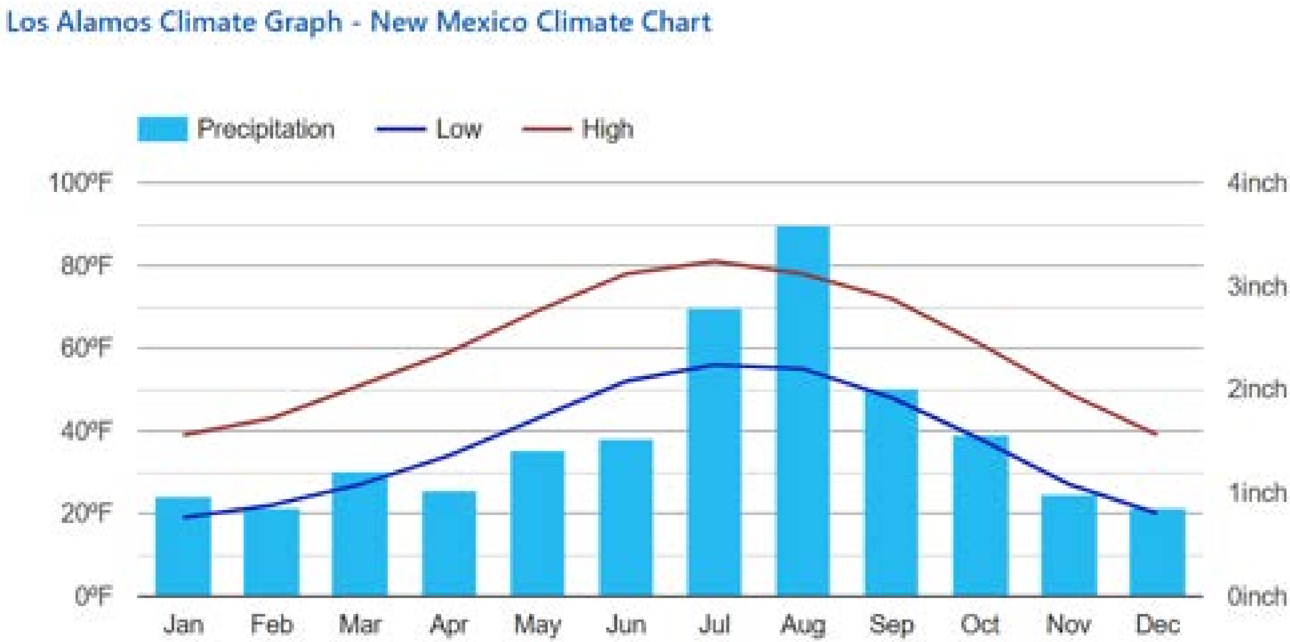
Related Hazards

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. Winds are discussed in more detail in Section 4.2.2.

Previous Occurrences

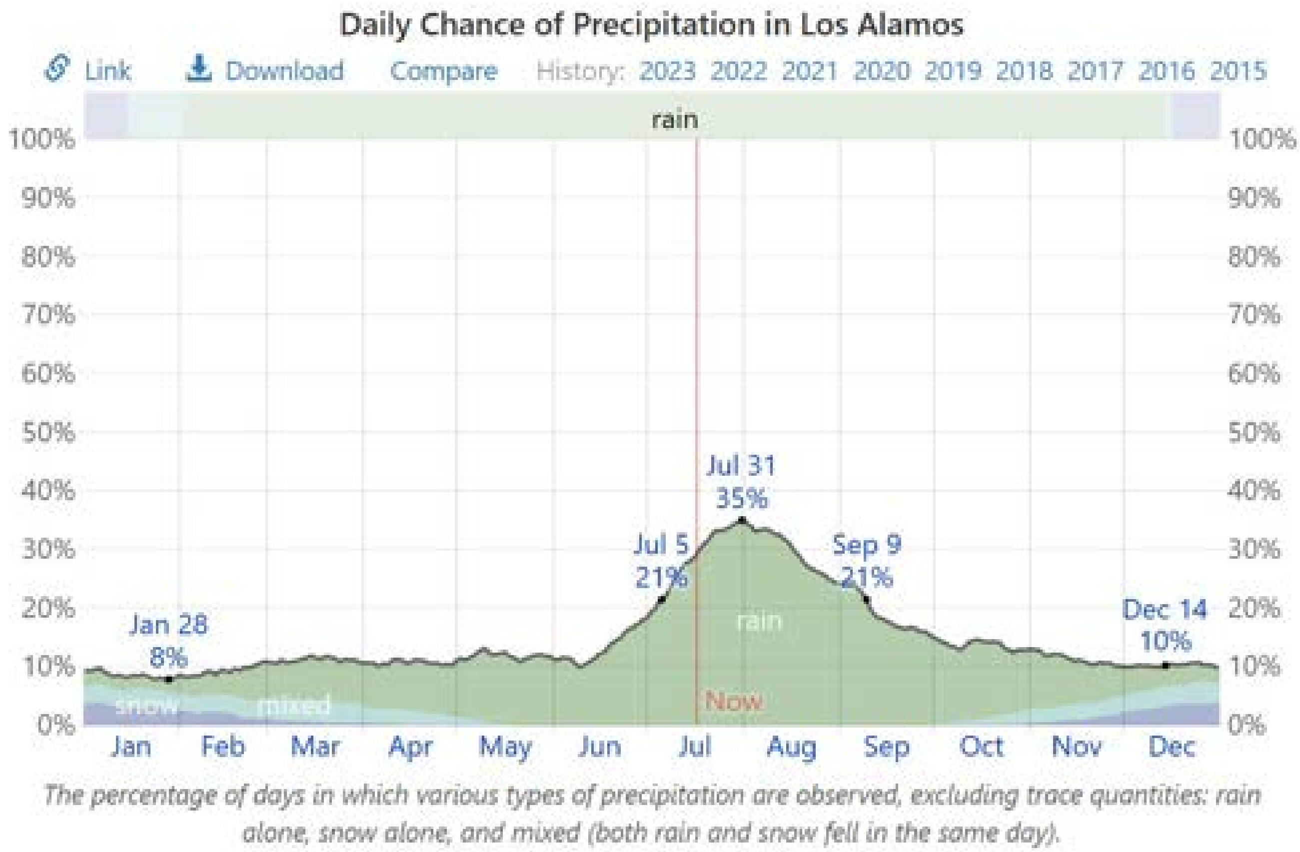
In Los Alamos County, summer begins with warm, and often dry, conditions in June, followed by a 2-month rainy season. This rainy season in July and August, often referred to as the "monsoon" season, is really just predictable afternoon rainstorms that comprise approximately 36% of the annual 18.7 inches of precipitation. However, the annual total fluctuates considerably from year to year and the monsoon can start as early as mid June. The lowest recorded annual precipitation is 6.8 inches in 1956; the highest is 30.3 inches in 1941. The maximum recorded precipitation for a 24-hour period is 3.5 inches in 1952. Because of the eastward slope of the terrain, there is a large east-to west gradient in precipitation across the plateau. As a result, White Rock often receives noticeably less annual precipitation than the official observing station within the Los Alamos National Laboratory (LANL) boundaries, while the eastern flanks of the Jemez Mountains often receive more. Average monthly precipitation totals for Los Alamos County are shown in Figure 4.7. Precipitation extremes for the County are shown in Figure 4.8.

Figure 4.7. Los Alamos County Monthly Average Total Precipitation



Source: www.usclimatedata.com/climate/los-alamos/new-mexico/united-states/usnm0179

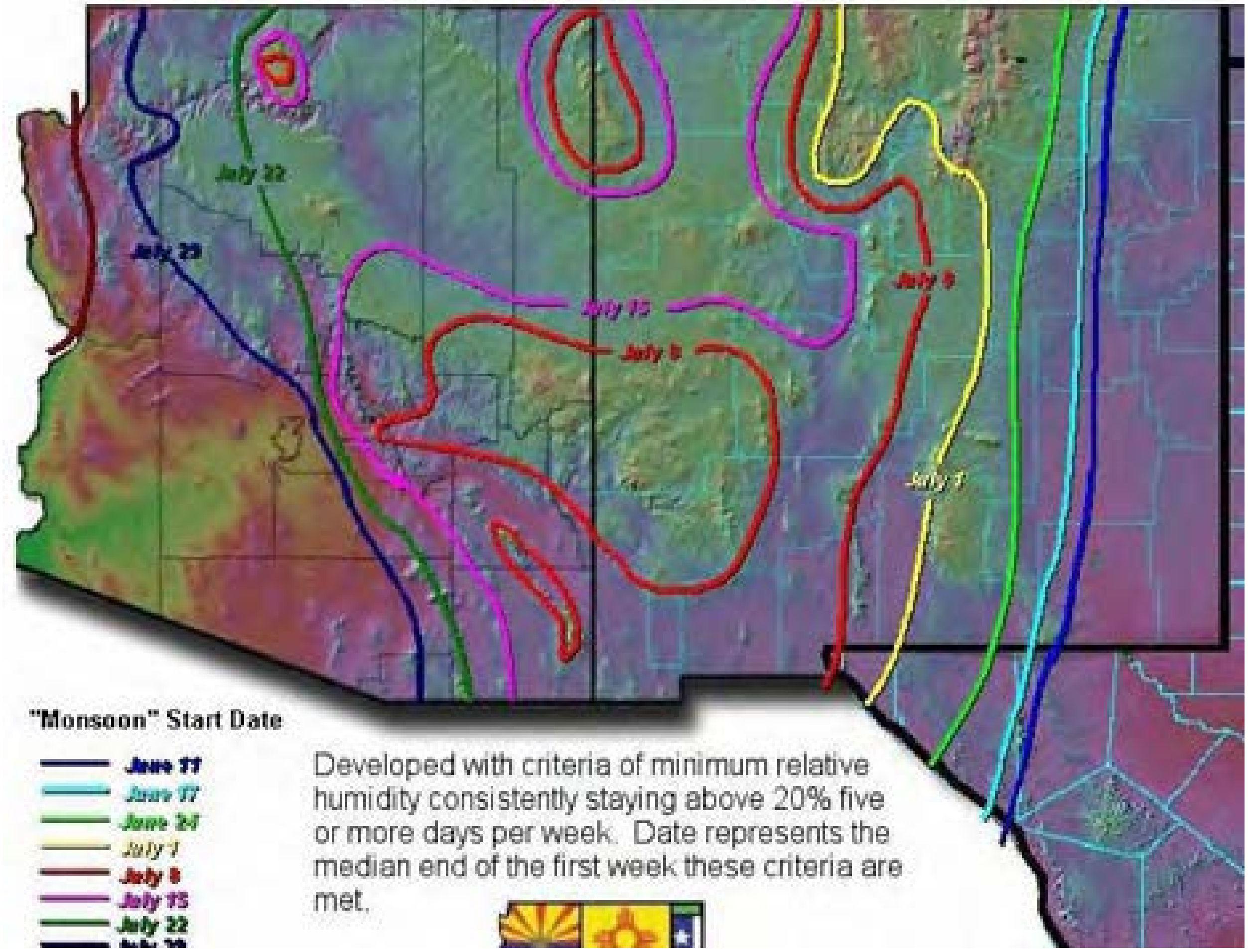
Figure 4.8. Los Alamos County Daily Precipitation Chances



Source: weatherspark.com/y/3330/Average-Weather-in-Los-Alamos-New-Mexico-United-States-Year-Round

Consistent with the monthly annual precipitation records, Figure 4.9 illustrates the typical monsoon season "start date" in New Mexico and Los Alamos County.

Figure 4.9. Monsoon Start Dates in New Mexico and Los Alamos County



Source: Southwest Area Predictive Services

Heavy rain, monsoons, thunderstorms, lightning, and hail in Los Alamos County are many in number and occur on a yearly basis. Specific events were detailed by the SHELDUS database (see Table 4.13). Specific events in the NCEI database are shown in Table 4.14.

Table 4.13. SHELDUS Incidences of Heavy Rain and Hail in Los Alamos County from 1960 to 2012

Hazard Begin Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
7/10/1961	Hail	0	0	$5,000	$0
5/13/1965	Hail	0	0	$156	$1,563
6/18/1965	Hail	0	0	$50	$0
9/6/1968	Hail	0	0	$5,000	$0
7/13/1990	Hail	0	0	$500	$0
7/6/2009	Hail	0	0	$25,000	$0
7/6/2009	Hail	0	0	$25,000	$0

Hazard Begin Date	Hazard Type Combo	Injuries	Fatalities	Property Damage	Crop Damage
10/12/2012	Hail	0	0	$50,000	$0
5/28/1972	Hail - Lightning	0	0	$5,000	$0
5/23/1965	Hail - Wind	0.08	0	$2,000	$200
4/1/1988	Severe Storm/Thunder Storm - Winter Weather	0	0	$0	$3,846
Totals		**0.08**	**0**	**$117,706**	**$5,609**

Source: SHELDUS

Table 4.14. NCEI Incidences of Heavy Rain and Hail in Los Alamos County from 1960 to 2022

Hazard Begin Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage
7/10/1961	Hail	0	0	$0	$0
6/18/1965	Hail	0	0	$0	$0
9/6/1968	Hail	0	0	$0	$0
5/9/1989	Hail	0	0	$0	$0
7/14/1989	Hail	0	0	$0	$0
7/14/1989	Hail	0	0	$0	$0
7/13/1990	Hail	0	0	$0	$0
7/20/1990	Hail	0	0	$0	$0
9/12/2000	Hail	0	0	$0	$0
7/15/2005	Hail	0	0	$0	$0
6/22/2006	Hail	0	0	$0	$0
6/22/2006	Hail	0	0	$0	$0
5/28/2008	Hail	0	0	$0	$0
5/28/2008	Hail	0	0	$0	$0
7/6/2009	Hail	0	0	$0	$0
7/6/2009	Hail	0	0	$0	$0
7/6/2009	Hail	0	0	$25,000	$0
7/6/2009	Hail	0	0	$25,000	$0
7/6/2009	Hail	0	0	$0	$0
7/30/2009	Hail	0	0	$0	$0
5/12/2012	Hail	0	0	$0	$0
5/21/2012	Hail	0	0	$0	$0
10/12/2012	Hail	0	0	$50,000	$0
10/12/2012	Hail	0	0	$0	$0
10/12/2012	Hail	0	0	$10,000	$0
10/12/2012	Hail	0	0	$0	$0
10/19/2015	Hail	0	0	$0	$0
6/25/2017	Hail	0	0	$0	$0

5/25/2020	Hail	0	0	$0	$0
Totals		**0**	**0**	**$110,000**	**$0**

Source: NCEI

Likelihood of Future Occurrences

High –Severe weather, including monsoon, thunderstorms, and hail is a well-documented seasonal occurrence that will continue to occur in the Los Alamos County Planning Area.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change will increase the incidence of extreme weather, high wind and precipitation events and change weather patterns. However, there are many questions and factors yet to be resolved about regional hail trends, and uncertainty remains high as it relates to climate change and its impact on this hazard. Further analysis and studies need to be conducted, specifically for this region.

Severe Weather: Winter Storms and Severe Cold

Hazard/Problem Description

Winter Storms

Los Alamos 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 a community depending on the severity and duration of a storm. Due to LAC's remote location, winter storms can easily hamper the limited access from other communities, including even White Rock.

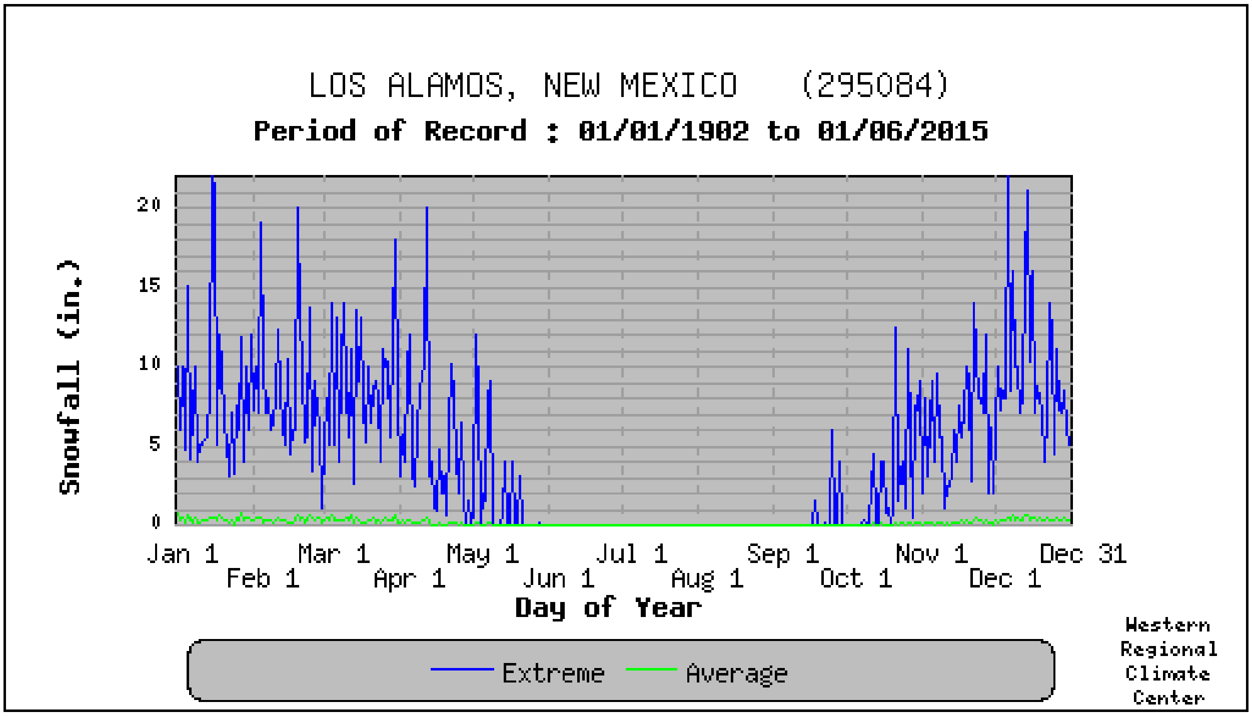
Snowfall can be measured using the Regional Snowfall Index (RSI) from NOAA's National Centers for Environmental Information. Currently the scale is only used on significant storms that impact the eastern two-thirds of the United States and has not been applied for storms in New Mexico.

Los Alamos County Station—Period of Record 1991 to 2020

According to NOAA, between the period from 1991 to 2020 and based on the sum of monthly averages, Los Alamos County received an annual average of 42.1 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.

At the time of the 2023 HMP update Figures 4.10 and 4.11 remain the most recent data available.

Figure 4.10. Los Alamos County Daily Snowfall Average and Extreme



Source: Western Regional Climate Center

Figure 4.11. Los Alamos County Daily Snow depth Average and Extreme

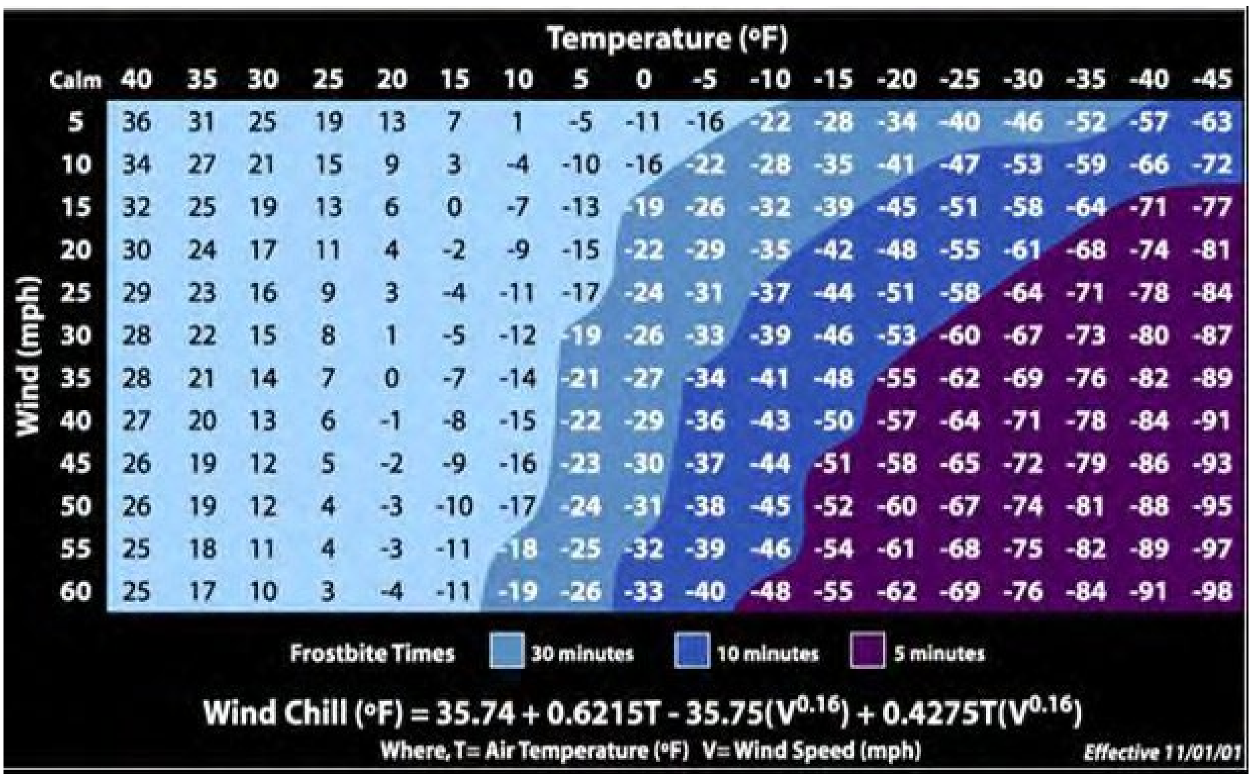
Source: Western Regional Climate Center

Severe Cold

Extreme cold 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 become 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 4.12. 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 4.12. 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

Information from the representative weather station in the County is summarized below.

Los Alamos County Station - Period of Record 11/1/1910 to 12/31/2022

In Los Alamos County, monthly average minimum temperatures from November through March range from the upper 10s to the upper 20s. The lowest recorded daily extreme was -18°F on January 13, 1963. In a typical year, minimum temperatures fall below 32°F on 153.3 days with

1.9 days falling below 0°F. Between 1902 and 2015, the lowest temperature reached in Los Alamos was -20. Depending on the wind speed, wind chill extent can be extrapolated from the Wind Chill Temperature Chart. Temperature extremes for Los Alamos County are shown in Figure 4.13. At the time of the 2023 HMP update table 4.13 remains the most recent available data.

Figure 4.13. Los Alamos County 12 Month Temperature Averages

Source: USA Facts

Location

Winter storms can occur anywhere within Los Alamos County; the entire planning area is equally susceptible to winter storm events.

Previous Occurrences

Winter Storm and Severe Cold

The heavy levels of snow in Los Alamos County combined with other inclement weather in the County 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. The SHELDUS database contains the following winter storm and severe cold events shown in Table 4.15.

Table 4.15. Los Alamos County SHELDUS Winter Storm and Severe Cold Events 1967-2008

Date	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
12/13/1967	0	0	$152	$0	Heavy snow, high wind, glaze
1/28/1975	0	0	$152	$0	Wind and snow
2/10/1981	0	0	$152	$0	Statewide
12/25/1982	0	0	$3,846	$0	Snow/Wind
12/12/1987	0	0	$15,625	$0	Heavy Snow, High Wind
12/6/1960	0.03	0	$15,625	$0	Heavy Snow And Glaze
1/3/1971	0	0	$15,625	$0	Extreme Cold
12/25/1974	0.03	0	$0	$0	Winter Storm
11/28/1975	0	0	$1,563	$0	Winter Storm
11/27/1976	0	0	$16,129	$0	Blizzard, Snow, Cold
1/8/1977	0	0	$15,625	$0	Snow, Cold
5/20/1978	0	0	$4,167	$0	Snowstorm
12/9/1982	0	0	$222,222	$0	Ice Storm
2/1/1983	0	0.43	$71,429	$0	Heavy Snowstorm
10/16/1984	0	0	$0	$2,941	Snow
1/15/1987	0	0	$15,625	$156	Winter Storm
2/16/1987	0	0	$152	$0	Winter Storm/Heavy Snow
2/24/1987	0	0	$556	$0	Winter Storm, Heavy Snow
5/3/1988	0	0	$0	$150,000	Extreme Cold
12/4/1992	0	0	$1,613	$0	Winter Storm
1/5/1995	0.26	0	$0	$0	Heavy Snow
12/17/1995	0.42	0	$0	$0	Heavy Snow
10/20/1996	0	0.09	$0	$0	Heavy Snow
4/24/1997	0	0	$65,217	$56,522	Winter Storm
3/17/1999	0	0	$8,333	$0	Winter Storm
1/27/2001	0	0.33	$0	$0	
12/15/2008	0	0.13	$0	$0	Heavy Snow
12/15/2008	0	0.13	$0	$0	Heavy snow
Totals	**0.74**	**1.11**	**$473,808.00**	**$209,619.00**	

Source: SHELDUS

The NCEI database contains the information shown in Table 4.16 for winter storm and severe cold events in Los Alamos County. Remarks and details are shown in the narrative below the table.

Table 4.16. Los Alamos County NCEI Winter Storm and Severe Cold Events 2009-2022

Date	Injuries	Fatalities	Property Damage	Crop Damage	Hazard Type	Size
12/7/2009	0	0	$10,000	$0	-	-
12/22/2009	0	0	$0	$0	-	-
1/18/2010	0	0	$0	$0	-	-
1/20/2010	0	0	$0	$0	-	-
1/21/2010	0	0	$0	$0	-	-
1/28/2010	0	0	$0	$0	-	-
2/3/2010	0	0	$0	$0	-	-
2/21/2010	0	0	$0	$0	-	-
3/9/2010	0	0	$0	$0	-	-
3/14/2010	0	0	$0	$0	-	-
12/16/2010	0	0	$0	$0	-	-
12/29/2010	0	0	$0	$0	-	-
1/31/2011	0	0	$0	$0	-	-
2/1/2011	0	0	$0	$0	-	-
2/2/2011	0	0	$0	$0	-	-
5/1/2011	0	0	$0	$0	-	-
12/4/2011	0	0	$0	$0	-	-
12/12/2011	0	0	$0	$0	-	-
12/19/2011	0	0	$0	$0	-	-
12/22/2011	0	0	$0	$0	-	-
4/2/2012	0	0	$0	$0	-	-
12/14/2012	0	0	$0	$0	-	-
12/19/2012	0	0	$0	$0	-	-
12/30/2012	0	0	$0	$0	-	-
1/1/2013	0	0	$0	$0	-	-
2/19/2013	0	0	$0	$0	-	-
3/8/2013	0	0	$0	$0	-	-
11/21/2013	0	0	$0	$0	-	-
12/13/2014	0	0	$0	$0	-	-
1/12/2015	0	0	$0	$0	-	-
1/21/2015	0	0	$0	$0	-	-
1/30/2015	0	0	$0	$0	-	-
2/26/2015	0	0	$0	$0	-	-
10/19/2015	0	0	$0	$0	Hail	0.88 in.
10/19/2015	0	0	$0	$0	Hail	0.88 in.
11/16/2015	0	0	$0	$0	Heavy Snow	
12/14/2015	0	0	$0	$0	Heavy Snow	
12/22/2015	0	0	$0	$0	Heavy Snow	
1/7/2016	0	0	$0	$0	Heavy Snow	

2/1/2016	0	0	$0	$0	Heavy Snow	
4/17/2016	0	0	$0	$0	Heavy Snow	
12/16/2016	0	0	$0	$0	Heavy Snow	
1/15/2017	0	0	$50,000	$0	Heavy Snow	
1/20/2017	0	0	$0	$0	Heavy Snow	
1/22/2017	0	0	$0	$0	Heavy Snow	
4/3/2017	0	0	$0	$0	Heavy Snow	
4/28/2017	0	0	$0	$0	Heavy Snow	
6/25/2017	0	0	$0	$0	Hail	0.88 in.
6/25/2017	0	0	$0	$0	Hail	1.25 in.
6/25/2017	0	0	$0	$0	Hail	0.88 in.
6/25/2017	0	0	$0	$0	Hail	1.00 in.
12/27/2018	0	0	$0	$0	Heavy Snow	
12/31/2018	0	0	$0	$0	Heavy Snow	
1/1/2019	0	0	$0	$0	Heavy Snow	
1/13/2019	0	0	$75,000	$0	Heavy Snow	
2/14/2019	0	0	$0	$0	Heavy Snow	
2/17/2019	0	0	$0	$0	Heavy Snow	
2/21/2019	0	0	$0	$0	Heavy Snow	
3/11/2019	0	0	$0	$0	Heavy Snow	
5/25/2020	0	0	$0	$0	Hail	0.88 in.
Totals	**0**	**0**	**$135,000**	**$0**		

Source: NCEI

Risk Index

Hazard	FEMA Risk Index Score	Rating
Winter Weather	50.2	Relatively Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Winter Weather	61.8	$78k	$.23T	12.9 Events/Year	Relatively Low	Relatively Moderate

December 7, 2009-A potent storm system brought heavy snow and high winds across the state. Snowfall started on December 6th across the San Juan Mountains. Snow increased in coverage and intensity on the 7th, and a final blast of snow came early on the 8th as a cold front swept from west to east across New Mexico. Many locales on the west facing slopes of the northern mountains were measuring snow in feet rather than inches. Meanwhile, a mid level jet streak in excess of 80 knots was moving across the southwest mountains northeastward onto the plains. The strong winds combined with the heavy snow resulted in blizzard conditions across the southwest mountains as well as portions of central New Mexico. Widespread surface wind gusts in excess of 60 mph were measured across this area. Several buildings, vehicles and trees sustained damage. Over a foot of snow was reported across the Jemez Mountains. Strong winds around Los Alamos resulted in downed power lines in the North Mesa and Barranca Mesa areas.

December 22, 2009–Widespread snow fell over northern and central New Mexico, with the highest amounts over the northern, western and south central Mountains as well as a portion of the eastern plains. Five to eight inches of snow was common across the Jemez Mountains with up to 14 inches.

January 18, 2010–Over eight inches of snow accumulated across the higher terrain, while amounts of 2 to 6 inches were common across the western and northern valleys. The hardest hit areas stretched from the Jemez Mountains, eastward across the Santa Fe Metro Area, to the southern Sangre De Cristo Mountains. Up to 9 inches of snow fell across the highest elevations of the Jemez Mountains.

January 20, 2010–The second storm in two days crossed New Mexico on the 20th, with widespread light to moderate snow. Overall snow amounts were less than the previous storm. Up to eight inches of snow fell over the higher peaks of the Jemez Mountains.

January 21, 2010–The third and final storm during the week of January 18th delivered heavy snow to much of western and central New Mexico from the morning of the 21st through the day on the 23rd. The first band of snow occurred on the morning of the 21st over far west and northwest sections of the state. Then, a strong cold front swept through the state on the 22nd, bringing a round of heavy snow across much of western and central New Mexico. An additional upper level disturbance crossed the southern portion of the state on the 23rd, bringing central and southern areas some additional snowfall. In general, between 6 and 14 inches of snow fell across the Jemez Mountains.

February 21, 2010–Over a foot of snow was noted in many mountain locales, while low lying areas generally received between 2 and 8 inches of snow.

March 14, 2010–A strong closed upper low pressure system slid south across western New Mexico while dragging a strong back door cold front across the eastern plains. The snow was responsible for several road closures, including portions of Interstate 25 and Interstate 40. The Jemez Mountains received up to a foot of snow.

December 16, 2010–Ski sites and SNOTELS in the Jemez Mountains picked up between 8 and 12 inches of snow. The White Rock and Los Alamos areas received between 5 and 8 inches of snow.

December 29, 2010–Snowfall amounts over 8 inches were common across the Jemez Mountains.

February 2, 2011-A powerful storm and arctic cold front combined to bring fresh snow cover to nearly all of northern and central New Mexico on the 1st and 2nd, as well as extremely cold, record setting minimum temperatures. This resulted in dangerously low wind chill values over many areas.

May 1, 2011–Various heavy snowfall amounts between 6 and 11 inches reported over the Jemez Mountains.

December 4, 2011–Between 12 and 13 inches were reported across the Jemez Mountains by both the cooperative observer and the Pajarito Ski Area.

December 19, 2011–Around 8 inches of snow fell in Los Alamos, but at the Pajarito Ski site, more than a foot of snow fell.

December 22, 2011–The east slopes of the Jemez Mountains picked up more than a foot of new snow in some areas, including at Pajarito Ski Area, which received approximately 16 inches. Near Los Alamos, 8 inches of snow was reported.

April 2, 2012–Between 6 and 12 inches of snow was reported across the Jemez Mountains. Strong winds and blowing snow caused near zero visibilities which caused many roads to close.

December 30, 2012–Snowfall amounts of 4 to 12 inches were reported from COOP, ski sites, and SNOTEL data. Very cold temperatures created hazardous travel conditions across this region.

February 19, 2013–Snowfall amounts around 10 inches were reported from various sources across the region.

March 8, 2013–Snowfall amounts of 4-13 inches were reported.

November 21, 2013-Storm total snowfall amounts ranging from 2 to 13 inches were reported. The highest amounts and greatest impacts occurred along the south and east facing aspects of the Jemez Mountains.

December 13, 2014- A subtropical moisture tap in association with this system produced heavy snow across the northern mountains on the 13th. Additional snow fell as the system exited on the 14th due to wrap around moisture, resulting in snowfall storm totals of up to 20 inches in the

Sangre de Cristo Mountains. Strong mid-level winds and lee side trough quickly shifted the focus to high winds on the 14th, with the strongest reports across the east central plains.

January 12, 2015-A series of winter storm systems tracked slowly through New Mexico from the 12th to the 14th and produced a long duration period of winter weather. The most significant accumulations occurred along the Continental Divide and the northwest mountains where 6 to 12 inches were reported. Several schools and businesses were closed or operated on 2-hour delays.

January 21, 2015- The system produced heavy snow and blowing snow across much of north central and eastern New Mexico. The highest snowfall totals were reported along the east slopes of the Sandia and northern Sacramento mountains, where anywhere from 10 inches to 2 feet fell. Numerous schools and businesses were closed, as well as U.S. Highway 82 in southwest Chaves County, state road 72 east of Raton, and state road 53 near El Morro.

January 30, 2015-COOP Observer, SNOTEL, and ski resort reports indicated between 6 and 15 inches of snow.

February 26, 2015-COOP, CoCoRaHS, SNOTEL, and public reports averaged between 13 and 33 inches storm total snow during this extended winter storm. The 33 inches at Wolf Canyon was the 5th heaviest 4-day snowfall event ever reported at the site dating back to 1912. The 16 inches on the 28th also set a new record for the date.

Likelihood of Future Occurrences

Winter Storm and Severe Cold

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

Effects of Climate Change on Probability of Future Events and Severity of Impacts

The effects of climate change on the probability of future events and severity of impacts for this hazard is currently unknown. Further analysis and studies need to be conducted.

Dam Failure

Hazard/Problem Description

Dams are manmade 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 rockfill, 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, and maintenance of dams over 10 feet high or dams that store more than 10 acre-feet of water. Federal dam owners are required to obtain a permit for a new dam; however, the Office of the State Engineer by law does regulate the continued safety of federal dams. 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.

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

According to data provided by the National Performance of Dams Program, there is one dam in Los Alamos County – Los Alamos Canyon Dam. It is rated a high hazard dam and has an Emergency Action Plan (EAP). Its location can be seen on Figure 4.14. 07 gives details of this dam.

Figure 4.14. Location of High Hazard Dams in Los Alamos County

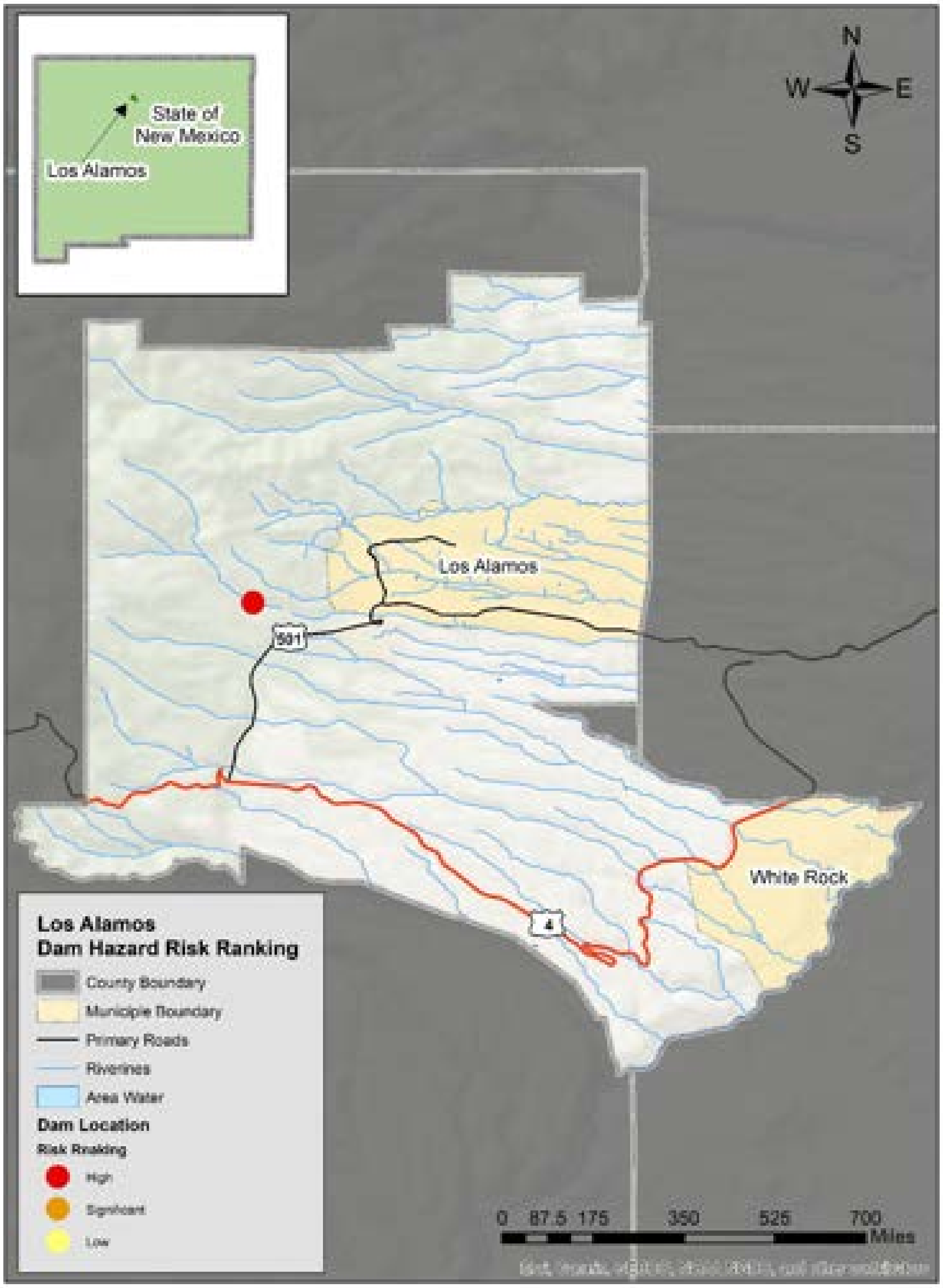


Table 4.17 Los Alamos County Dam Inventory

Name of Dam	Stream	Nearest City/ Distance/ Population Risk	Hazard at Class	Type	Capacity (Acre- feet)	Dam Height	Year Built	Owner	EAP
Los Alamos Canyon Dam	Los Alamos Creek	Los Alamos mile	High 1	Earth	49	40	1938	Federal	Y

Source: National Performance of Dams Program
*One Acre Foot=326,000 gallons

In September of 2001, LAC acquired ownership of the Los Alamos Dam from the Federal Government. The dam is an earth embankment dam that is approximately 40 feet high and 175 feet long with an approximate reservoir storage capacity of 49 acre-feet based on the permit application dated August 16, 1937. The drainage area above the dam is approximately 5 square miles and the entire watershed was burned during the Cerro Grande fire, and also suffered damage during the Los Conchas fire.

The dam was used as a flood control dam. However, LAC returned the reservoir to a water supply reservoir after the watershed recovered from the Cerro Grande fire. Although the dam was previously listed as a low hazard dam in the Office of State Engineer's dam inventory, based on the 2003 inspection it was recommended that the dam be classified as a high hazard potential dam on the dam inventory. A dam failure could impact future water supply plans, as well as cause downstream erosion, though the resulting flood would be confined to Los Alamos Canyon. The only potential downstream damage would possibly be to the Ice Rink, which should be evacuated if there are indications of a dam failure, and debris blockage to the culverts at Highway 502. There have been no historic flood events in LAC as a result of dam failure.

Los Alamos County Emergency Management and the dam Emergency Action Plan has more data tied to spillway elevations and discharge data; this information is not reproduced in this plan.

Previous Occurrences

A search of the National Performance of Dams Program database indicated that there have been no past incidents of dam failure or any dam incidents. In 2011, there was a potential for overtopping of the Los Alamos Canyon dam while the dam was undergoing rehabilitation. The dam held, and no damage was reported. Since the completion of dam improvements in 2013 there is less likelihood of overtopping in the future.

Likelihood of Future Occurrences

Low—No dam failure events have occurred in the County. Further, based on input from the

HMPC, it is unlikely that a major dam failure event will occur in Los Alamos County. The State Hazard Mitigation plan made efforts to determine a probability of occurrence for dam failure. Los Alamos County falls in Preparedness Area 3, which the State determined had a 6% chance of a dam failure occurring in a given year.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change will increase the incidence of extreme weather and precipitation events and change weather patterns. Extreme and prolonged precipitation events will likely increase the risk of dam failure. However, there are many factors yet to be resolved about dam failure trends as it relates to climate change and its impact on this hazard. Further analysis and studies need to be conducted, specifically for this region.

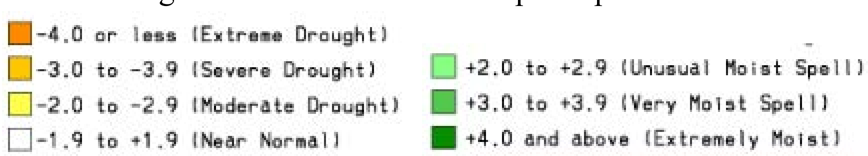
Drought

Hazard/Problem Description

A drought is a prolonged period when an area or community has a water shortage. This often occurs during an absence of precipitation for an extended period. According to (NOAA, 2023).

Drought is a complex issue involving (see Figure 4.15) many factors—it occurs when a normal amount of moisture is not available to satisfy an area's usual water-consuming activities. Drought can often be defined regionally based on its effects:

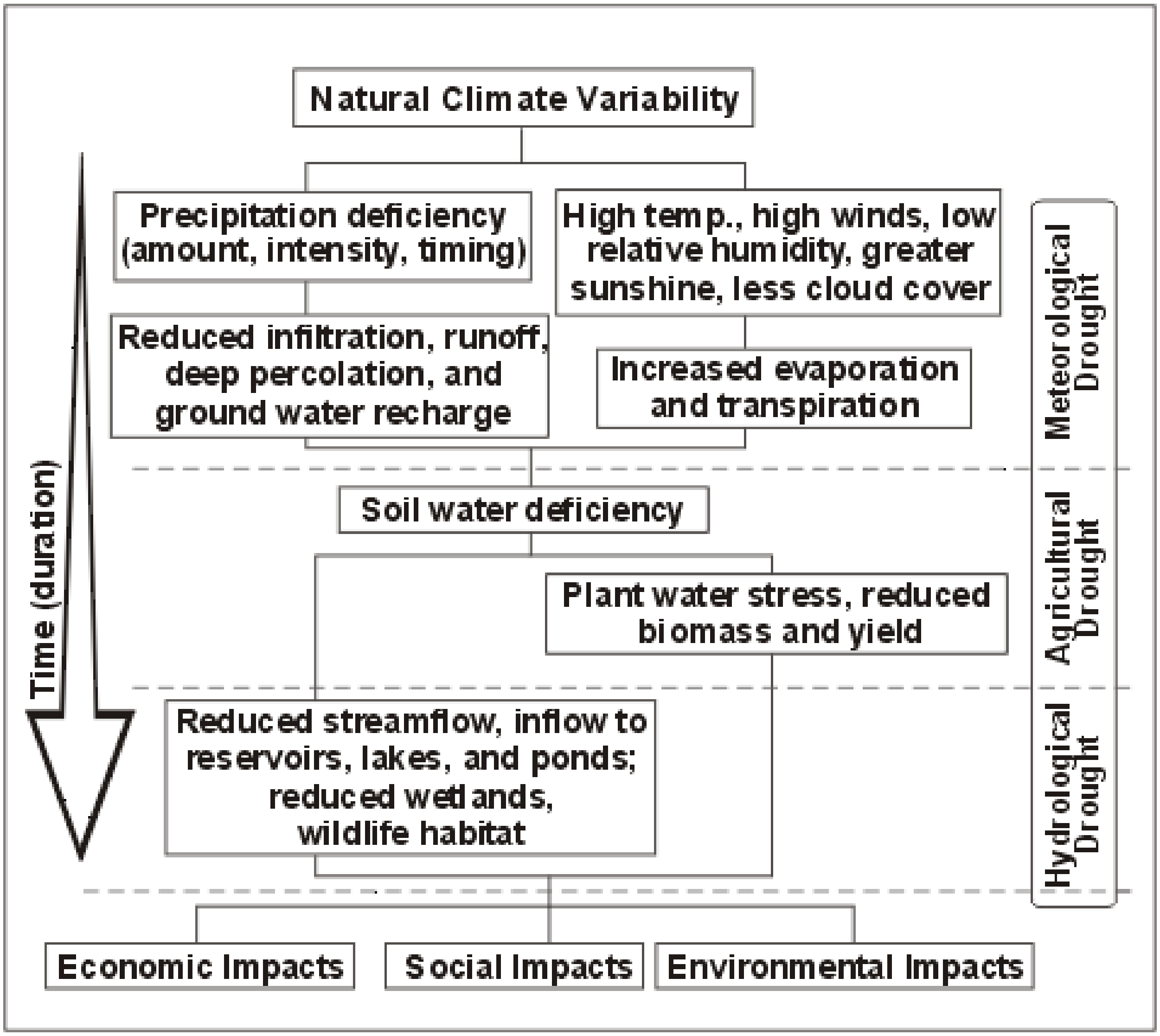
Palmer Drought Severity Index: The Palmer Drought Severity Index (PDSI) uses readily available temperature and precipitation data to estimate relative dryness. It is a standardized index that generally spans -10 (dry) to +10 (wet). Maps of operational agencies like NOAA typically show a range of -4 to +4, but more extreme values are possible. The PDSI has been reasonably successful at quantifying long-term drought. As it uses temperature data and a physical water balance model, it can capture the basic effect of global warming on drought through changes in potential evapotranspiration. Monthly PDSI values do not capture droughts on time scales less than about 12 months; more pros and cons are discussed in the Expert Guidance. The entire planning area within Los Alamos County can experience any level of the Palmer Drought Index at a given time. The current drought levels at the time of the plan update are included in **Figure 4.16**.



Meteorological drought is usually defined by a period of below average water supply.
Agricultural drought occurs when there is an inadequate water supply to meet the needs of the state's crops and other agricultural operations such as livestock.
Hydrological drought is 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 4.15. Causes and Impact of Drought

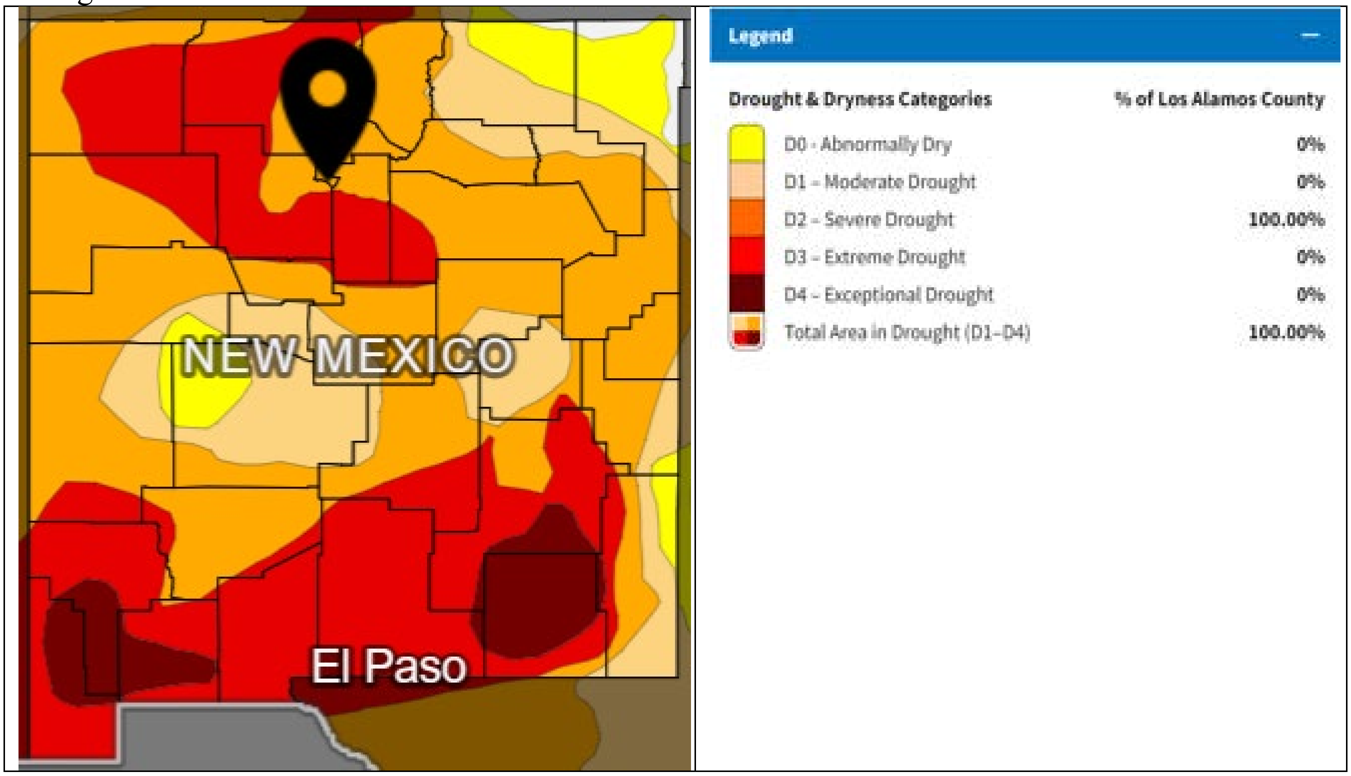


Source: National Drought Mitigation Center

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. A snapshot of the drought conditions in New Mexico as of October 20, 2022 can be found in Figure 4.16.

Figure 4.16. Current Drought Status in Los Alamos County

Drought status December 2023



* Los Alamos County highlighted by black oval Source:
US Drought Monitor

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.

Location

Droughts can occur anywhere within Los Alamos County; the entire planning area is equally susceptible to drought events.

Previous Occurrences

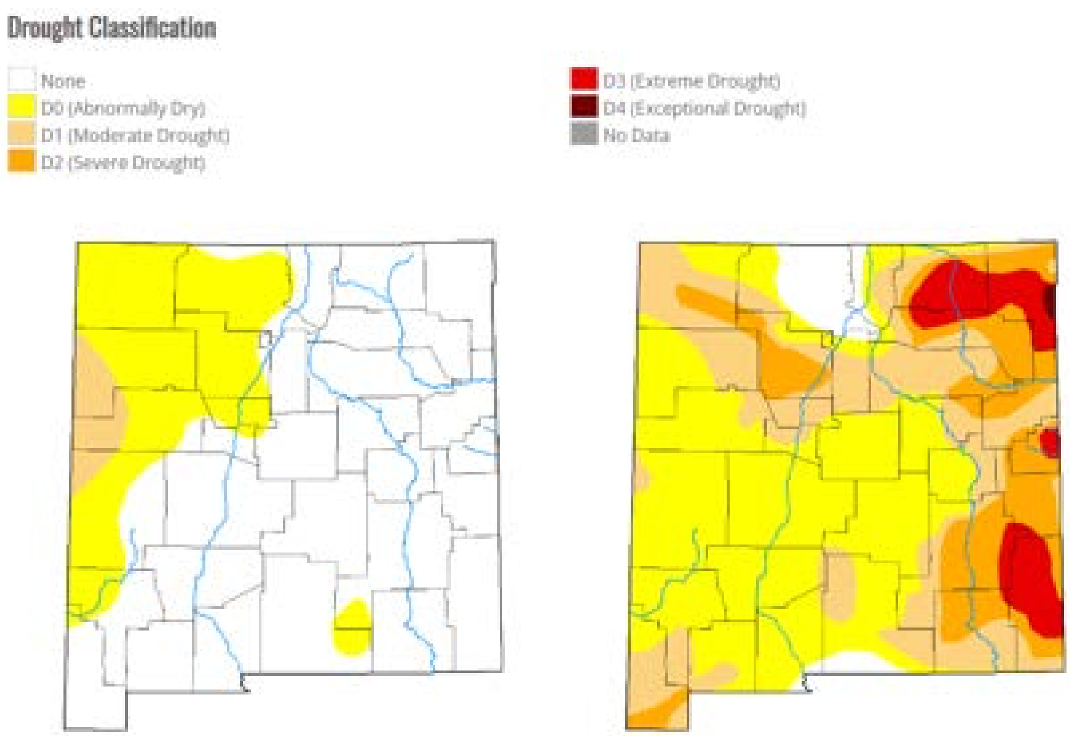
SHELDUS contains no record of drought in Los Alamos County, even though there was a federal disaster declaration for the entire state in 1977. The NCEI database shows only records from the drought that has persisted since 2011. The 2018 State of New Mexico Hazard Mitigation Plan noted the following for Preparedness Areas 2 and 3 (Los Alamos County falls in Area 3):

This area reported drought conditions from 2003 to 2014. As drought conditions persist (coupled with the extreme heat events the region is susceptible to) wildfire risk also increases. In populated areas that are already struggling with limited water resources, fighting fires becomes more difficult. Additionally, in rural communities resources to fight wildfires may be limited. As a result, the vulnerability of people and structures within the region increase significantly. Wood frame construction makes up 52% of the Preparedness Area's building inventory, elevating vulnerability even further as well as the risk of catastrophic losses of life and property. Prolonged drought can also contribute to flash flooding events if the soil is unable to absorb moisture quickly after a rain event. Additionally, reservoir levels throughout New Mexico are at their lowest levels since the mid-1970s.

Specific to Los Alamos County the HMPC identified the loss of ponderosa pine trees as an impact of ongoing drought. With longer periods between precipitation incidents, most ponderosa pine (and other fir trees) suffer from drought stress. According to Los Alamos County, anywhere from 5-10% of the ponderosa and Douglas fir trees along major roads are dead, or are showing signs of severe drought stress. Trees along roads experience more stress because temperatures are higher along the black road surface; temperatures are higher because there is no shade for the first row of trees adjacent to an open area; the first row of trees also experiences stronger wind speeds; salt used to melt ice increases drought stress by requiring the tree to transpire more water to eliminate the salt absorbed by tree roots; and often, the soil around these trees has been compacted by vehicle traffic.

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 continues. At the end of 2022 roughly 90% of the State of New Mexico was experiencing extreme or exceptional drought conditions. Los Alamos was considered in Severe Drought.

Table 4.17. New Mexico Drought History Comparison November and October 2022



Likelihood of Future Occurrences: High - Climate change has been contributing to more dry periods . Drought is occurring in Los Alamos and nationwide.

hazard, it can be extrapolated that conditions in Los Alamos County would generally correlate with this average, and that Los Alamos would suffer some level of drought conditions every ten years.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Los Alamos County is expected to experience some of the hottest temperatures in the U.S. in the coming years, which may affect cooling methods and costs. Many residents in the county rely on swamp coolers to cool their homes and businesses, which requires water to create evaporative cooling. If water lines or power go out due to extreme temperatures and/or drought, residents may be unable to adequately cool their homes and places of work. Climate change considerations will likely lead to a higher probability of future drought occurrences.

Risk Index

Hazard	FEMA Risk Index Score	Rating
Drought	N/A	N/A

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Drought	N/A	N/A	N/A	83.8 Events/Year	N/A	N/A

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 amount of energy released during an earthquake is usually expressed as a magnitude and is measured directly from the earthquake as recorded on seismographs. An earthquake's magnitude is expressed in whole numbers and decimals (e.g., 6.8). 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 is used to quantify the magnitude or strength of the seismic energy released by an earthquake. Another measure of earthquake severity is intensity. Intensity is an expression of the amount of shaking at any given location on the ground surface (see Table 4.18). Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.18. 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 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

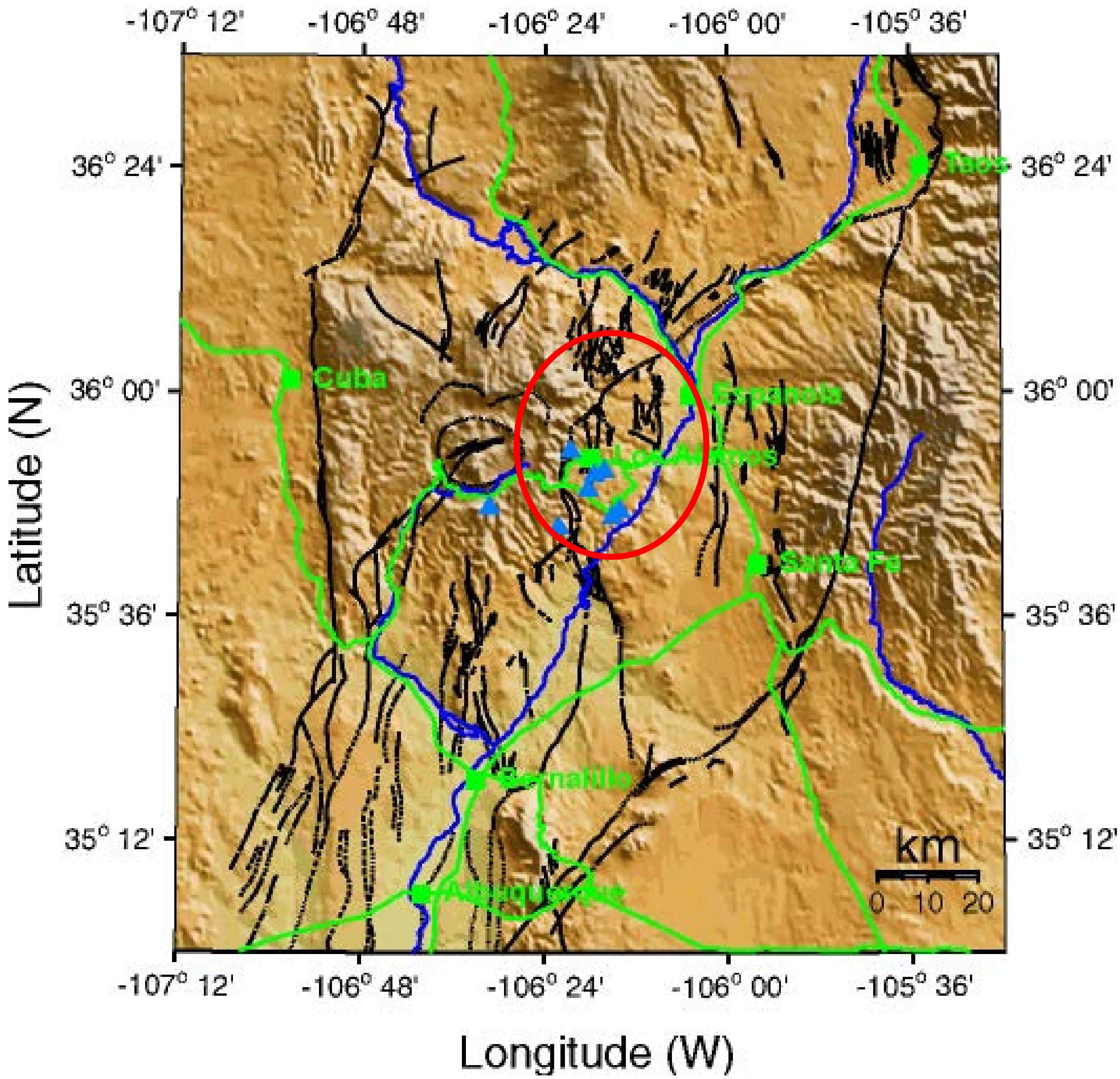
A fault is defined as "a fracture or fracture zone in the earth's crust along which there has been displacement of the sides relative to one another." For the purpose of planning there are two types of faults, active and inactive. Active faults have experienced displacement in historic time, suggesting 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.

Los Alamos lies near several major boundary faults of the Rio Grande Rift in north central New Mexico. The margin of the Rio Grande Rift in the Los Alamos 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. LANL data 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 (i.e., 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 4.18 shows the fault areas in or near the County. The red circle approximates the area of the County.

Figure 4.18. Faults in or Near Los Alamos County

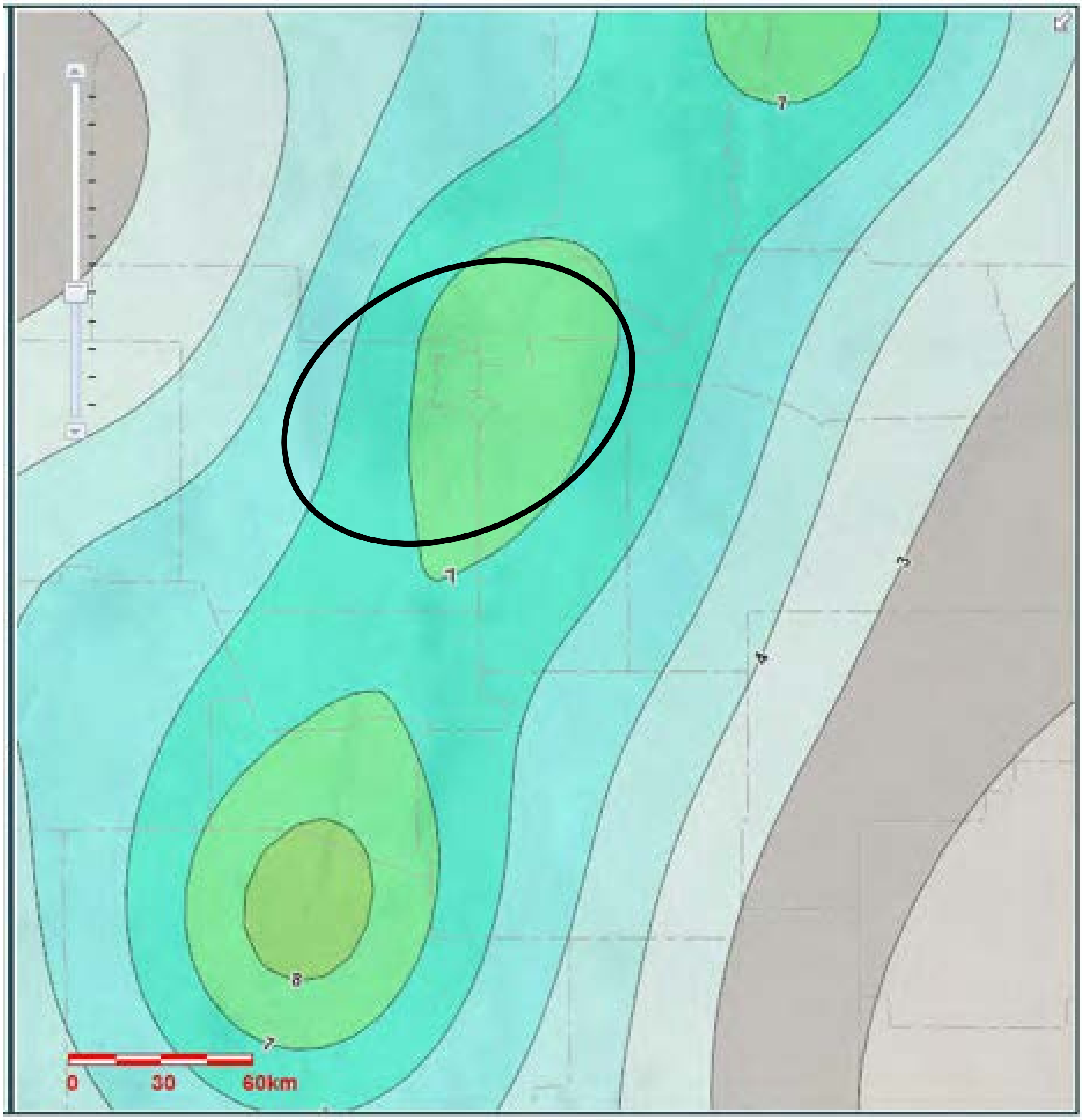


* Los Alamos County highlighted by red oval Source: Los Alamos Seismic Network

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 4.19 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 7%g area. This data indicates that the expected severity of earthquakes in the region is somewhat limited, as damage from earthquakes typically occurs at peak accelerations of 30%g or greater.

Figure 4.19. Peak Horizontal Acceleration with 10% Probability of Occurrence in 50 Years

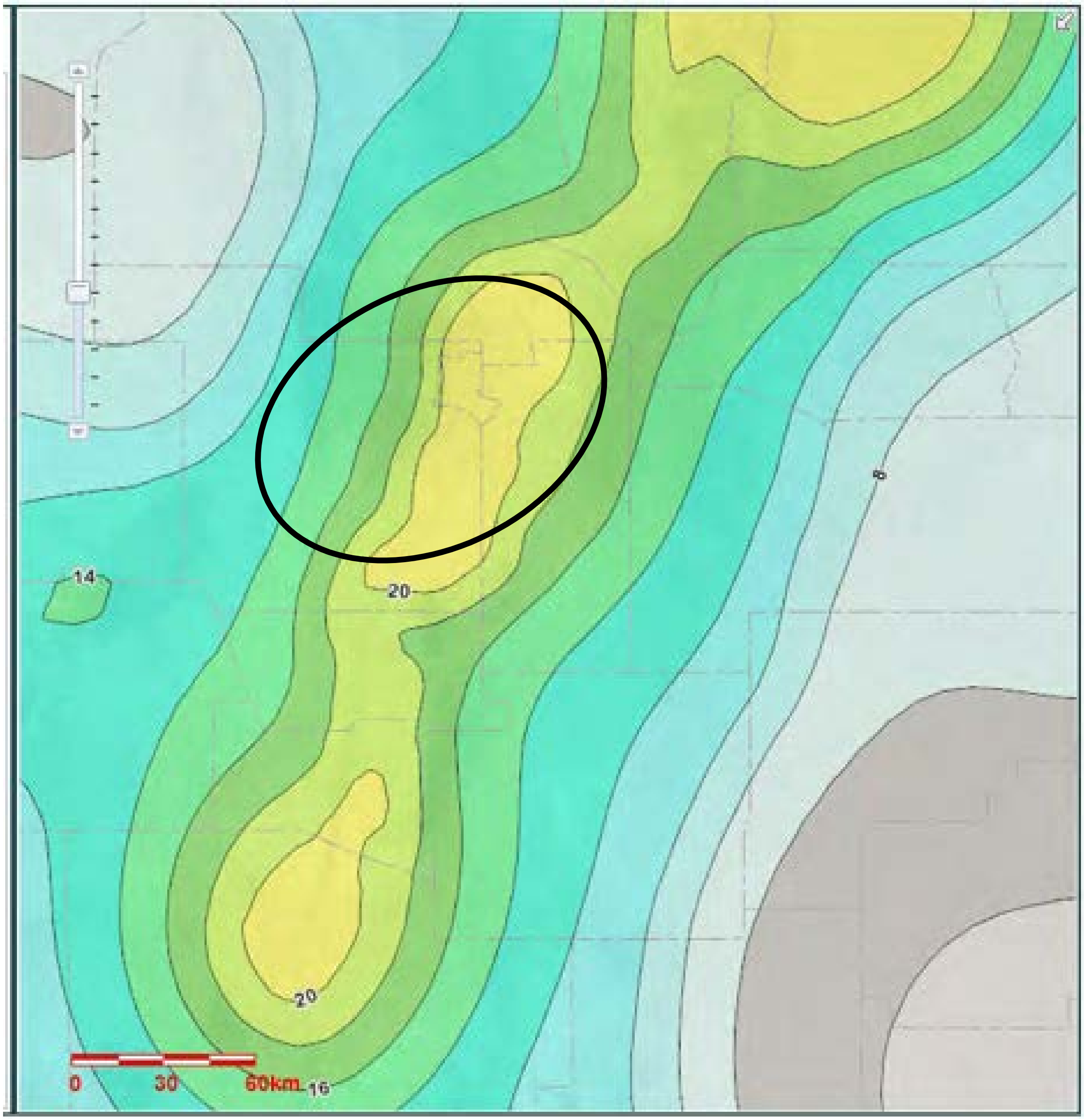


* Los Alamos County highlighted by black oval
Source: USGS National Seismic Hazard Maps - 2008 Interactive Tool. Available online at http://gldims.cr.usgs.gov/nshmp2008/viewer.htm

Figure 4.20 depicts the peak horizontal acceleration (%g) with 2% probability of exceedance in 50 years for the County. The figure demonstrates that the County falls in the 20%g area. Ground motions become structurally damaging when average peak accelerations reach 10 to 15 percent of gravity, average peak velocities reach 8 to 12 centimeters per second, and when the

Modified Mercalli Intensity Scale is about VII (18-34 percent peak ground acceleration), which is considered to be very strong (general alarm; walls crack; plaster falls).

Figure 4.20. Peak Horizontal Acceleration with 2% Probability of Occurrence in 50 Years



* Los Alamos County highlighted by black oval

Source: USGS National Seismic Hazard Maps - 2008 Interactive Tool.

Liquefaction

Liquefaction is a process whereby soil is temporarily transformed to a fluid form during intense and prolonged ground shaking. Liquefaction occurs in saturated 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. During the 2015 update there were no available maps; the likely areas prone to liquefaction would be limited within the County based on the geology of the region.

Risk Index

Hazard	FEMA Risk Index Score	Rating
Earthquake	70.5	Relatively Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Earthquake	73.1	$.57M	$.23T	.126% Chance/Year	Relatively High	Relatively Low

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.

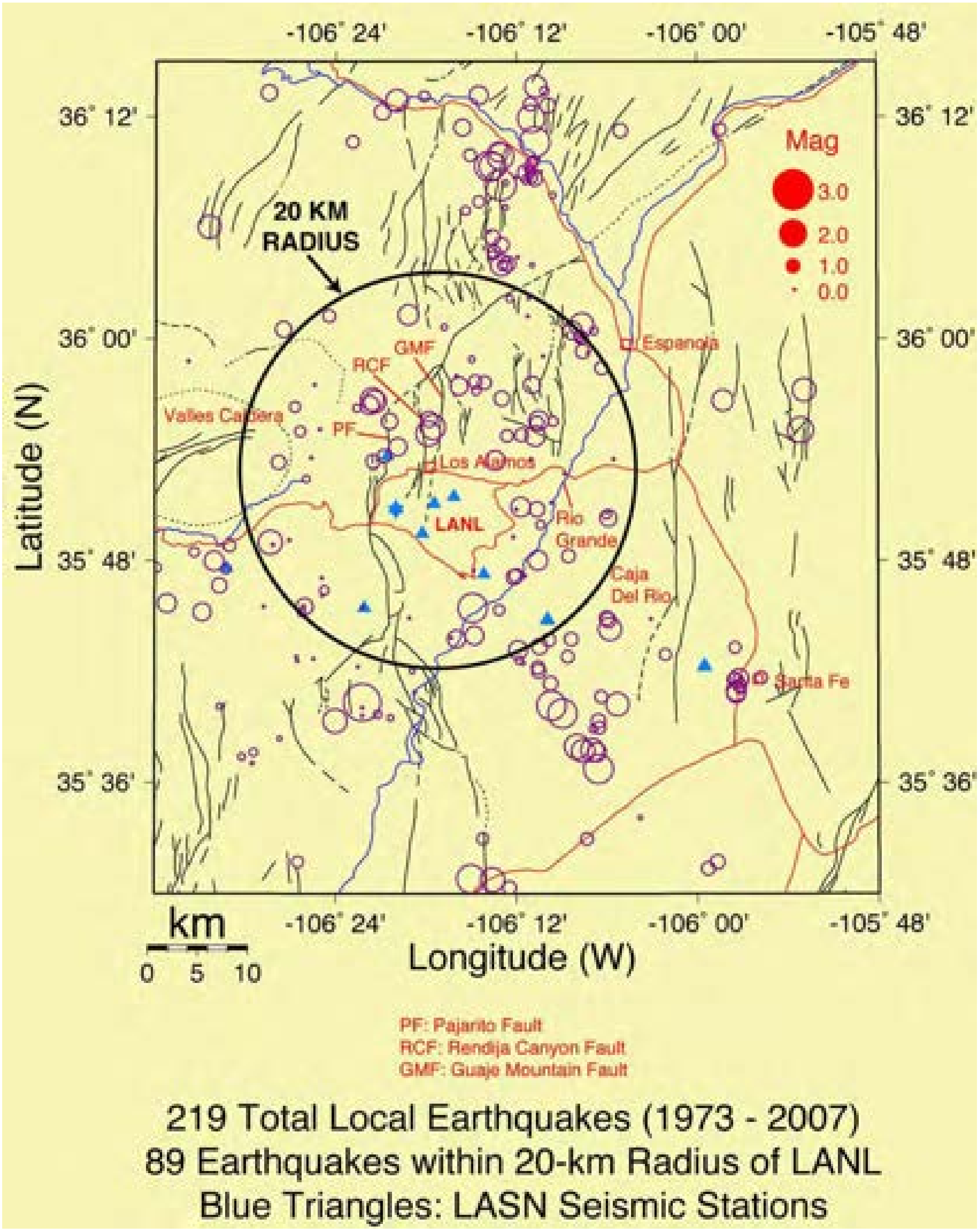
This earliest documented 6.0+ earthquake in New Mexico was in the Socorro area, in 1906, MM Intensity VII. Four rebuilt chimneys were shaken off the Socorro County Courthouse, and two others were cracked severely. Plaster fell at the courthouse, and a cornice on the northwest corner of the two-story 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. From this information, the Planning Team assumes that the earthquake could have been felt in Los Alamos.

In 1918, an earthquake with strong local effects in nearby Santa Fe County, where people in the village of Cerrillos were thrown off their feet and fallen plaster was reported (intensity VII - VIII).

The Los Alamos Seismic Network (LASN)—The Los Alamos Seismograph Network is located in North-Central New Mexico, about 60 miles north of Albuquerque. 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.

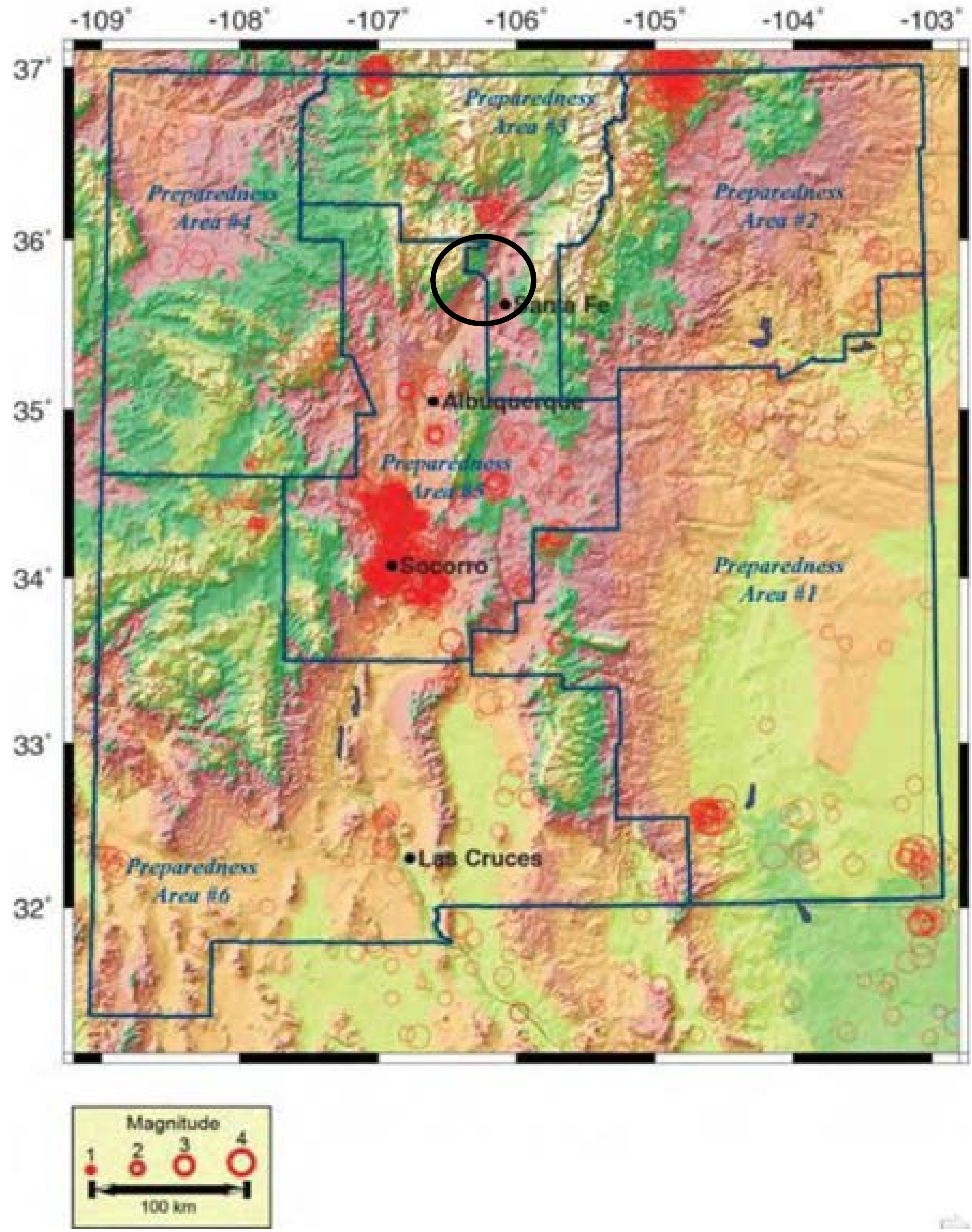
Figure 4.21 shows the earthquake activity within the Los Alamos area from 1973-2007 from the Los Alamos Seismic Network. It is a close up view of earthquake activity near the County. Figure 4.22 is from the 2013 New Mexico State Hazard Mitigation Plan and shows a broader picture of earthquakes in both the Planning Area and the State.

Figure 4.21. Earthquakes in the Los Alamos Area 1973-2007



Los Alamos County highlighted by black oval Source:
Los Alamos Seismic Network

Figure 4.22. Earthquakes in New Mexico 1962-2012



Los Alamos County highlighted by black oval
Source: 2018 New Mexico State Hazard Mitigation Plan

Since the establishment of LANL during the early 1940's, there have been seven earthquakes felt by the residents of LAC. The largest of these were a magnitude 4 (Richter) in 1952 and a magnitude 3.3 in 1971, both reported as Modified Mercalli Intensities of V in Los Alamos. More recently, in 1991 and 1998, LAC experienced very small magnitude earthquakes (M<2) with unusually high Modified Mercalli Intensities up to V, indicating significant felt effects. This is due to the unusually shallow nature of these earthquakes. Two of these earthquakes happened on the same day in 1991; the other earthquake occurred in 1998. The areas where residents felt the quakes are built on a thick package of old, alluvial material deposited atop the Bandelier tuff or on artificial fill. Residences built directly on the tuff area were far less likely to feel the small quakes. Although the County has felt ground shaking from earthquakes with epicenters located elsewhere, no major earthquakes have been recorded within the County. There have been no disaster declarations in the County for earthquakes.

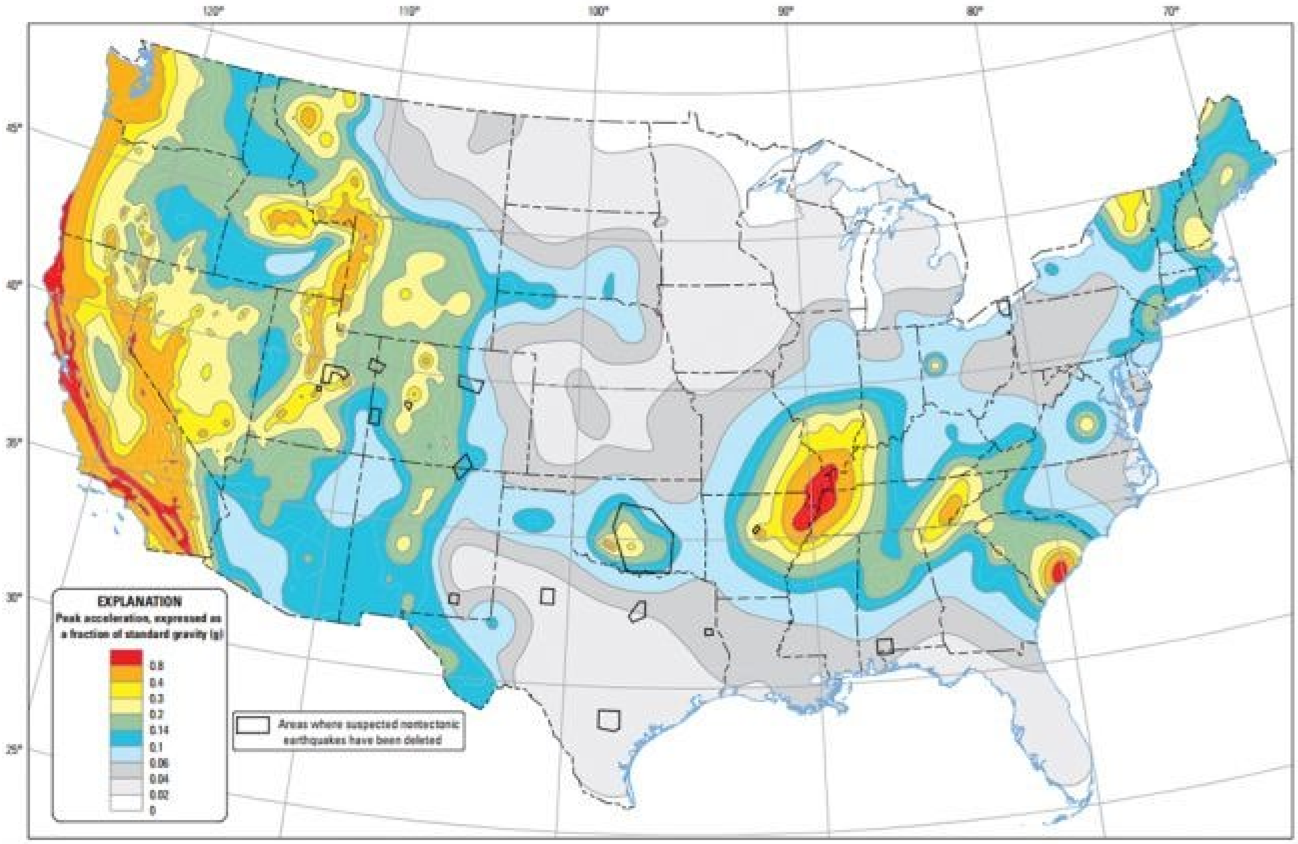
Likelihood of Future Occurrences

Low – 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 LAC. LANL has prepared seismic hazard assessments for the purposes of critical and lifeline facility risk assessments. Based on these studies the seismic hazard for LAC is significantly higher than what is presented in the USGS National Map hazard. The map is shown in Figure 4.23 and indicates that Los Alamos County has a lower risk of earthquake occurrence, which coincides with the likelihood of future occurrence rating of medium.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change is not expected to impact the earthquake risk directly nor the probability of future events or increase the severity of impacts for this hazard. This section is included as required by FEMA's Local Mitigation Plan Review Tool 44 CFR § 201.6; B1-e [44 CFR § 201.6(c)(2)(i))].

Figure 4.23. Probability of Earthquake Magnitudes Occurring in 30 Year Time Frame



Source: www.americangeosciences.org/critical-issues/maps/national-seismic-hazard-map

Flood: 100/500-year and Localized Flooding

Hazard/Problem Description

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. 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 life safety issues. Floods can be extremely dangerous, and even 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 also break utilities lines and interrupt services. Standing water can cause damage to crops, road, foundations, and electrical circuits. 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.

Health Hazards from Flooding

Certain health hazards are also common to flood events. While such problems are often not reported, three 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 also 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.

The second type of health problem arises after most of the water has gone. Stagnant pools 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.

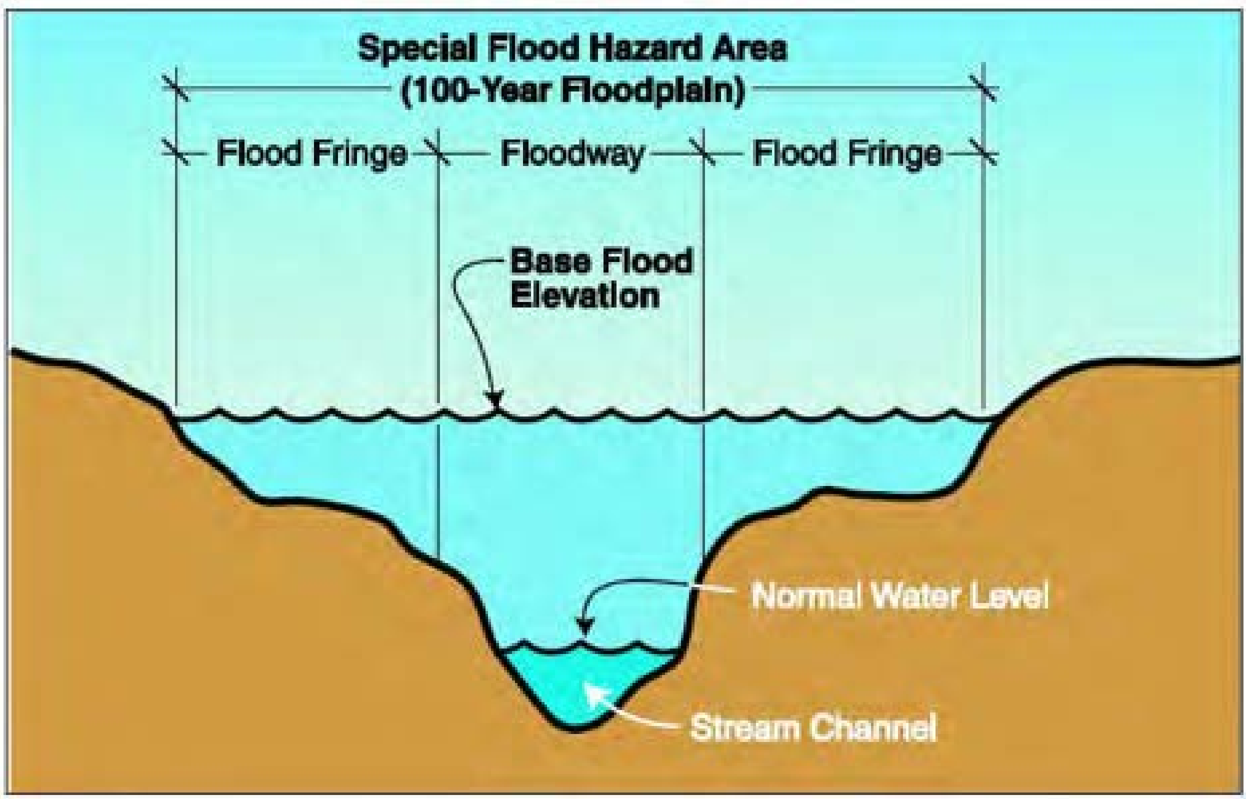
The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and irreplaceable keepsakes destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a 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.

100-/500-year Flooding

Floodplains

The area adjacent to a channel is the floodplain (see Figure 4.24). 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 that 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 4.24. Floodplain Definitions



Source: 2013 New Mexico State Hazard Mitigation Plan

According to the 2011 Flood Insurance Study for Los Alamos County, the County is minimally flood prone, with the primary threat being flash floods. Monsoon season in New Mexico starts in June and lasts through mid-September. It is characterized by heavy to severe downpours, lasting anywhere from five minutes to an hour. Such downpours can create flash floods.

The Los Alamos 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 Section 4.2.6). 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 Los Alamos 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 Los Alamos 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.

Major Sources of Flooding

Los Alamos County encompasses multiple rivers, streams, creeks, and arroyos. During most of the year, these watercourses are often dry. Damaging floods in Los Alamos County occur primarily in the developed areas of the County. Flood flows generally follow defined stream channels, drainages, and watersheds. 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 4.2.12.

Localized Stormwater/Flash Flooding

Localized, stormwater flooding also occurs throughout the County. 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 occur over areas of development or wildfire burn areas

According to Los Alamos County, numerous parcels and roads throughout the County not included in the FEMA 100- and 500-year floodplains are subject to flooding in heavy rains. In addition to flooding, damage to these areas during heavy storms includes pavement deterioration, washouts, mudslides, debris areas, and downed trees. The frequency and type of damage or flooding that occurs varies from year to year, depending on the quantity of runoff. As of 2023 the County currently does not have maps of these problem areas, but 13 sites had damage that were identified as eligible for FEMA Public Assistance following the September 2013 flooding. These sites include:

Los Alamos Airport
Bayo Canyon
Camp May Road
Entrada Pond
Guaje Canyon
Los Alamos County Landfill
North Road Drainage
PCS Pond
Quemazon Drainage
Guaje Canyon Road
School Canyon Drainage
Upper Rendija Canyon and access through San Illdefonso land to NM 502
White Rock Visitors

As roads have a history of flooding, some pavement deterioration, undermining, washouts and debris deposits have occurred. Additional problem areas include:

West Road
Unpaved road leading to reservoir
Maple Drive in Ponderosa Estates
Sewer Road to the Wastewater Treatment Plant

Extent

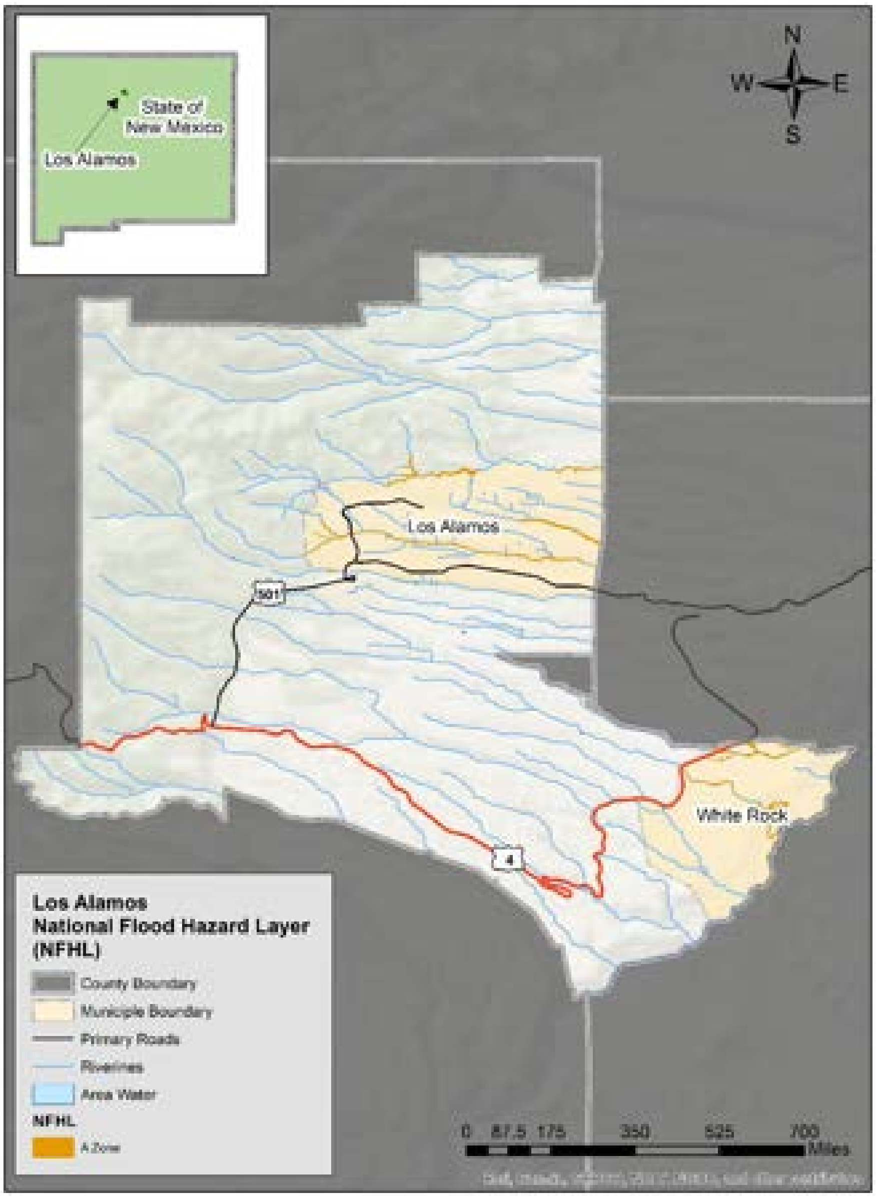
According to the National Weather Service (NWS) flood levels definitions are described as:
-Action Flooding represents the level where the NWS or a partner/user needs to take some type of mitigation action in preparation for possible significant hydrologic activity**.**
-Minor Flooding is defined to have minimal or no property damage, but possibly some public threat. A FLOOD ADVISORY product is issued to advise the public of flood events that are expected not to exceed the minor flood category.
-Moderate Flooding is defined to have some inundation of structures and roads near the stream. Some evacuations of people and/or transfer of property to higher elevations may be necessary. A FLOOD WARNING should be issued if moderate flooding is expected during the event.
-Major Flooding is defined to have extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary. A FLOOD WARNING should be issued if major flooding is expected during the event.

Based on historic occurrences Los Alamos County has experienced 4 of these minor flood events, although no moderate or major events have been recorded some low lying areas throughout the county could experience more significant events in the future. Due to a limited history of flood occurrences in Los Alamos County and a lack of inundation analyses, no flood depth data is currently available for the county.
Flood Inundation Mapper (usgs.gov)

Flood Maps

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

Los Alamos National Flood Hazard Layer (NFHL) map 2023:



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 Los Alamos County FIS is dated July 18, 2011. This study covers the entire County. As of the 2023 HMP update the 2011 data remains the most recent available.

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. DFIRM maps for greater Los Alamos County and the townsites of Los Alamos and White Rock can be found in Section 4.36.

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 basemaps;
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 July 2011 for Los Alamos County were released and are used for this plan's flood hazard analysis.

Risk Index

Hazard	FEMA Risk Index Score	Rating

Riverine Flooding	12.2	Very Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Riverine Flooding	17.5	$47k	$.59B	0.5 Events/Year	Relatively Low	Very Low

Previous Occurrences

Historically, portions of Los Alamos 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 the 100-year floodplain and in other localized areas. Past events and descriptions from the NCEI database are as follows.

June 2, 2000—Heavy showers developed over the southern sections of the Cerro Grande Burned area. Ash and debris from Water and Pajarito Canyons blocked Highway 501 just south of Los Alamos. No property damage estimates were available. No injuries or deaths were reported.

June 28, 2000—Heavy ash and debris swept off the Cerro Grande Burn area into Water and Pajarito Canyons during heavy rain of 1 inch just west of Los Alamos. No property damage estimates were available. No injuries or deaths were reported.

July 16, 2000—Heavy rain over sections of the Cerro Grande burned area produced heavy mud and debris flow that swept through Garcia Canyon passing from Los Alamos County east into Rio Arriba County and reaching to the Rio Grande River in Santa Fe County. No property damage estimates were available. No injuries or deaths were reported.

August 28, 2000—Heavy storm water runoff flooded Guaje and Garcia Canyons below the Cerro Grande Burn area during a burst of 1 inch rainfall. No property damage estimates were available. No injuries or deaths were reported.

July 2, 2001—A storm with heavy rain of 1 to 2 inches in an hour developed over Pueblo Canyon on the west edge of Los Alamos. Storm runoff from the burned forest was brief, but intense with water and mudflows estimated at 1,500 cubic feet per second, which overwhelmed the inlet structure west of North Road and then breached the street 60 feet above. A 150-yard section of road surface was destroyed and one of the city's main sewer lines was undercut and then broken. Debris filled the basements of at least five homes along Alabama Avenue. The total damage estimate for this event was $3.5 million. No injuries or deaths were reported.

August 11, 2001—Brief heavy rain and strong runoff caused more damage to North Road in Los Alamos where recent drainage upgrades and repairs were washed away. North Road continued to suffer damage with such rapid and high runoff from the burned areas of Pueblo Canyon which had not recovered from the Cerro Grande fire storm. $100,000 in property damage occurred as a result of the flooding. No injuries or deaths were reported.

August 4, 2008—A southerly flow of moist, unstable air poured into New Mexico, causing a few reports of flash flooding and large hail in the Jemez Mountains. Boulders and several rock slides poured onto Route 4 between White Rock and the Bandelier National Monument due to heavy rain. $10,000 in property damage occurred as a result of the flooding. No injuries or deaths were reported.

August 3, 2011—One of the most active monsoonal days occurred on August 3rd, with heavy rains noted across much of the state. However, the biggest impact came to the recently burned areas, particularly to the Las Conchas and White Fire burn scars. A few storms also reported severe wind gusts in outflow boundaries, including around White Sands Missile Range. Both Highway 4 and 501 were closed in the Jemez Mountains due to flooding. Heavy rains on the Las Conchas burn scar caused significant runoff and debris flow over the roadways. At least a 50 yard stretch of debris several inches deep was noted along State Highway 501. Both roads had to be cleared by the Highway Department before traffic was allowed to pass. No property damage estimates were available. No injuries or deaths were reported.

August 21, 2011—Flash flooding in the County resulted in a federal disaster declaration (DR- 4047). Early in the afternoon, showers and thunderstorms developed over the central and northern portions of the burn scar. These storms generally produced 1 to 2 inches of rainfall. Later in the afternoon and early evening, even stronger and very slow moving storms developed across the southern portions of the burn scar. Radar estimated 3 to 4 inches of rain across a widespread area. Flash flooding was reported with each of these storms. The storms moved eastward over Santa Fe in the evening, and produced additional flooding. 1 to 1.5 inches of rain fell on the northern portion of the Las Conchas burn scar, flash flooding was reported in Santa Clara Canyon. Four people that were working in the canyon had to be rescued by helicopter. Water and debris flowed over Highway 501 after approximately one inch of rain fell over central portions of the Las Conchas burn scar. The highway was temporarily closed. The total damage estimate for this event was $6.0 million. No injuries or deaths were reported.

July 11, 2012—An upper level high pressure system shifted westward centering over portions of Utah and western Colorado. With sufficient moisture as well as instability, storms initially developed over northern portions of the state during the afternoon hours. These storms increased in coverage into the early evening with general storm motions toward the west and southwest. The thunderstorms, though not severe, did produce significant amounts of rainfall in very short time durations. This led to flooding of the Las Conchas Fire burn scar as the storms moved from north to south covering the entire burn scar. Mud, logs and large rocks washed onto State Road 501 (West Jemez Rd.) near State Road 4, as well as in Los Alamos Canyon and along Camp May road. The intersection of State Road

4 and State Road 501 was closed due to flash flooding. Heavy equipment and road graders were needed to clear the debris. $50,000 in property damage occurred as a result of the flooding. No injuries or deaths were reported.

September 13, 2013—Flash flooding in the County resulted in a federal disaster declaration (DR-4079). Flooding developed at Los Alamos National Labs as an isolated thunderstorm formed directly overhead and remained nearly stationary for an extended period of time. Power outages as well as flooding in the basement at Los Alamos National Labs were reported. An isolated strong cell formed over the area and stayed generally stationary for 2 hours. Rainfall amounts over 1.5" were recorded at sites across LANL. No injuries or deaths were reported. Property damages were reported at 13 sites including noted previously and described in the text and photos that follow:

Figure 4.25. West Holding Pond at Pajarito Cliffs Site

Source: Los Alamos County

Figure 4.26. Six-Foot Deep Gravel and Mud Covering Drainage Inlet at Ponderosa Estates.

Source: Los Alamos County

Figure 4.27. Timber, silt and debris blocking box culvert inlet on North Road

Source: Los Alamos County

Figure 4.28. Airport Retention Pond Sediment

Source: Los Alamos County

Figure 4.29. Landfill Sedimentation Pond Erosion

Source: Los Alamos County

Figure 4.30. LANL Remediation Site Sediment

Source: Los Alamos County

Figure 4.31. Damage to Retaining Wall at ECO Station

Source: Los Alamos County

Figure 4.32. Debris/Fence Damage at Airport

Source: Los Alamos County

During this flood event, the Los Alamos Reservoir filled with silt and debris and the access road was washed out and the underlying waterline exposed and damaged. The estimated cost to repair was $2.4 million.

Figure 4.33. Debris at Los Alamos Reservoir Spillway

Source: Los Alamos County

Figure 4.34. Sediment Filled Reservoir

Source: Los Alamos County

Other damages associated with the storm include:

Rendija Canyon Road – San Ildefonso Access – $50,000
The road to the Guaje Canyon well field has washed out in several locations, and access to Guaje Canyon from the east end of Rendija Canyon Road (San Idefonso) allows for a more economical means of mobilizing equipment to the well field.
Manhattan Loop Sewer Project – $40,000
Ongoing sewer reconstruction project in Pueblo Canyon was inaccessible after the flooding when the road washed out.
Composting Facility Project – $10,000
Ongoing project to construct a composting facility experienced large amounts of erosion damage.
Guaje Canyon – $2.25 million
The road has washed out in several locations, waterline has been exposed/damaged, one concrete low water crossing has been damaged beyond repair, and multiple low water crossings will require significant repair and armoring.

Table 4.19. Flooding Events in Los Alamos County 2000 to 2022

Date	Hazard Type	Injuries	Fatalities	Property Damage	Crop Damage	Remarks
7/2/2001	Flooding	0	0	$3,500,000	$0	
8/11/2001	Flooding	0	0	$100,000	$0	
8/4/2008	Flooding	0	0	$10,000	$0	Flash Flood
8/21/2011	Flooding	0	0	$6,000,000	$0	
08/12/2022	Flooding	0	0	0	0	Flash Flood
Total		0	0	$9,610,000	$0	

Source: SHELDUS

Likelihood of Future Occurrences

100-Year Flood

Low—The term "100-year flood" is misleading. It is not the flood that will occur once every 100 years. Rather, it 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.

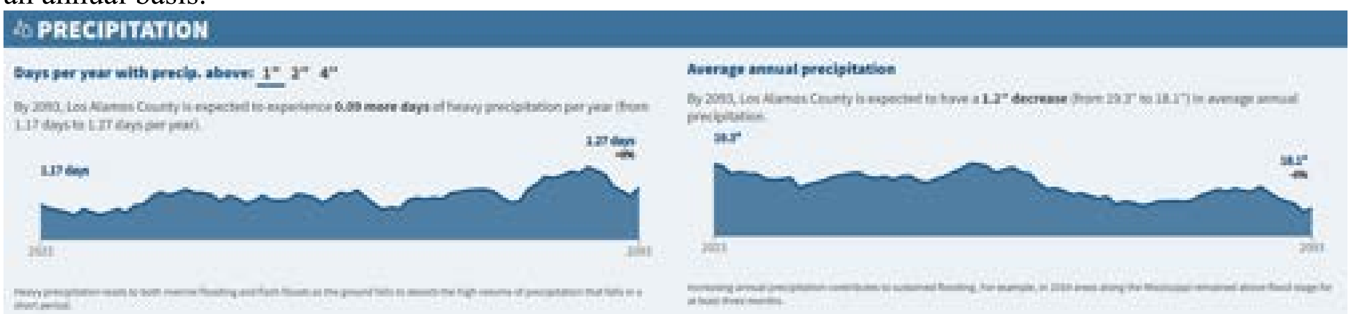
500-Year Flood

Low—The 500-year flood is the flood elevation or depth that has a 0.2 percent chance of being equaled or exceeded each year. There is no area of the County that falls in the FEMA 500-year floodplain.

Localized Stormwater/Flash Flooding

High—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. Los Alamos County falls in Preparedness Area 3, which the State determined had a 33% chance of flash flooding occurring in a given year.

Effects of Climate Change on Severity of Impacts: Heavy precipitation leads to riverine flooding and flash floods as the ground fails to absorb the high volume of precipitation that falls in a short period. Increasing annual precipitation contributes to sustained flooding. (Neighborhoods At Risk, 2023). According to 70 year projections provided via Neighborhoods at Risk Los Alamos County could expect .09 more days of heavy precipitation with an expected overall decrease of 1.2’’ of total precipitation on an annual basis.



Landslides and Rockfall

Hazard/Problem Description

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.

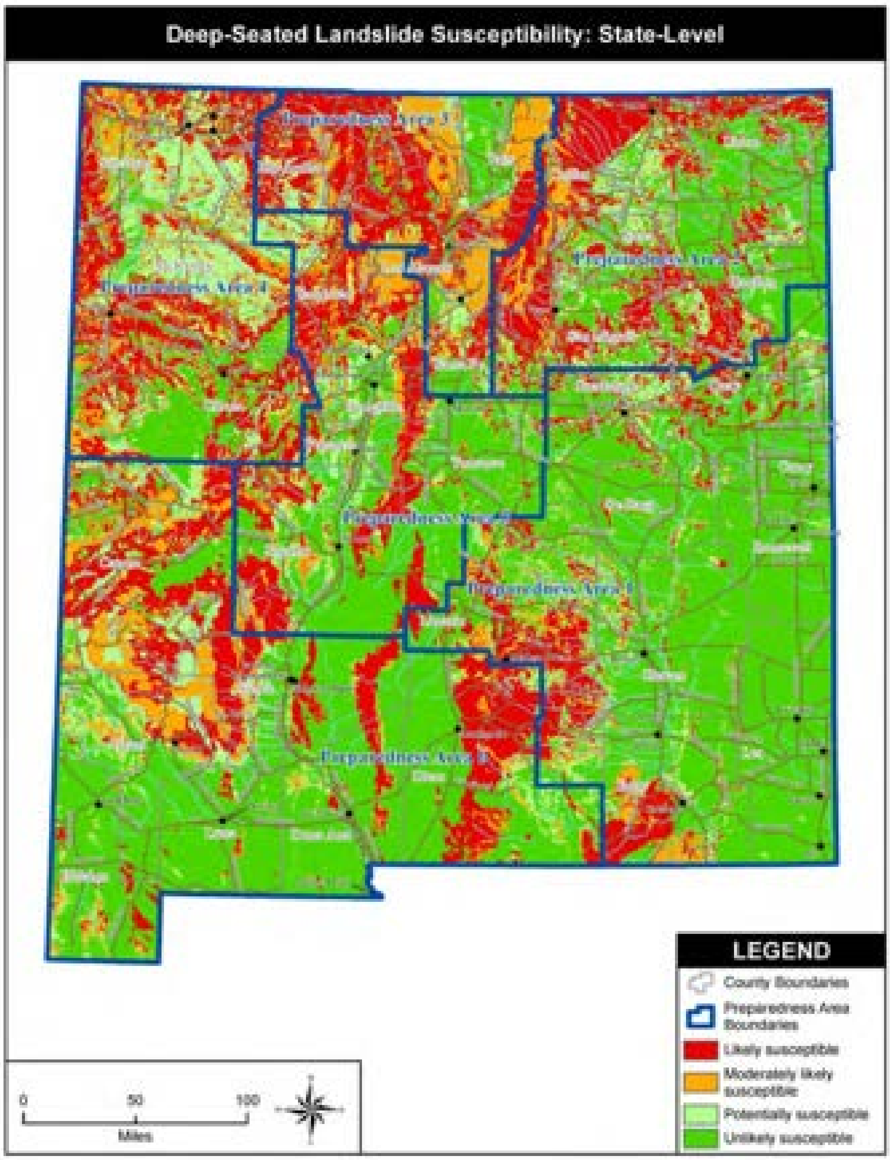
Landslide and debris flow problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides and debris flows. Land-use zoning, professional inspections, drainage and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

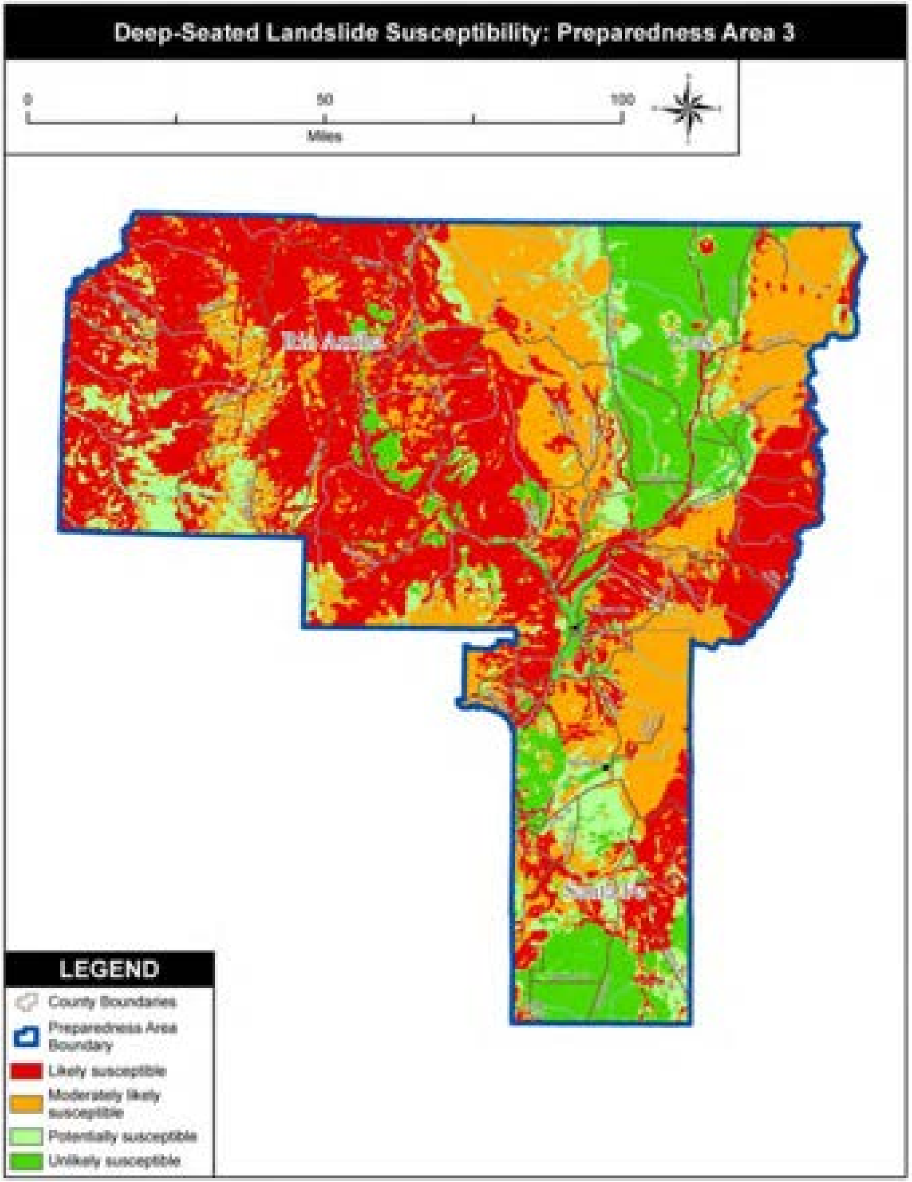
The USGS National Atlas landslide map is the best available landslide hazard mapping data for the County. The map in Figure 4.35 shows the Rio Grande River as being potentially susceptible. This area has little or no development. What is not shown on the map are areas prone to rockfall on the sides of the mesas, or areas susceptible to debris flow from wildfire burns.

New Mexico Landslide Susceptibility



Source: New Mexico State Hazard Mitigation Plan 2018

Preparedness Area 3 Landslide Susceptibility



Source: New Mexico State Hazard Mitigation Plan 2018

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 such as telephone lines, 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. Landslides can be classified using the Alexander Scale, as shown in Table 4.20.

Table 4.20 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

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.

Risk Index

Hazard	FEMA Risk Index Score	Rating
Landslide	16.7	Relatively Low

Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Landslide	$36.7	$22k	$0.15T	0 Events/Year	Very Low	Relatively Low

Previous Occurrences

According to the HMPC, past rockfalls in the area have primarily occurred along State Highway 502, which is maintained by the State Department of Transportation, and in the area of the switchback located along State Route 4. Depending on the severity of an incident, blockages may last from hours to days.

There are a few other areas within the County that also experience some minor rockfall occurrences. The steep canyons that lace Los Alamos County can produce rockfall hazards, but only the occasional hiker may be at risk since the valley floors are largely undeveloped. One documented rockfall fatality is associated with the naming of the "Deadman Trail" in Los Alamos Canyon. This trail was named for a 1930's homesteader who was killed by a rockfall while working on the trail.

Although, historically, there have been few reported injuries and little property damage associated with the rockfall hazard in LAC, the potential for damages in the future remains. In addition to potential damages to people and property, the greatest potential impact from rockfalls is the impact to transportation routes. The HMPC did not have records of past damaging landslide events. Although specific documentation is not available, debris flows and erosion/deposition associated with increased runoff in wildfire burn areas have been witnessed in recent years.

Likelihood of Future Occurrences

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

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change will increase the incidence of extreme weather and precipitation events and change weather patterns. It is likely that increased and prolonged precipitation events may be a catalyst for landslides in certain areas. Further analysis and studies need to be conducted, specifically for this region.

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.

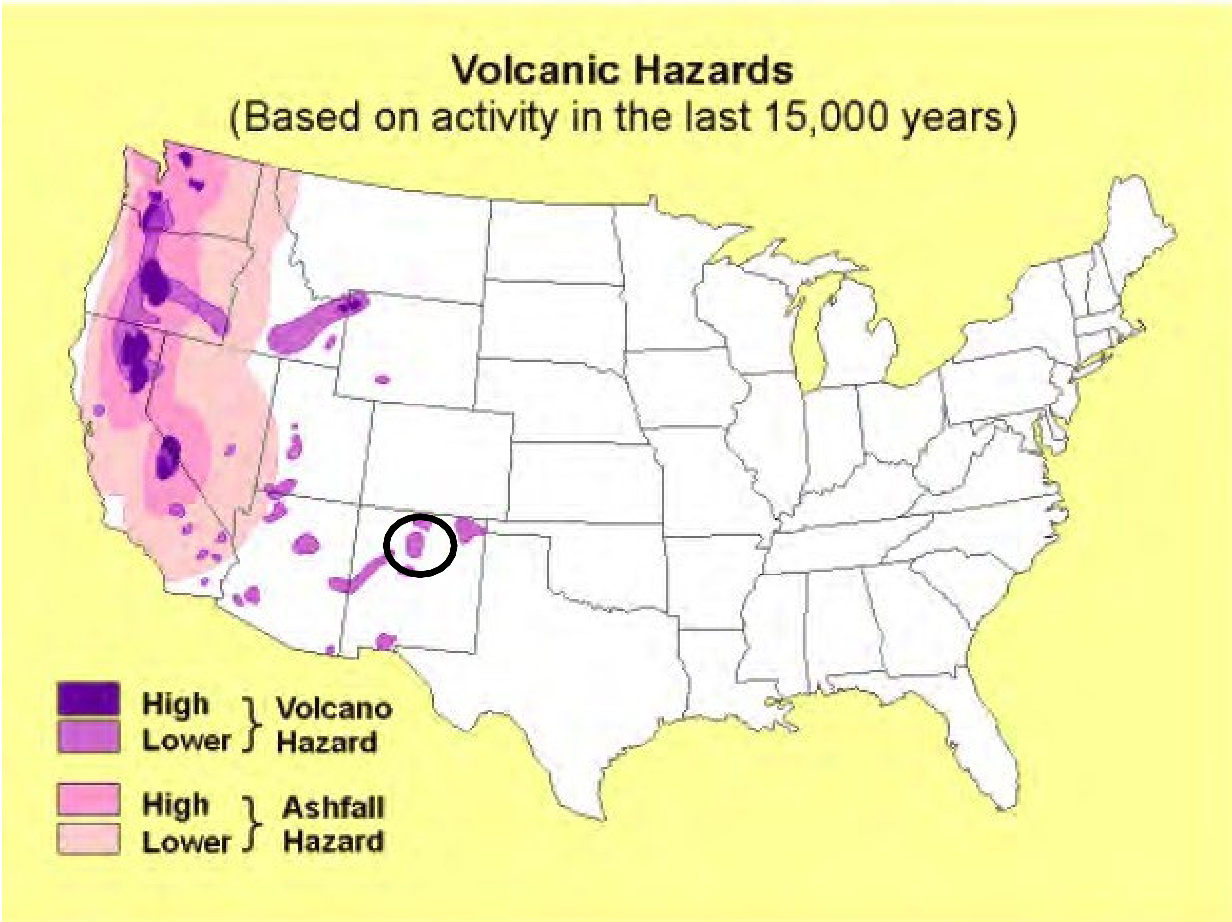
Populations living near volcanoes are most vulnerable to volcanic eruptions and lava flows, although volcanic ash can travel and affect populations many miles away and cause problems for aviation. The USGS notes specific characteristics of volcanic ash. Volcanic ash is composed of small jagged pieces 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.

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 US



* Los Alamos County highlighted by black oval
Source: 2013 and 2018 New Mexico State Hazard Mitigation Plan

Risk Index

Hazard	FEMA Risk Index Score	Rating
Volcanic Activity	85.9	Relatively Low

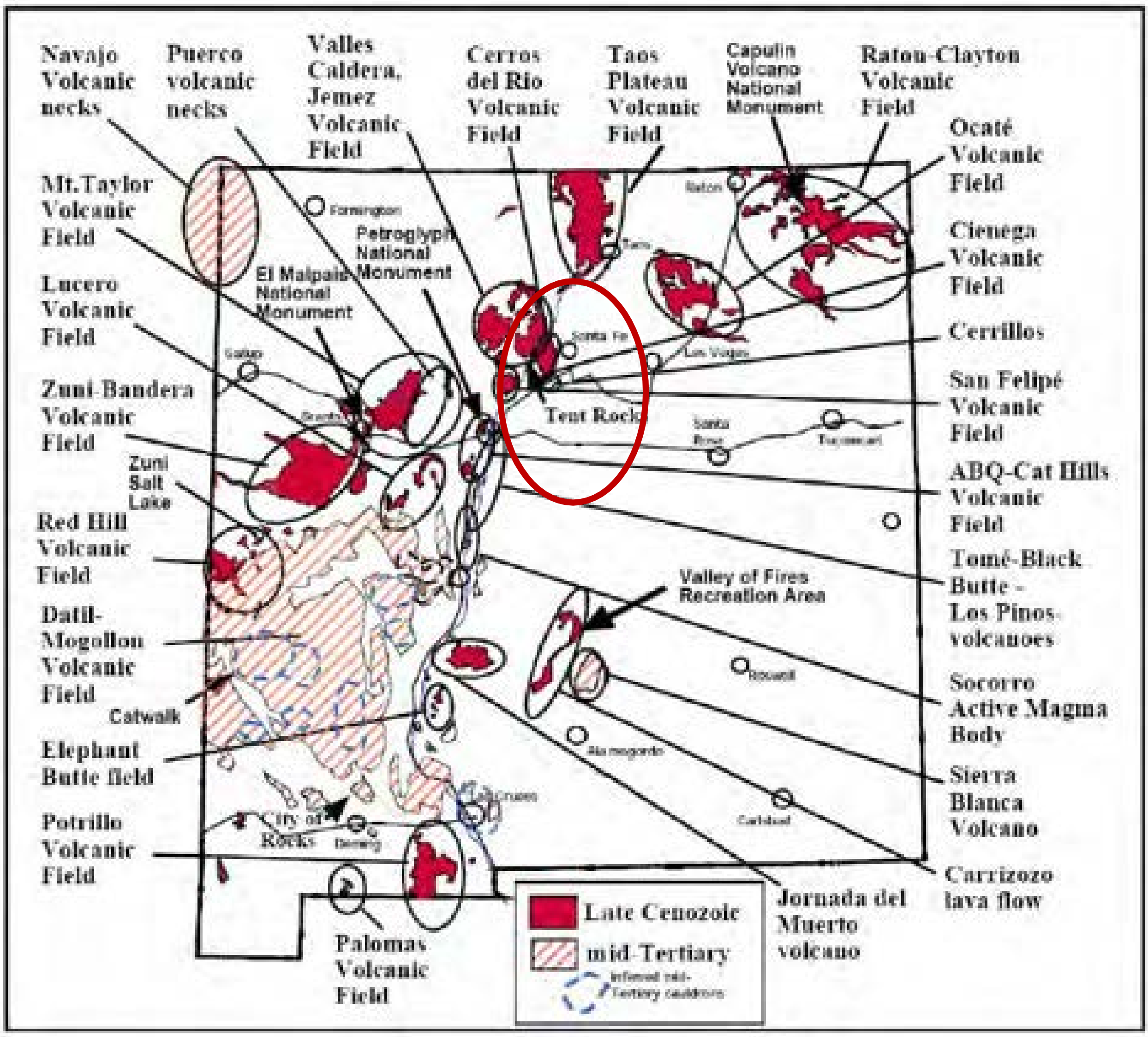
Expected Annual Losses

Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Volcanic Activity	N/A	N/A	N/A	N/A	N/A	N/A

Previous Occurrences

New Mexico has one of the greatest concentrations of young, well-exposed, and un-eroded volcanoes on the continent. This can be seen on Figure 4.37. The Jemez Mountains, located to the northwest of Los Alamos County and circled in red, are a volcanic field that overlies the west edge of the Rio Grande rift.

Figure 4.37 Volcanic Areas of New Mexico



* Los Alamos County highlighted by red oval
Source: http://nmnaturalhistory.org/sci_volcanoes.html

This volcanic field, which is located in and near Los Alamos County, is best known for the Valles Caldera (see 8). 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.

Figure 4.38 Mesas and Valles Caldera

This view is looking west across the dissected Bandelier Tuff of the Pajarito Plateau. The view looks across the lava domes and composite cones of the pre-2-million-year Jemez volcanic field (middle) into the Valles caldera. The grassy area, located at the center top, is the southeast quarter of the caldera. The Los Alamos townsite is in the foreground.

During these events over 90 cubic miles of ash/rock spewed out, forming the Bandelier tuff (see Figure 4.40). 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.

Figure 4.39 Looking west towards the Los Alamos National Laboratory, up a Canyon

The skyline is the topographic rim of the Valles Caldera. The cliffs on the right are Bandelier Tuff, and the layers represent the two major eruptions of the tuff, and different cooling rates in each tuff deposit. The center of an ash-flow tuff sheet cools slower than the top and bottom, so its fragments of volcanic glass become welded to each other. This rock is massive and strong, unlike the unwelded ash-flows and air-fall tuffs, which can commonly be crumbled by hand. So, the center of an ash-flow tuff holds up cliff tops, and the top and bottom tend to form slopes.

Figure 4.40 Bandelier Tuff, Jemez Canyon

The pale rock here is Bandelier tuff, erupted from the Valles Caldera. The cliff-forming layers are the centers of ash-flows, and the slopes are weaker rock from the tops and bottoms. Beneath the Bandelier tuff are red shales and sandstones of the Permian aged Abo formation, and brown limestone of Pennsylvanian age. Some of the white patches on the hillside are hot-spring deposits – with heat courtesy of the Valles volcano. This scene is near Jemez Pueblo and the Soda Dam hot springs.

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. Researchers from LANL estimate that the most recent volcanic activity ended 50,000 years ago.

Likelihood of Future Occurrences

Low—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 Los Alamos County, these estimates would be lower, and 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, Valles Caldera should be considered a dormant volcano that will probably erupt again. Further, should an eruption occur, based on past record, any future eruption would probably be, in part, explosive. When or if the next cycle of volcanic activity could begin is unknown. Renewed activity would likely be preceded with increased seismic activity that would provide some warning of the potential hazard.

Effects of Climate Change on Probability of Future Events and Severity of Impacts

Climate change is not expected to impact the volcano risk directly nor the probability of future events or increase the severity of impacts for this hazard. This section is included as required by FEMA's Local Mitigation Plan Review Tool 44 CFR § 201.6; B1-e [44 CFR § 201.6(c)(2)(i))].

Wildfire

Hazard/Problem Description

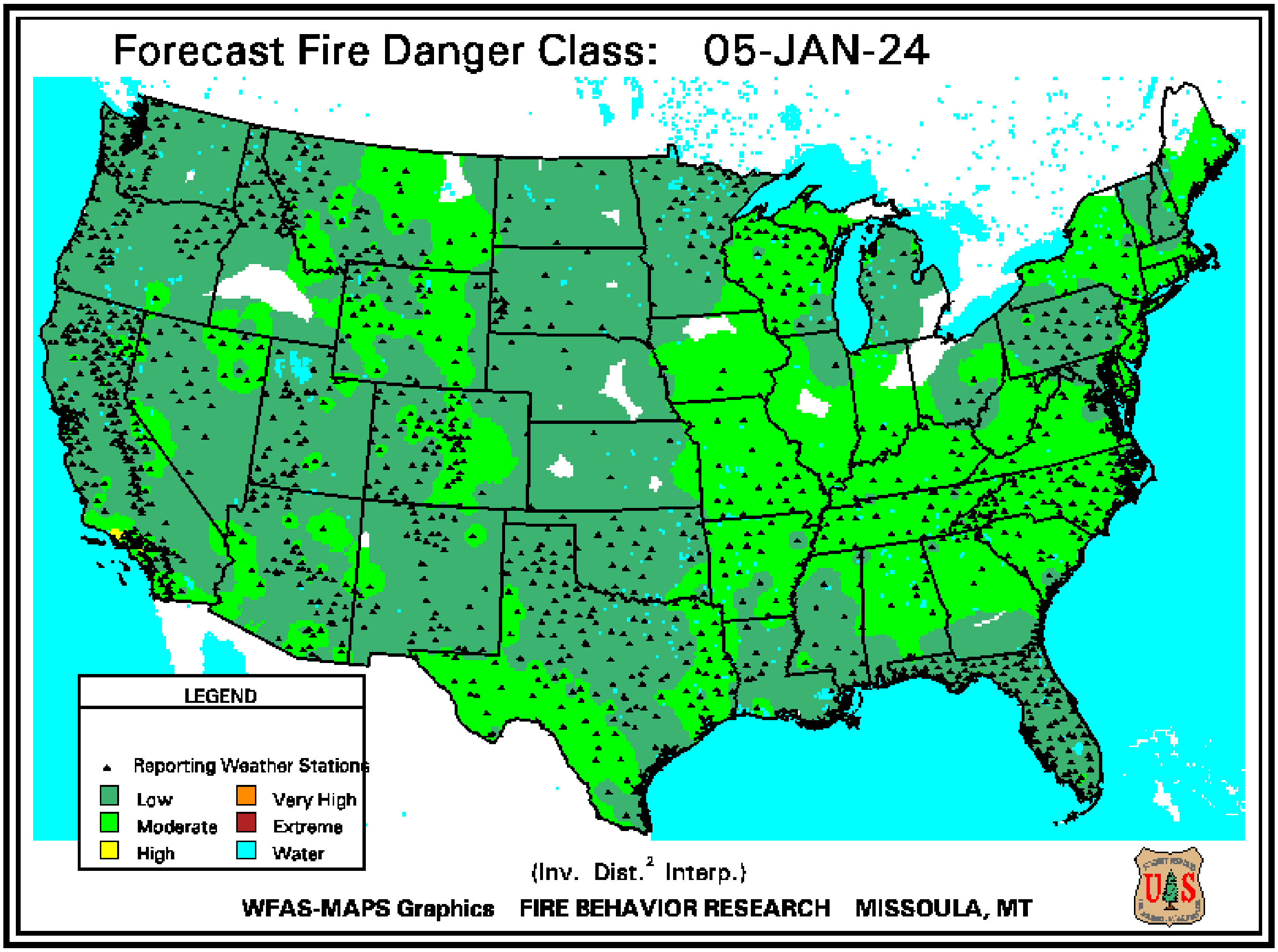
A wildfire means a fire burning uncontrolled on lands covered wholly or in part by timber, brush, grass, grain or other inflammable vegetation. There are several types of wild fires. Prescribed fires are planned fires ignited by land managers to accomplish specific natural resource improvement objectives. 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.

According to the 2009 Los Alamos County Community Wildfire Protection Plan (CWPP), Los Alamos is located in a ponderosa pine forest. Ponderosa pine is the most common and widespread pine in North America. Ponderosa forests developed in this part of the Southwest about 8,000 years ago as the climate warmed at the end of the last ice age. These forests were open with individual trees, or small clumps of trees, spread widely apart. Tree densities were from about 50 to 150 trees per acre. Locally, ponderosa forests occur from about 7,000 to about 8,500 feet above sea level.

In the 2016 Los Alamos County Community Wildlife Protection Plan (CWPP) there is mention of changes in the ecology and wildland which increases the severity of wildfires since the previous planning period. Climate change has prolonged the periods of dry periods and increase the frequency of intense storms. Although natural events have increased the likelihood of large fires, in the last 50 years they have all been human caused. The 2016 CWPP describes the behaviors of fires in different vegetative environments.

<u>**Extent:**</u> **Keetch-Byram Drought Index (KBDI) – U.S. Forest Service,** assesses the risk of fire by representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.

The KBDI attempts to measure the amount of precipitation necessary to return the soil to full field capacity. The index ranges from zero, the point of no moisture deficiency, to 800, the maximum drought that is possible, and represents a moisture regime from 0 to 8 inches of water through the soil layer. At 8 inches of water, the KBDI assumes saturation. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero, or saturation. Based on historic occurrences Los Alamos County can experience any level of the Fire Danger Class.



[Keetch-Byram Drought Index (KBDI) – U.S. Forest Service | Drought.gov]

Los Alamos Neighborhood Wildfire Risk Analysis

Source: 2022 Los Alamos Community Wildfire Protection Plan

Figure 4.41 Open Stands of Ponderosa Pine in and around Los Alamos

Source: Los Alamos County CWPP

Fire is a keystone ecological process in these forests: if fire is removed, the system collapses. Ponderosa pine is a fire-adapted species with thick, scaly bark that insulates the tender growing tissue beneath. The trees are self-pruning, losing their lower branches so that a fire burning on the ground does not have a "fuel ladder" to climb into the crowns. The species has long needles, which protect the growing branch tips from drying out.

Prior to about 1890, ponderosa pine forests had the highest fire frequency of all forest types found in the Jemez Mountains. But these fires were much different than what we see today. Frequent low intensity surface fires burned through the grassy understory of these open forests about every seven to ten years. These fires, mostly ignited by the abundant lightning that occurs during the spring and summer months, kept the forests open by thinning out young trees. They also consumed old wood and needles on the forest floor, recycling nutrients, especially nitrogen, in the process. Plant species, wildlife habitat opportunities and food sources for animals and birds were numerous.

Due to the combined effects of overgrazing, high-grade logging, fire suppression, and a highly variable climate, the forests became much denser, choked with ground, ladder, and crown fuels in a continuous blanket across the landscape. Locally, tree densities increased from 50 to 150 trees per acre to between 400 and 1,300 trees per acre or more. Dead fuel loads have increased from a few tons per acre to as much as 20 tons per acre of needles, branches, and logs.

Wildland fire is an ongoing concern for the Los Alamos County Planning Area. Generally, the fire season extends from April to July 1 of each year during the hotter, dryer 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 may 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.

In Los Alamos County, geography, vegetation patterns, and the ponderosa pine ecosystem combine to create a widespread WUI. Due to the interlacing neighborhoods and forest, the extensive and winding canyon rims, and the frequent lightning strikes and high winds, the entire community lies within the WUI. Ninety percent of the County is undeveloped land and any location is the potential source for a fire that moves into the urban area. The damages are primarily reported as damage to infrastructure, built environment, loss of socio-economic values and injuries to people.

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 Los Alamos County gives great detail regarding these factors, which are summarized from the CWPP below.

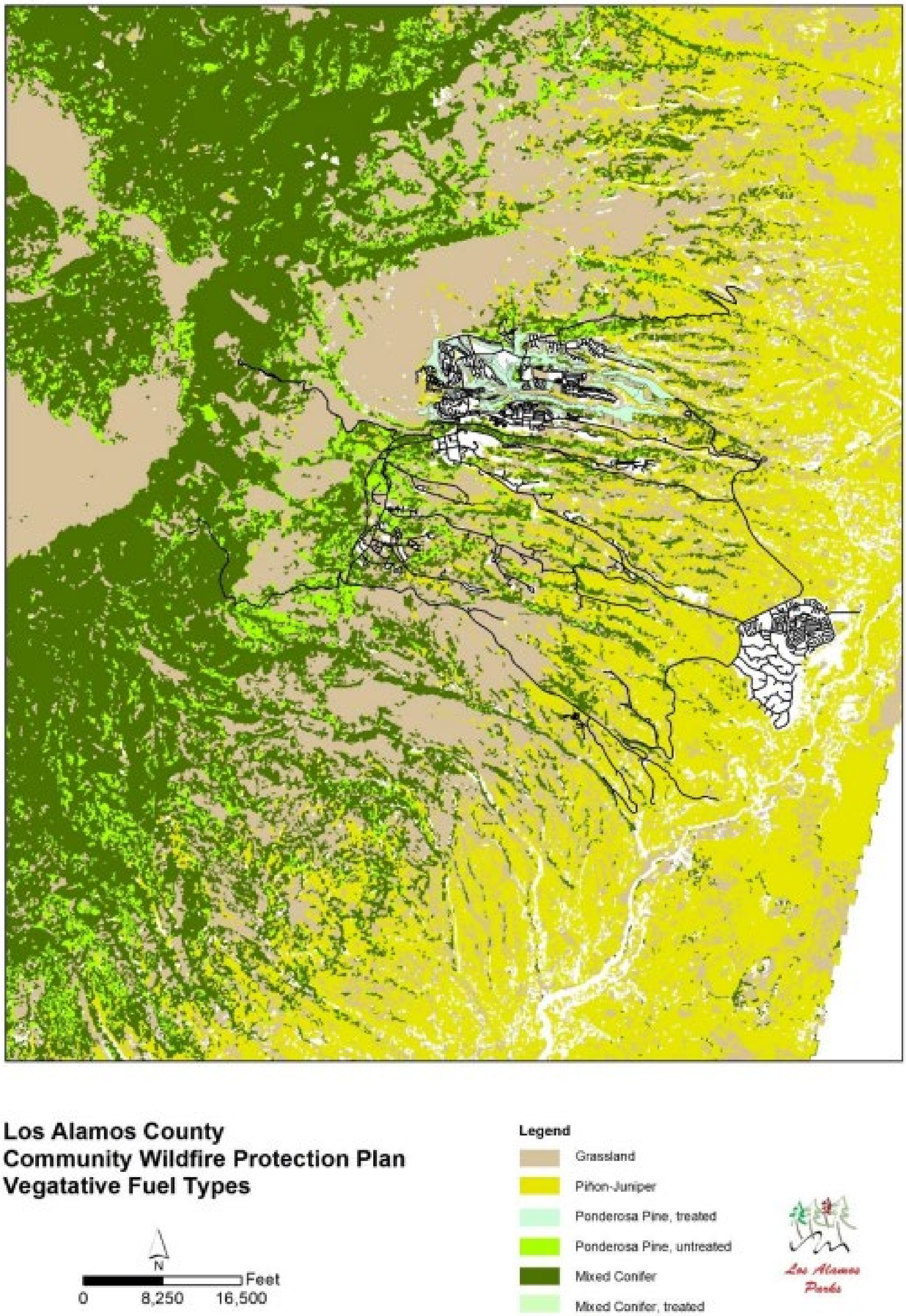
Fuel

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.

Los Alamos County supports four distinct fire-affected ecosystems, as shown in 2. Each plant association type offers distinct characteristics of potential fire intensity, fire rate of spread, and probability of fire ignition.

Mid-Elevation Grassland
Pinon-Jumper Savannas and Woodlands
Ponderosa Pine Forests
Mixed Conifer

Figure 4.42 Vegetative Fuel Types in Los Alamos County

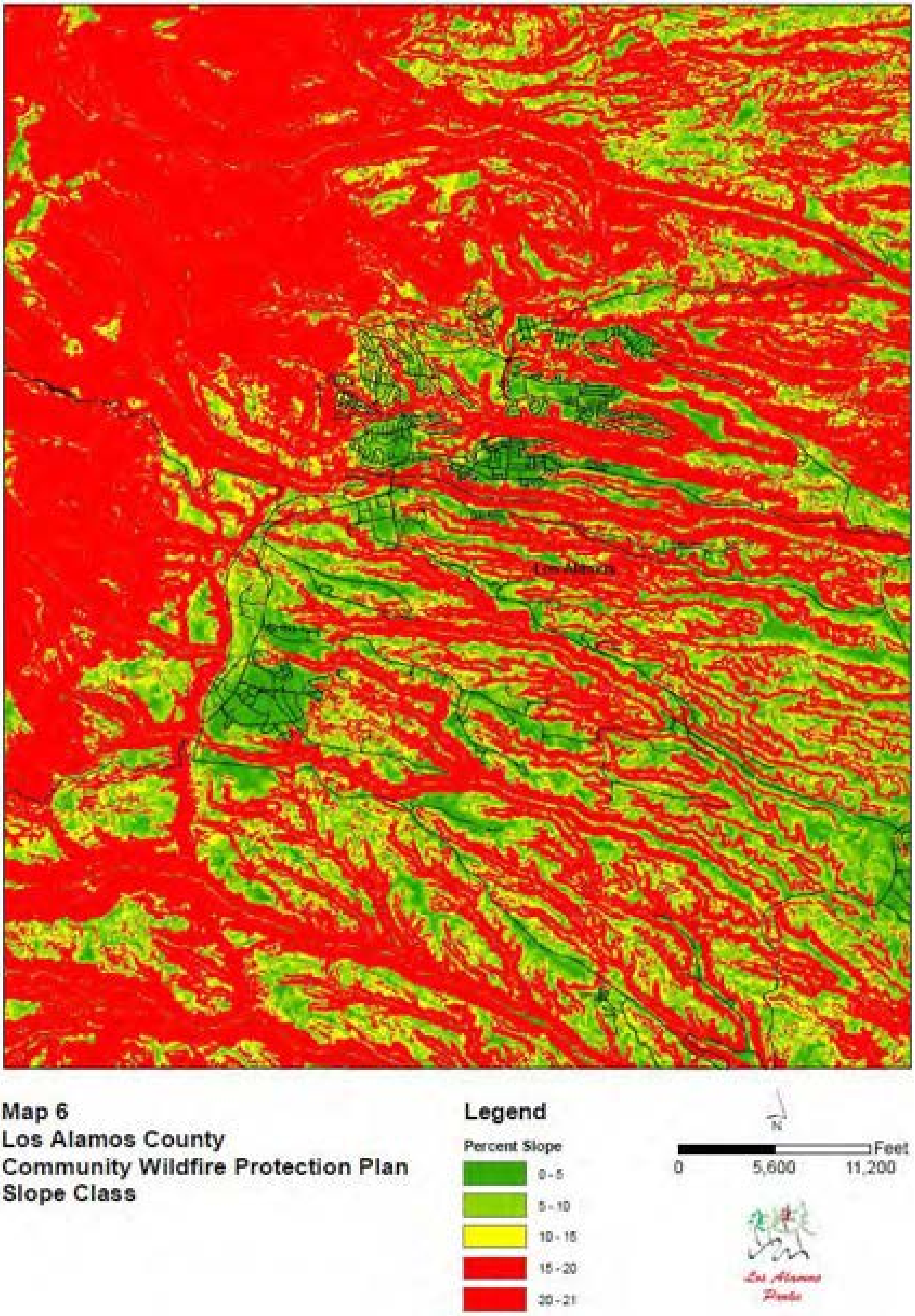


Source: Los Alamos County CWPP2022

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. In conjunction with the urban structure of Los Alamos—about one of every seven houses in Los Alamos lies on a canyon edge—slope is a critical criterion for evaluating fire risk. Fires often run rapidly up steep slopes and are often pushed up or down canyons by daily cycles of wind direction. Because Los Alamos and White Rock are dissected by numerous canyons, fire hazard for neighborhoods is strongly influenced by their distance from steep canyons.

Figure 4.43 Topography and Slope in Los Alamos County



Source: Los Alamos County CWPP

Despite active maintenance of fire access roads and trails, difficult terrain makes direct suppression attack impossible on a wildfire ignition in many locations in Los Alamos. Although Los Alamos and White Rock are laced with an extensive road and trail network, many locations within the county are inaccessible by vehicle or difficult to reach on foot. Due to steep terrain without escape routes, suppression of a wildfire ignition in many canyon areas would put firefighters at great risk.

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 the wildfire creating a situation where fuel will more readily ignite and burn more intensely.

Although Los Alamos and White Rock sit at about 7,300 and 6,300 feet above sea level respectively, the climate of both sites is generally warm and dry. Precipitation averages about 18 inches per year in the Los Alamos townsite, and about 8 inches per year in White Rock. Fire risk is influenced by characteristically dry periods from April to July. The majority of large fires have occurred in these months. Following the dry spring, seasonal wind patterns bring moisture to the area in July and August. Daily heating and rising air along the mountain fronts combine with this moisture to produce frequent thunderstorms. The summer storms provide the area with more than 50 percent of its annual precipitation.

Drought is a recurring climate condition in New Mexico and the increase in large fires in the past two decades is related to extended dry periods. Recent climate data suggests long-term drought conditions will continue in the southwest, which affects forest health, fire risk and fire behavior. Changing rainfall patterns continue to contribute to ponderosa pine mortality in the forested areas in Los Alamos County. The most critical factor is the five-year average precipitation average which is about three inches below normal (as of April 2015). Also, in the past two years total precipitation has been average, but the pattern of delivery has been different. In both years, longer than average dry spells (up to four months without significant precipitation according to the HMPC) have been followed by periods of above average and often intense precipitation. Much of the water from an intense storm runs off before the ponderosa pines can absorb the moisture. A secondary effect of drought stress is the susceptibility of trees to bark beetles and other insect or fungal infestations. Pockets of dead trees continue to appear around the county, and the fuel mitigation project continues to address the problem by mapping the areas and removing the dead trees when necessary.

Historically, large wildfires in northern New Mexico occur in mid- to-late spring (with a peak in June) and are driven by prevailing spring winds out of the southwest. With each passing cold front, spring winds blow strongly and can reach up to 70 mph. Thus, housing areas with forested terrain to the southwest are most vulnerable to direct fire spread and to showers of firebrands.

A recent example of a wind-driven fire, the Cerro Grande fire, moved steadily to the northeast, and at times advanced as much as two miles an hour in that direction. The wind factor is complicated by the concentration of dense forest areas to the south and west of Los Alamos. As a result, fires originating in the forests southwest of the townsite and White Rock have the potential to be readily driven into the community.

The critical wildfire corridor for Los Alamos lies in the mixed conifer forests of the Upper Frijoles Watershed, the ponderosa pine forests of the east-facing flank of the Valles caldera, and within heavily forested canyons reaching out from the foothills of the Sierra de los Valles.

Lightning also ignites wildfires, often in difficult-to reach terrain for firefighters. Studies of lightning strikes in the Jemez Mountains reveal between 9,000 and 23,000 strikes per year in the range. The highest risk is from June 12 to July 4 when frequent dry storms develop before there is enough atmospheric moisture to produce precipitation. More than 5,000 historic fires have been mapped in the range since 1909. Since 1977, 3 fires have burned more than 5,000 acres; the largest fire, Las Conchas, burned over 126,500 acres. All three of these fires were human- caused.

Potential losses from wildfire include human life, structures and other improvements, natural and cultural resources, quality and quantity of water supplies, cropland, timber, and recreational opportunities. Economic losses could also result. Smoke (and its related effects) and air pollution from wildfires can be a severe health hazard. In addition, catastrophic wildfire can create favorable conditions for other hazards such as flooding, landslides, and erosion during the rainy season.

The neighborhood design of all of the government-built neighborhoods in North Community and the Western Area exerts a huge influence on the urban fire risk factors. These neighborhoods have houses spaced less than 40 feet apart. Most houses are constructed with at least partial wood siding, no enclosed eaves, and flat roofs.

Wildland fires that burn in natural settings with little or no development are part of a natural ecological cycle and may actually be beneficial to the landscape. Century old policies of fire exclusion and aggressive suppression have given way to better understanding of the importance fire plays in the natural cycle of certain forest types.

Risk Index

Hazard	FEMA Risk Index Score	Rating
Wildfire	85.9	Relatively Low

Expected Annual Losses

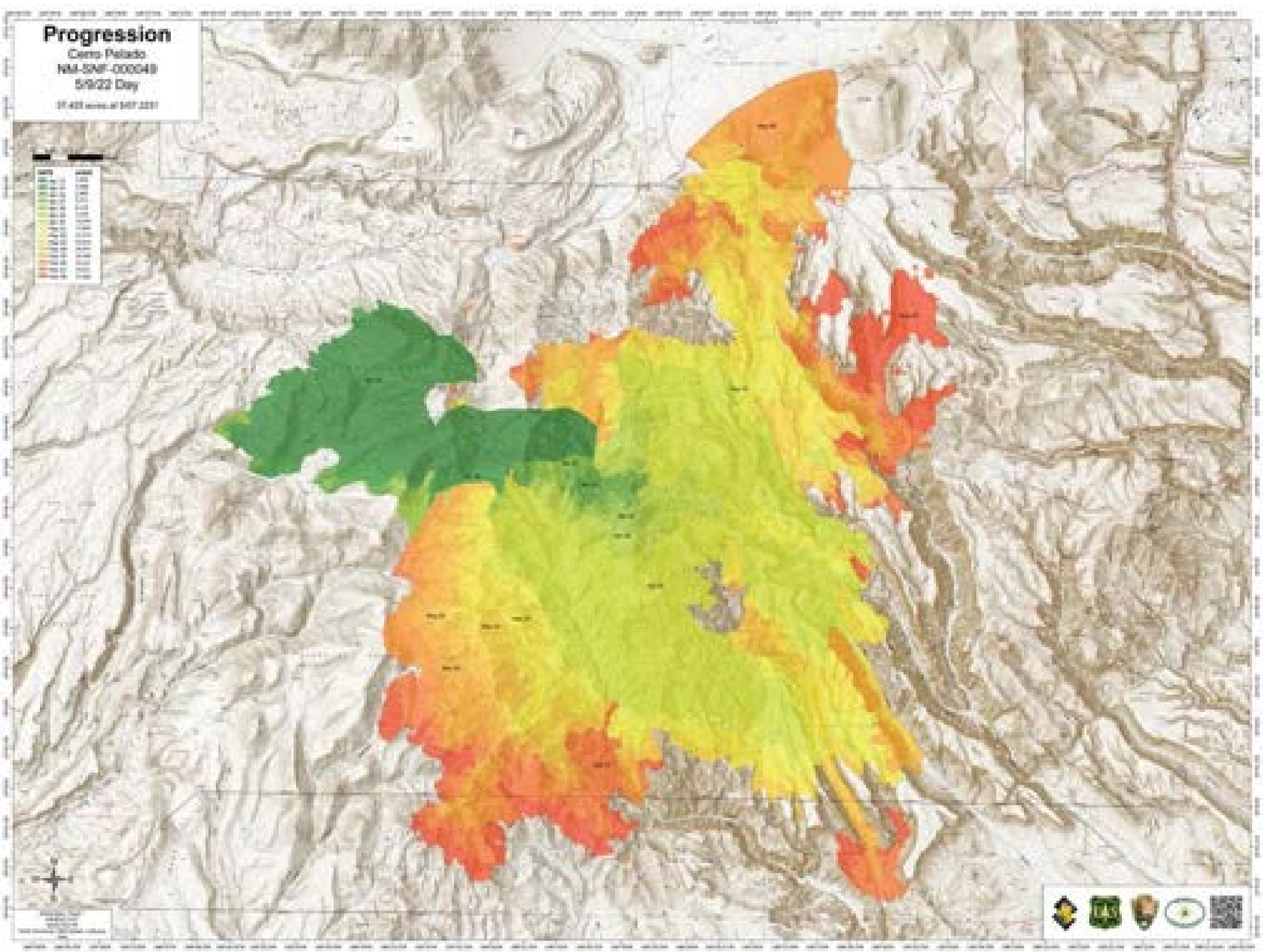
Hazard	Score	Expected Annual Loss	Exposure	Frequency	Historic Loss Ratio	Expected Annual Loss Rating
Wildfire	88.7	$1.3M	$69B	0.250% Chance/Year	Relatively low	Relatively Moderate

Previous Occurrences

There have been numerous wildland fires within Los Alamos County and vicinity. Los Alamos County has had two disaster declaration in 2000 (for the Cerro Grande fire) and in 2022 (for the Cerro Pelado fire) one fire management assistance grant declaration (for the 2011 Los Conchas fire), and two emergency management grants (in 1998 and 2000) related to wildfire. See a description in 0, for wildfire declarations within Los Alamos County between 1955 and 2022.

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 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.

Cerro Pelado Fire 2022



Source: https://losalamosreporter.com/

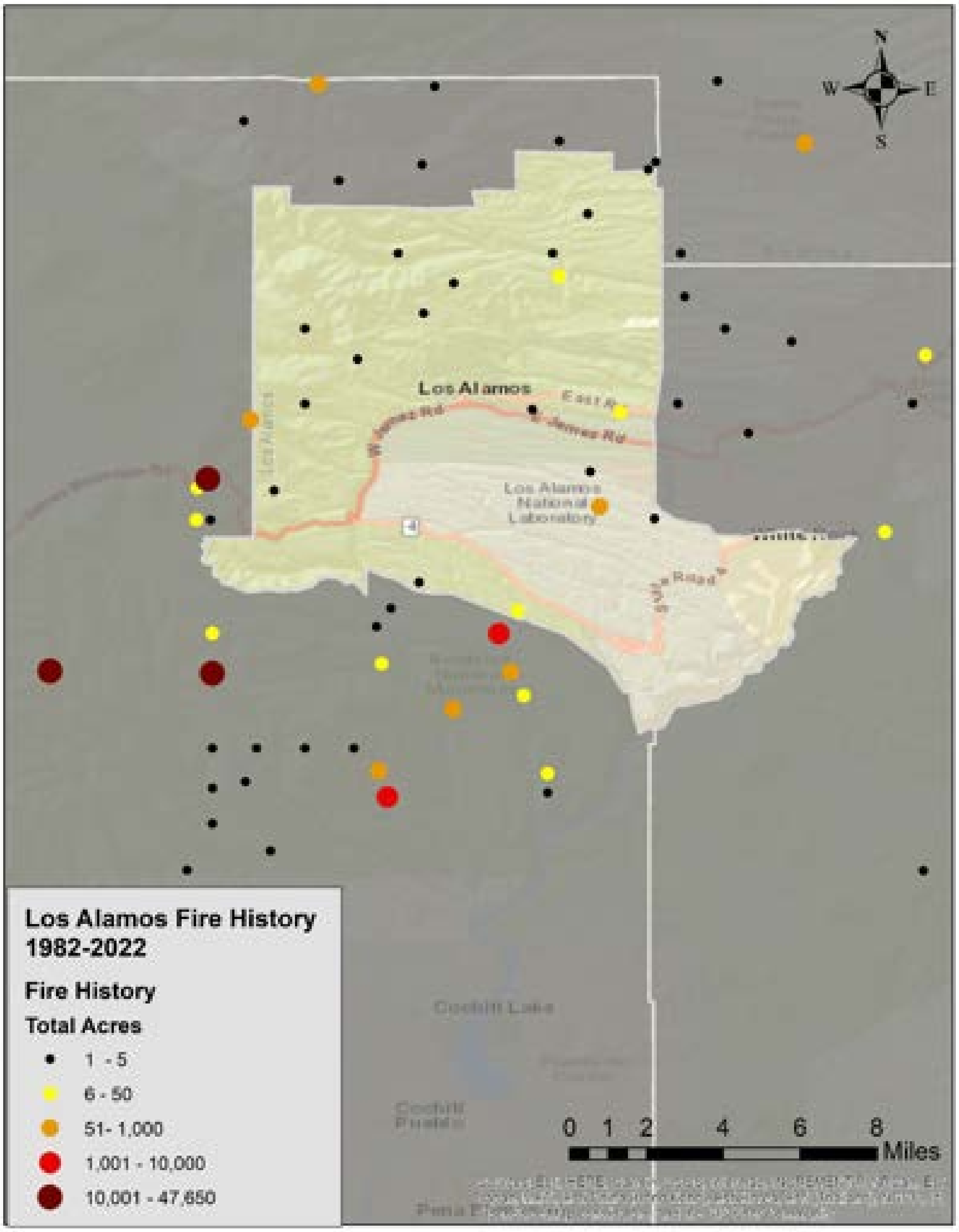
The data provides a reasonable view of the spatial distribution of past large fires in the County. Using GIS, fire perimeters that intersect Los Alamos County were extracted and are listed in Table 4.21 and shown in Figure 4.44. There are 22 fires recorded in this database for Los Alamos County that exceeded 10 acres. There were also 37 fires that occurred that were less than 10 acres. These are not included in Table 4.21. Each of them was tracked by the National Fire Database; this database was last updated in 2012. Table 4.21 lists each fire's alarm date, name, cause, and calculated acreage. Figure 4.44 also shows fires, colored by fire size. More information on specific fires is described below.

Table 4.21 Los Alamos County Fire History*

Year	Fire/Treatment Name	Acres	Cause
2022	Cerro Pelado	45,605	Under Investigation
2014	Jemez Mountains	3626	Natural
2013	Jemez Mountains (ZONE)	23,937	Natural
2011	Las Conchas	126,554	Human
2011	Cerro (UF-1) Piles	313	Human
2011	Valle Canyon	95	Human
2010	PA 14 and 27 Rx	235	Human
2007	Upper Frijoles RX	1,505	Human
2004	Highway 4	271	Human
2003	Hwy#4FB	196	Human
2000	Cerro Gran	47,650	Human
2000	C. Grande2	6,695	Human
2000	Unit 40	350	Human
2000	C. Grande	294	Human
1999	Unit 38	1,404	Human
1998	Unit 30	600	Human
1998	Cochiti	10	Human
1997	Lummis	1,655	Natural
1997	Burnt Mesa	19	Natural
1996	HQ Unit40	218	Human
1995	Unit 8	175	Human
1990	–	15	Natural
1990	–	10	Natural
1987	–	120	Natural

Source: Federal Fire Occurrence database; *Fires intersecting with the Los Alamos County limits with > than 10 acres burned.

Figure 4.44 Los Alamos County Fire History 1982-2022

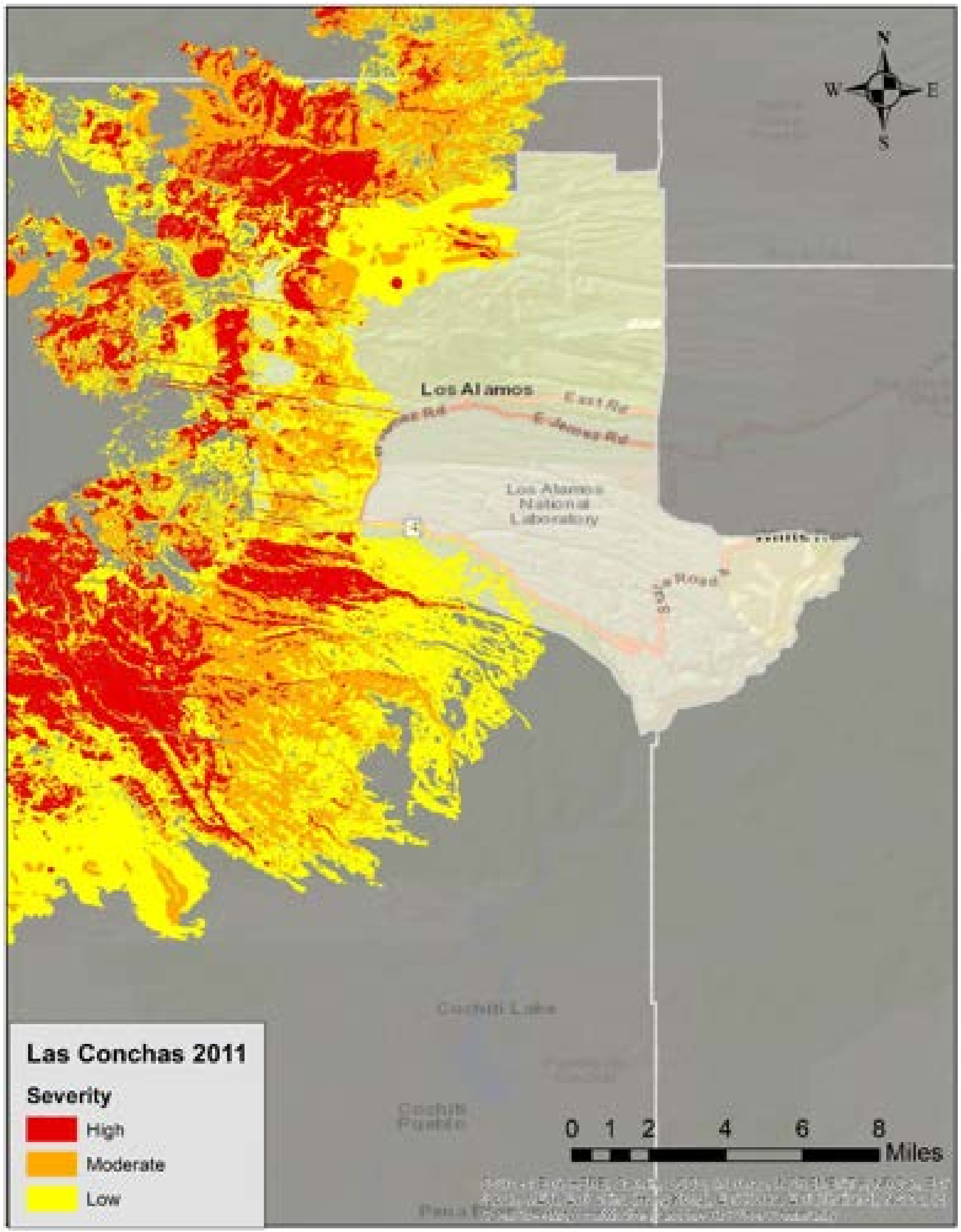


Los Conchas Wildfire (2011)

The Las Conchas Wildfire began when a tree fell on a power line 12 miles southwest of Los Alamos on June 26th. The fire quickly spread eastward under windy and unstable conditions, covering more than 40,000 acres the first day. The fire was contained by the end of the month.

In all, this fire burned 156,593 acres, making it the largest fire in New Mexico history (see Figure 4.45. The Las Conchas wildfire damaged 80 homes, of which, 15 were primary residences. The other 65 homes were seasonal. Numerous outbuildings were also damaged or destroyed and 10 vehicles were completely destroyed. The fire prompted evacuations of Los Alamos National Labs, Bandelier National Monument, the city of Los Alamos, as well as numerous other campgrounds and homes within the burn area itself. The fire burned portions of the Santa Clara, Cochiti, San Ildefonso and Santa Domingo Indian Reservations as well as portions of Bandelier National Monument and the Valles Caldera National Preserve. This fire burned on both sides of Highway 4, and up to Highway 501, causing both highways to be closed for a time. Some of this area was previously burned by the Cerro Grande Fire in 2000. Fortunately, no member of the public or any emergency responders were seriously injured during the fire suppression efforts. Total property damage was $17 million. A federal fire management assistance grant (FMAG #2933) was issued as a result of the Los Conchas fire.

Figure 4.45 Los Conchas Burn Area



Cerro Grande Wildfire

The Cerro Grande Wildfire was the costliest fire in the state's history. The Cerro Grande Fire began on Thursday, May 4, 2000, when National Park Service personnel ignited a prescribed burn with the intent of mitigating future fire risks by reducing the increasing fuel loads. Sporadic and changing winds carried fire embers up and away causing the fire to "spot" across the fire line. Control was lost and the prescribed burn was declared a wildfire on May 5th. The fire was initially contained on May 6 and 7 until significant wind speed increases resulted in a major wildfire outbreak. On May 10, carried by still increasing winds, the wildfire entered Los Alamos Canyon and moved towards the townsite of Los Alamos. Approximately 18,000 people, the entire populations of Los Alamos and White Rock, were evacuated. The fire spread rapidly over the next few days, burning public, private and Pueblo lands.

In Los Alamos, 239 residential structures were burned, displacing over 400 families. More than 25% of LANL lands were burned, including numerous small buildings, historic structures, vehicles, utilities and environmental monitoring stations. The fire continued to spread onto private lands and lands of San Ildefonso and Santa Clara Pueblos. The fire encompassed approximately 47,000 acres. The event resulted in a federal disaster declaration, FEMA-1329.

Other Wildfires

Other major wildfires within LAC and the immediate vicinity include:

Water Canyon Fire, 1953, 6,000 acres
Burnt Mountain Fire, 1954, 1000+ acres
La Mesa Fire, 1977, 15,444 acres
Dome Fire, 1996, 16, 683 acres
Oso Complex Fire, 1998, 5,820 acres

Likelihood of Future Occurrences

High – From approximately May to October of each year, Los Alamos 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 **High** rating of future occurrence.

Effect of Climate Change on Wildfires
According to the USGS, Over the last several decades, climate conditions, especially in the western United States, have grown hotter and drier. If climate change continues to play out as predicted, the likelihood of wildfires will worsen. Our understanding of fire's role in the natural world and fire management policies has changed over the last century. We have learned that fire is an important part of many ecosystems. It "cleans out" dead leaves and branches, adds nutrients to the soil, and helps the seeds of some plants to sprout. Knowing this, policies have shifted away from full fire suppression to that of more natural fire cycles.

Unfortunately, while we are working to improve fire management, we are also dealing with the compounding issue of climate change. Many regions of the U.S. are now experiencing prolonged periods of drought and record temperatures. These areas often also have an excessive buildup of fallen leaves and understory brush. Conditions remain ripe to drive intense wildfires that damage natural areas and, sadly, nearby communities.
Source: www.usgs.gov/science-explorer/climate/wildfire

Vulnerability Assessment

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.

With Los Alamos County's hazards identified and profiled, the HMPC conducted a vulnerability assessment to describe the impact that each priority hazard would have on the County. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses. This section focuses on the risks to the County as a whole.

This vulnerability assessment follows the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses. The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by 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;

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.

Los Alamos County Vulnerability and Assets at Risk

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 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
Growth and development trends.

Total Assets at Risk

The following data in Table 4.22 from the Los Alamos County Assessor's Office is based on the assessor's data for 2013. This data presents an inventory of the total exposure of developed properties within LAC. 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.

Methodology

The 2013 Los Alamos County's assessor data and parcel layer were joined together using GIS and used as the basis for the inventory of parcels. Analysis that was performed are shown in tables to show the number of structures, land value and total structure value for each parcel by property type and by Land Area/Owner. Each parcel record was attributed with its land area/owner name (Los Alamos and White Rock townsites, Santa Fe National Forest, Bandelier National Monument and Los Alamos National Laboratory) based on whether its geographic center fell in or out of those boundaries. For the purposes of tabulating data, the unincorporated county was considered to be anything that didn't fall within the sited jurisdictions above and is listed in the table as Other County Areas. The account type field within the assessor database and parcel layer was used to categorize the property types.

59 parcels did not join to the assessor's database and, as such, do not have any land or assessed values attached to them but they were still considered in the analysis for number of structure and risk to hazards. A building footprint layer was intersected with the parcel layer to obtain the number of structures that were within each parcel. This analysis was imperative to help show more depth in the parcel analysis since the parcels were converted into centroids for analysis purposes.

Los Alamos County has 7,272 total parcels with a total land value of $1,163,728,250. There are 6,455 improved parcels in the County with a total structure value of $1,443,082,160. The townsite of Los Alamos has the most structures and value of the County's jurisdictions; there are

4,087 improved parcels in the Los Alamos townsite with a total value of $1.6 billion. 0 shows the 2013 assessor values for the entire Los Alamos County Planning Area (i.e., the total values at risk) by land area/owner. The assessor values for Los Alamos County by property type are provided in 0

A limitation to this analysis was created by the parcel layer in that there are only 20 total parcels that make up Los Alamos National Laboratory when there are 2,708 building footprints mapped within that area. Due to this limitation, detailed hazard analysis could not be performed in this area.

Table 4.22 Los Alamos County Assets at Risk: By Land Area/Owner

Land Area/Owner	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Los Alamos townsite	4,741	4,087	5,345	$1,014,897,190	$608,867,830	$1,623,765,020
White Rock townsite	2,501	2,361	3,128	$421,198,150	$330,199,750	$751,397,900
Other County Area	6	3	113	$2,961,200	$6,176,500	$9,137,700
Total	**7,248**	**6,451**	**8,586**	**$1,439,056,540**	**$945,244,080**	**$2,384,300,620**
Santa Fe National Forest	3	0	5	$0	$21,655,850	$21,655,850
Bandelier National Monument	1	0	15	$0	$39,458,100	$39,458,100
Los Alamos National Laboratory	20	4	2,708	$4,035,620	$157,370,220	$161,405,840
Grand Total	**7,272**	**6,455**	**11,314**	**$1,443,092,160**	**$1,163,728,250**	**$2,606,820,410**

Source: 2013 Los Alamos County Assessor's Office

Table 4.23 Incorporated Los Alamos County Total Assets at Risk by Property Type

Land Area/ Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Los Alamos townsite	Commercial	128	98	185	$101,770,370	$37,777,950	$139,548,320
	Exempt Church	19	19	33	$26,865,580	$10,161,990	$37,027,570
	Exempt Commercial	5	4	6	$1,018,730	$1,347,620	$2,366,350
	Exempt County	232	16	290	$45,386,640	$175,227,490	$220,614,130
	Exempt Federal	5	2	9	$1,986,160	$1,740,730	$3,726,890
	Exempt School	18	13	64	$68,980,120	$18,325,550	$87,305,670
	Open Area	37	0	15	$0	$3,722,180	$3,722,180
	Residential	4,097	3,934	4,736	$768,881,740	$337,886,130	$1,106,767,870
	Vacant Commercial	6	0	0	$0	$1,605,870	$1,605,870
	Vacant Residential	194	1	7	$7,850	$21,072,320	$21,080,170
	Total	**4,741**	**4,087**	**5,345**	**$1,014,897,190**	**$608,867,830**	**$1,623,765,020**
White Rock townsite	Commercial	48	22	61	$12,725,760	$7,279,080	$20,004,840
	Exempt Church	11	11	17	$7,423,460	$4,734,140	$12,157,600
	Exempt County	82	2	60	$1,532,940	$105,226,320	$106,759,260
	Exempt Federal	2	0	0	$0	$1,331,200	$1,331,200
	Exempt School	2	2	15	$10,429,110	$2,573,550	$13,002,660
	Open Area	7	0	1	$0	$666,910	$666,910
	Residential	2,326	2,324	2,973	$389,086,880	$206,660,500	$595,747,380
	Vacant Commercial	1	0	0	$0	$86,290	$86,290
	Vacant Residential	22	0	1	$0	$1,641,760	$1,641,760
	Total	**2,501**	**2,361**	**3,128**	**$421,198,150**	**$330,199,750**	**$751,397,900**
Other County Areas	Commercial	2	1	9	$2,817,690	$1,438,460	$4,256,150
	Exempt County	2	1	3	$100,570	$3,094,730	$3,195,300
	Residential	1	1	101	$42,940	$1,575,630	$1,618,570
	Vacant Residential	1	0	0	$0	$67,680	$67,680
	Total	**6**	**3**	**113**	**$2,961,200**	**$6,176,500**	**$9,137,700**
Grand Total		**7,248**	**6,451**	**8,586**	**$1,439,056,540**	**$945,244,080**	**$2,384,300,620**

Source: 2013 Los Alamos County Assessor's Office

Critical Facility Inventory

Critical facilities as defined by the HMPC include: (1) Essential Facilities and Services - those essential in providing services before, during, and after response and recovery operations, (2) At-

Risk Populations – those facilities that house discrete populations that may require greater assistance in the event of a hazard, and (3) Hazardous Materials Facilities – those that produce, use or store highly volatile, flammable, explosive, toxic and/or water reactive materials.

A fully detailed list of all critical facilities in the planning are can be found in Table 4.24.

Table 4.24 Los Alamos County Critical Facilities Summary Table

Facility	Critical Facility Category	Facility Type	Address
Ark Child Development Center	At-Risk Population	Daycare	715 Diamond Dr
Aspen Elementary	At-Risk Population	School	2182 33Rd St
Aspen Ridge Lodge Assisted Living	At-Risk Population	Adult Care	1010 Sombrillo Ct
Barranca Mesa Elementary	At-Risk Population	School	57 Loma Del Escolar
Bilingual Montessori School	At-Risk Population	School	115 Longview Dr
Canyoncito Montessori School	At-Risk Population	School	2525 Canyon Rd
Chamisa Elementary	At-Risk Population	School	301 Meadow Ln
Children's Montessori Preschool	At-Risk Population	Daycare	1060 Nugget St
High School	At-Risk Population	School	1300 Diamond Dr
Horizon Preschool Day Care	At-Risk Population	Daycare	580 Meadow Ln
Little Forest Playschool	At-Risk Population	Daycare	3880 Villa St
Mesa Public Library	At-Risk Population	Library	2400 Central Ave
Middle School	At-Risk Population	School	2101 Hawk Dr
Mountain Elementary	At-Risk Population	School	2280 North Road
Pinion Elementary	At-Risk Population	School	90 Grand Canyon Dr
Ponderosa Montessori School	At-Risk Population	School	304 Rover St
Quemazon Montessori School	At-Risk Population	School	4600 Esperanza
Sage Montessori School	At-Risk Population	School	142 Meadow Ln
Sombrillo Nursing Home	At-Risk Population	Adult Care	1011 Sombrillo Ct
Airport	Essential Facility	Airport	1040 Airport Rd
Arizona Tank	Essential Facility	Water Tank	
Ashley Pond	Essential Facility	Gathering Area	
Barranca Tank 1	Essential Facility	Water Tank	
Barranca Tank 2	Essential Facility	Water Tank	
Bstr Sta 3 Tank	Essential Facility	Water Tank	
Century Link Communications	Essential Facility	Communications	1907 Trinity Dr

Facility	Critical Facility Category	Facility Type	Address
Century Link Communications	Essential Facility	Communications	2075 Trinity Dr
Community Tank	Essential Facility	Water Tank	
County Municipal Building	Essential Facility	Government Building	1000 Central Ave
County Reservoir And Dam	Essential Facility	Dam	
EOC LANL	Essential Facility	EOC	63 TD-Site Rd
Fill Bridge	Essential Facility	Bridge	
Fire Administration	Essential Facility	Fire Facility	999 Central Ave
Fire Station	Essential Facility	Fire Facility	4401 Diamond Dr
Fire Station	Essential Facility	Fire Facility	457 East Rd
Fire Station 1	Essential Facility	Fire Facility	397 Crossroads / LANL Bldg. 16-0180
Fire Station 2	Essential Facility	Fire Facility	132 Dp Rd
Fire Station 3 Police Substation White Rock	Essential Facility	Fire Facility	129 State Road 4
Group 12 Tank	Essential Facility	Water Tank	
Guaje Bstr Sta 1 Tank	Essential Facility	Water Tank	
Guaje Bstr Sta 2 Tank	Essential Facility	Water Tank	
Guaje Bstr Sta 3 Tank	Essential Facility	Water Tank	
Hospital	Essential Facility	Hospital	3917 West Rd
Ice Rink	At-Risk Population	Recreation/Day-Care	4475 West Rd
LAC Fleet	Essential Facility	Transportation	101 Camino Entrada
LAC Traffic	Essential Facility	Transportation	101 Camino Entrada
LAC Warehouse	Essential Facility	Government Building	101 Camino Entrada
North Mesa/Hawk Tank	Essential Facility	Water Tank	
Omega Bridge	Essential Facility	Bridge	
Otowi #1 Tank	Essential Facility	Water Tank	
Otowi Bstr 2 Tank	Essential Facility	Water Tank	
Otowi Well 4 Tank	Essential Facility	Water Tank	
Pajarito Bstr Sta 2 Tank	Essential Facility	Water Tank	
Pajarito Bstr Sta 3 Tank	Essential Facility	Water Tank	
Pajarito Tank 1	Essential Facility	Water Tank	
Pajarito Tank 4	Essential Facility	Water Tank	
Pajarito Tank 4A	Essential Facility	Water Tank	
Pajarito Well #2	Essential Facility	Well	
Pajarito Well & Bstr #3	Essential Facility	Well	
Pajarito Well 5 Tank	Essential Facility	Water Tank	
Police Station Admin EOC	Essential Facility	EOC	2500 Trinity Dr
Pump Station	Essential Facility	Pump Station	
Pump Station	Essential Facility	Pump Station	

Facility	Critical Facility Category	Facility Type	Address
Quemazon Tank	Essential Facility	Water Tank	
School Maintenance	Essential Facility	School Facilities	101 Camino Entrada
Schools Administration	Essential Facility	School Facilities	2075 Trinity Dr
S-Site Tank 1	Essential Facility	Water Tank	
S-Site Tank 2	Essential Facility	Water Tank	
TA-3 Substation	Essential Facility	Electrical Substation	
Townsite Substation	Essential Facility	Electrical Substation	
Twin Tank	Essential Facility	Water Tank	
Urgent Care	Essential Facility	Urgent Care	1470 Trinity Dr
Utilities Facilities	Essential Facility	Utility	101 Camino Entrada
Waste Water Treatment Los Alamos	Essential Facility	Waste Water Treatment	3500 Pueblo Canyon Rd
Waste Water Treatment White Rock	Essential Facility	Waste Water Treatment	700 Overlook Rd Overlook Rd

Source: Los Alamos County GIS

Cultural, Historical, and Natural Resources

Assessing Los Alamos 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

Los Alamos 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.

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.

Historical resources included in the programs above are identified in Table 4.25.

Table 4.25 Los Alamos County Historical Resources – State and National Register

Resource Name	Location	State Register	National Register
Chupaderos Canyon Small Structural Site	Espanola Range	–	11/7/1990
Chupaderos Mesa Village	Espanola Range	–	11/7/1990
Guaje Water/Soil Control Site	Espanola Range	–	11/7/1990
Bandelier National Monument (2 portions) NHL and CCC National Register Historic District	Los Alamos	5/21/1971	10/15/1966
Bandelier National Monument (2 portions) NHL and CCC National Register Historic District	Los Alamos	5/21/1971	5/28/1987
Bayo Canyon Road	Los Alamos	–	11/7/2003
Beanfield Mesa Road	Los Alamos	4/11/2003	–
Beanfield Notch Road	Los Alamos	4/11/2003	–
Camp Hamilton Road	Los Alamos	6/13/2003	–
Gonzales Road	Los Alamos	6/13/2003	–
Grant Road	Los Alamos	4/11/2003	1/14/2004
Guaje Site	Los Alamos	3/12/1982	12/7/1982
Homestead and Ranch School Era Roads & Trails of Los Alamos MPL	Los Alamos	6/13/2003	9/20/2003
Homestead Crossing	Los Alamos	6/13/2003	–
Los Alamos Canyon Bridge	Los Alamos	5/9/1997	–
Los Alamos County Historical Museum and Archives	Los Alamos	2/9/1973	–
Los Alamos Ranch School	Los Alamos	5/23/1969	–
Los Alamos Scientific Laboratory NHL	Los Alamos	–	10/15/1996
Los Alamos Sherriff's Posse Lodge	Los Alamos	8/10/2012	–

Resource Name	Location	State Register	National Register
Los Alamos United States Post Office	Los Alamos	10/10/2003	–
Luhan, Martin Homestead	Los Alamos	8/8/2003	–
Lujan Road	Los Alamos	6/13/2003	1/12/2005
Mesa Public Library	Los Alamos	11/18/1994	–
Pond Cabin (Dwight Young Cabin)	Los Alamos	5/12/1989	–
Ranch School Trail	Los Alamos	6/13/2003	–
Rendija Canyon Traditional Cultural Properties District	Los Alamos	4/4/2008	–
Roybal Road	Los Alamos	6/13/2003	–
Pajarito Springs Site	White Rock	3/12/1982	12/6/1982
White Rock Canyon Archaeological District	White Rock	2/9/1990	5/18/1990
White Rock Canyon Archaeological District	White Rock	2/9/1990	5/28/1992

Source: New Mexico Historic Preservation Division

The National Park Service administers two programs that recognize the importance of historic resources, specifically those pertaining to architecture and engineering. While inclusion in these programs does not give these structures any sort of protection, they are valuable historic assets.

The Historic American Buildings Survey (HABS) and Historic American Engineering Record (HAER) document America's architectural and engineering heritage. Table 4.26 lists the HABS and HAER structures in Los Alamos County:

Table 4.26 Los Alamos County HABS and HAER Structures

Area	Historic Building/Structure
Los Alamos	Fuller Lodge, Central & Twentieth Streets
Los Alamos	Romero Cabin, Parajito Road

Source: The Library of Congress, American Memory, http://memory.loc.gov/ammem/collections/habs_haer/

It should be noted that these lists may not be complete, as 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.

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.

Section 4.3.6 illustrates the locations of floodplains. These areas, as well as areas of riparian habitat along the rivers and streams in the County may accommodate floodwaters for purposes of groundwater recharge and stormwater management.

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 4.27 summarizes Los Alamos County's special status animal species in the Fish and Wildlife Service database. A search for Los Alamos County's special status plant species in the Fish and Wildlife Service database yielded no results.

Table 4.27 Threatened and Endangered Animals in Los Alamos County

Name	Scientific Name	Status
Jemez Mountains salamander	*Plethodon neomexicanus*	Endangered
Yellow-billed Cuckoo	*Coccyzus americanus*	Proposed Threatened
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered
Rio Grande cutthroat trout	*Oncorhynchus clarkii virginalis*	Candidate
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	Proposed Endangered

Source: US Fish and Wildlife Service

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 Los Alamos County for January 1, 2012 was 18,159, representing a small increase from just over 17,500 people in 1980. Table 4.28 illustrates the pace of population growth in Los Alamos County dating back to 1980. Table 4.29 shows more recent population trends for each townsite.

Table 4.28 Historical Population of Los Alamos County

	1980	1990	2000	2010	2012
Population	17,560	18,104	18,343	17,950	18,159
Change	–	2.93%	1.26%	-2.2%	1.2%

Source: US Census Bureau

Table 4.29 Population Growth for Los Alamos County from 1990-2010

	2000	2010	Growth 2000-2010
Los Alamos	11,909	12,019	0.9%
White Rock	6,045	5,725	-5.3%

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 Los Alamos County are shown in Table 4.30. Overall, population is expected to have flat growth in the near term and small population losses after 2025.

Table 4.30 Los Alamos County Population Projections

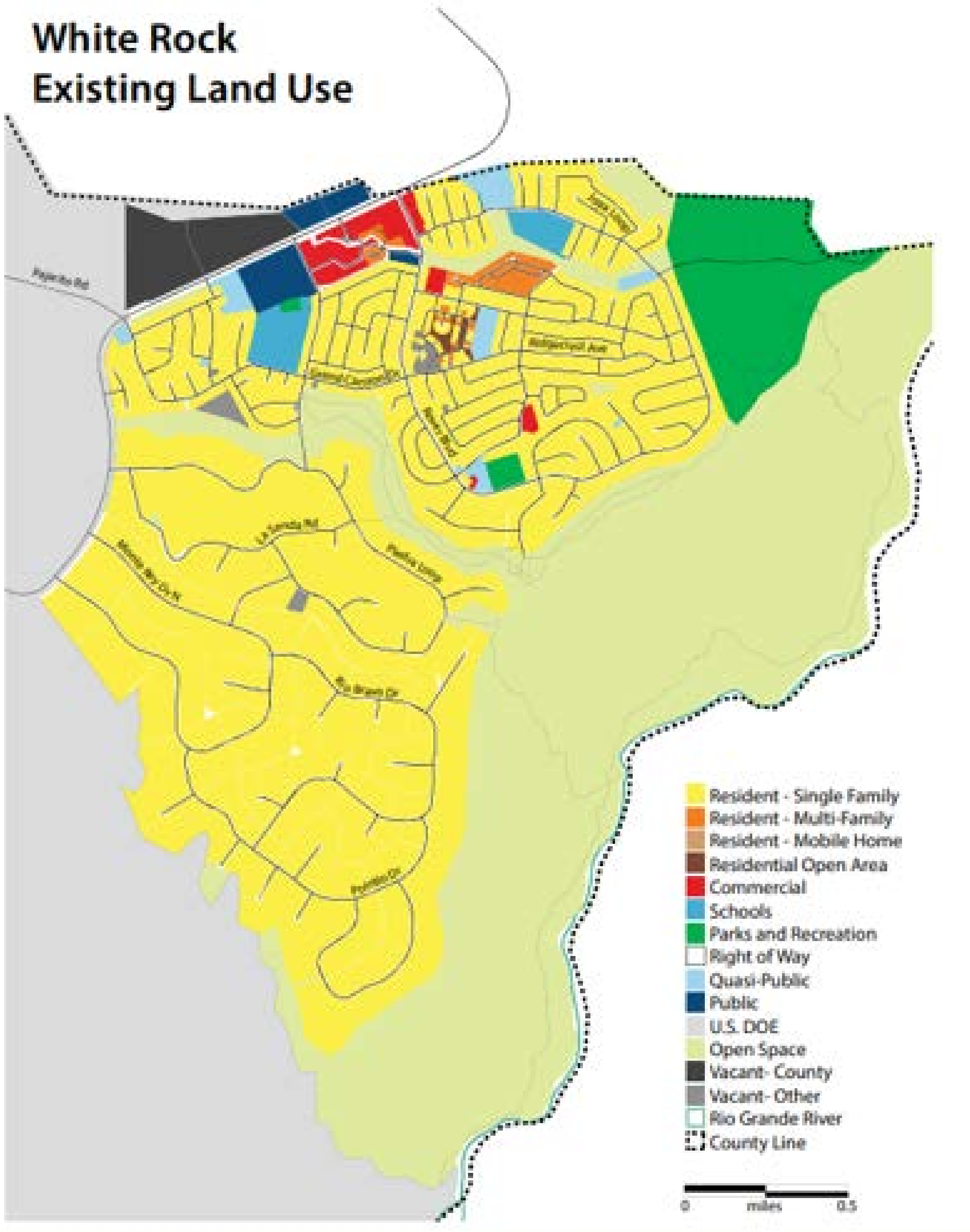
Projections	2015	2020	2025	2030	2035	2040
Los Alamos County	18,058	18,063	18,106	17,880	17,603	17,210

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

Land Use/Zoning

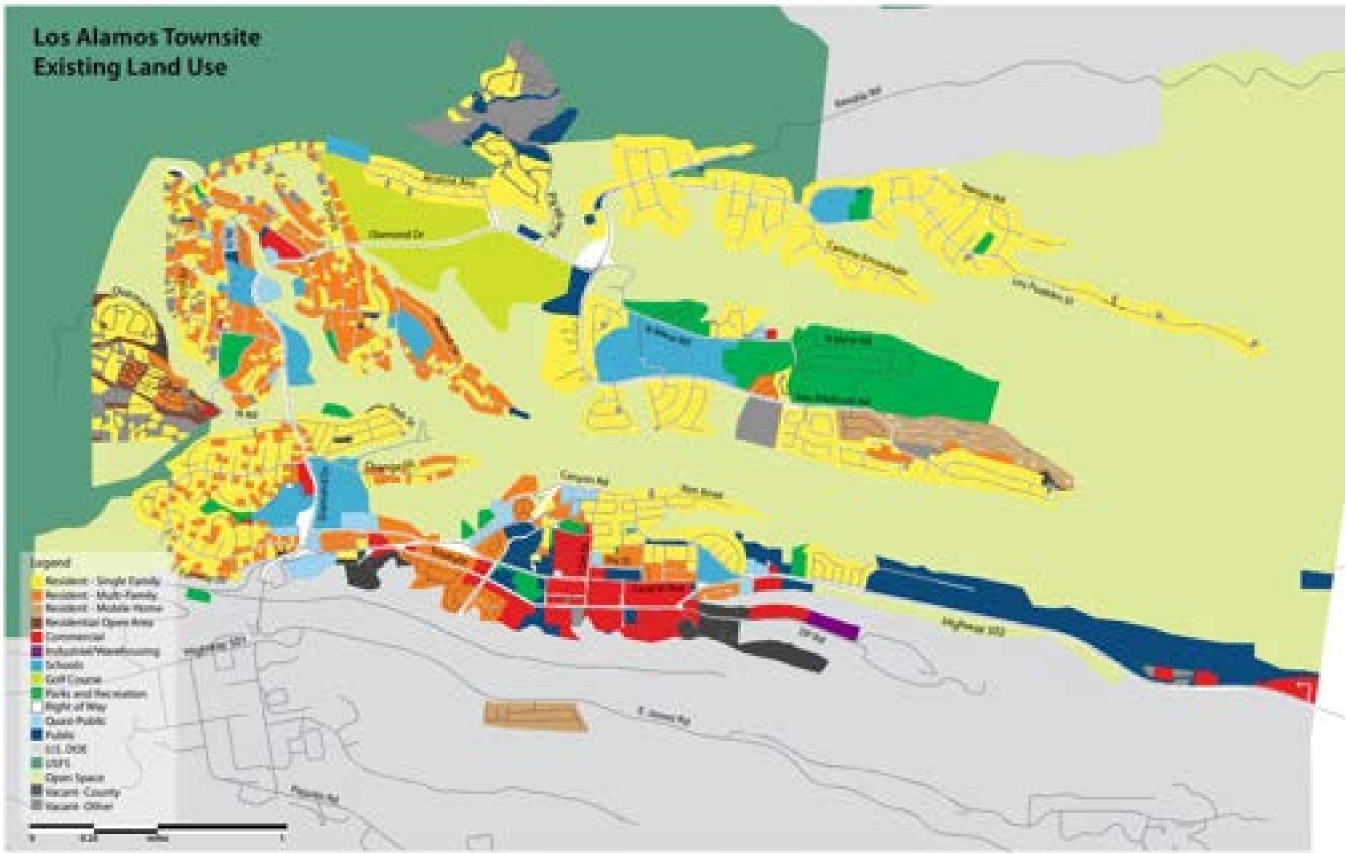
Future land use and growth management strategies in Los Alamos County aim to concentrate future development into and toward existing communities through various policies relating to zoning and minimum development standards and requirements. Zoning designations prescribe allowed land uses and minimum lot sizes for the purpose of supporting efficient infrastructure design, conservation of natural resources, and to avoid conflicting uses. Figure 4.46 shows proposed land use designations in the townsite of Los Alamos. Figure 4.47 shows proposed land use designations in the townsite of White Rock.

Figure 4.46 White Rock Townsite Land Use



Source: Los Alamos County Comprehensive Plan

Figure 4.47 Los Alamos Townsite Land Use



Source: Los Alamos County Comprehensive Plan

Future Growth Areas

Parcel A-19 was transferred from the DOE to the County for economic sustainability purposes in the fall of 2002 and is an area currently being slated for development as of 2015. The land parcel is located on the north side of State Rd 4 in White Rock (across from the Hampton Inn). It is approximately 70 acres in size. Sixty acres lie on the west side of a drainage channel and 10 acres are located on the east side of the channel. Approximately four acres on the east side were developed for the new White Rock Fire Station No. 3 in 2007. The remaining 6 acres on the east side are reserved for future municipal uses and/or possible commercial uses. The White Rock Implementation Committee and Los Alamos County have hosted several public meetings on the A-19-a master plan project since work began in 2010, with assistance from a consultant. Canada de Buey is a significant arroyo that passes through Tract A-19-A and includes flood hazard areas mapped on FIRM Map No 350035 Panel 0135C. A 2012 master drainage report for Tract A-19- A provides a framework for development of the master plan area in the context of flood and drainage issues on the site. A preliminary analysis of anticipated land treatments, runoff flow rates and trunk storm drain pipes sizes is included in the report (https://www.losalamosnm.us/projects/cdd/Documents/A-19-a%20Drainage%20Report.pdf).

Although the west side of A-19 is 60 acres in size, its estimated net developable acreage (remaining acreage once right-of-ways, parks, open space, roads, sidewalks, easements, setbacks and topographical limitations are accounted for) is approximately 42 acres.

In approximately 2004, the Department of Energy accelerated the transfer of the parcel the County used to build the new wastewater treatment plant in Pueblo Canyon. The DOE has since transferred the rest of the Pueblo Canyon tract to the County.

Changes in Development

According to the HMPC there has been no development in the flood plains, and no growth has taken place in areas prone to wildfire or other hazard prone areas. Changes in development throughout the County, have not shown to have any adverse impacts or vulnerabilities related to the identified hazards within the planning area.

Los Alamos County Vulnerability to Specific Hazards

The Disaster Mitigation Act regulations require that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. This section summarizes the possible impacts and quantifies, where data permits, the County's vulnerability to each of the identified hazards including:

Dam Failure
Drought
Earthquake
Flooding

Landslide and Rockfall
Severe Weather: High Winds (includes Straight Line Winds and Microbursts,)
Severe Weather: Lightning
Severe Weather: Thunderstorm
Severe Weather: Winter Storm and Severe Cold
Wildfire
Volcanoes

An estimate of the vulnerability of the County to each identified hazard, in addition to an estimate of likelihood of future occurrence, is provided in each of the hazard-specific sections that follow. A summary of vulnerability is categorized into the following classifications expressed based on previous occurrences, extent, and damage and casualty potential.

Extremely Low—The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
Low—Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
Medium—Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
High—Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
Extremely High—Very widespread with catastrophic impact.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Other information can be collected in regard to the hazard area, such as the location of critical community facilities, historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the impact, or vulnerability, of that area to that hazard.

The HMPC identified five hazards in Los Alamos County for which specific geographical hazard areas have been defined and for which sufficient data exists to support a quantifiable vulnerability analysis. These five hazards are dam failure, earthquake, flood, landslide, and wildfire. Because these hazards have discrete hazard risk areas, their risk varies by location within the County. For dam failure, the EAP was used to give an account of possible damages. For flood, landslide, and wildfire, the HMPC inventoried the following for each community, to the extent possible, to quantify vulnerability in identified hazard areas:

General hazard-related impacts, including impacts to life, safety, and health
Insurance coverage, claims paid, and repetitive losses
Values at risk (i.e., types, numbers, and value of land and improvements)
Identification of critical facilities at risk

Identification of cultural and natural resources at risk
Development trends within the identified hazard area

The HMPC incorporated a DHSEM study using FEMA's loss estimation software, HAZUS-MH, to analyze the County's vulnerability to earthquakes. The vulnerability and potential impacts from priority hazards that have neither specific mapped areas nor the data to support additional vulnerability analysis are discussed in more general terms. These include:

Drought
Severe Weather: High Winds
Severe Weather: Lightning
Severe Weather: Thunderstorm
Severe Weather: Winter Storms
Volcano

Dam Failure Vulnerability Assessment

Likelihood of Future Occurrence—Low
Vulnerability—Medium

To determine vulnerability to dam failure in Los Alamos County, the 2010 Los Alamos Canyon Dam EAP was used. With the exception of the ice rink and the West Road Crossing of Los Alamos Creek, there currently appears to be minimal development immediately within Los Alamos Canyon, thus it would be expected that the evacuation area will have a limited size. Due to the relatively steep canyon walls, there does not appear to be much difference in the lateral extent of the flood wave generated for a sunny day dam breach simulation with the reservoir at the elevation of the spillway crest versus a dam breach simulation with water flowing through the spillway and a peak water surface at the elevation of the dam crest. Thus, a single evacuation map based on a breach of the dam with water flowing through the spillway with a peak water surface at the elevation of the dam crest was created to alleviate the potential for confusion if an actual emergency situation involving the dam were to occur.

A major flood caused by a sudden breach of the dam could affect one business and the two roads shown below in Table 4.31. Flooding would reach the ice rink in approximately 16 minutes.

Table 4.31 Dam Inundation Analysis from EAP

Business/Highway	Address	Distance Downstream from Dam	Max Water Depth above Stream Bed	Velocity of Flow (ft/s)
Unpaved Rd to Los Alamos Res	West Road to Los Alamos Reservoir	0 to 1.4 miles	6.3-4.7 feet	Approx 21-14
West Road	From Los Alamos Creek crossing to Omega Bridge crossing	1.4 miles	5.5 feet	14
Los Alamos County Ice Rink	4475 West Road	1.7 miles	4.7 feet	14

Source: Los Alamos Canyon Dam EAP, 2010

Future Development

There is no planned development in the inundation area according to the HMPC.

Drought Vulnerability Assessment

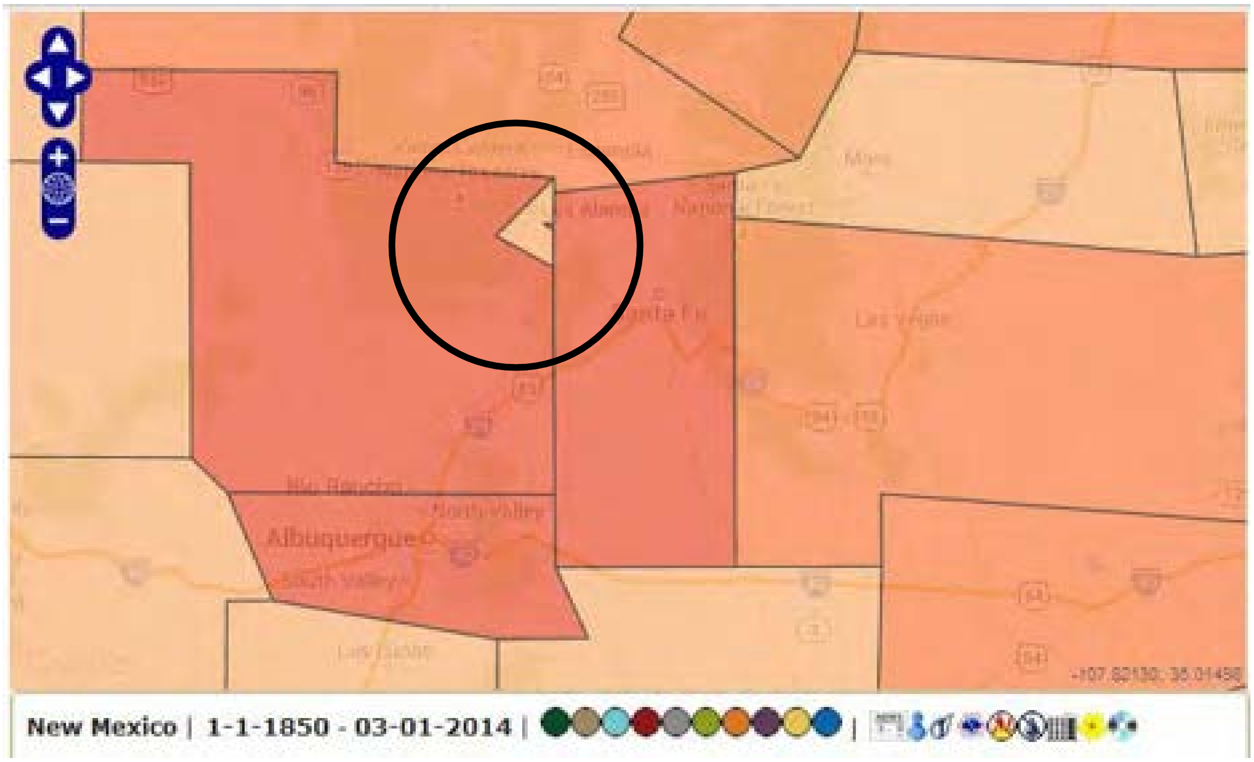
Likelihood of Future Occurrence—Medium
Vulnerability—Medium

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.

Based on historical information, the occurrence of drought in New Mexico, including Los Alamos 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 Los Alamos County to drought is countywide, but impacts may vary and include reduction in water supply and an increase in dry fuels.

Drought impacts are wide-reaching and may be economic, environmental, and/or societal. Tracking drought impacts can be difficult. The Drought Impact Reporter from the NDMC is a useful reference tool that compiles reported drought impacts nationwide. Figure 4.48 and Table 4.32 show drought impacts for the Los Alamos County Planning Area from 1850 to March 2014. The data represented is skewed, with the majority of these impacts from records within the past ten years.

Figure 4.48 Drought Impact Reporter for Los Alamos County (1850 to 2014)



* Los Alamos County highlighted by black oval Source:
National Drought Mitigation Center

Table 4.32 Los Alamos County Drought Impacts

Category	Number
Agriculture	92
Business and Industry	15
Energy	2
Fire	57
Plans & Wildlife	31
Relief, Response, and Restrictions	57
Society and Public Health	28
Tourism and recreation	8
Water Supply and Quality	24
Total	**314**

Source: National Drought Mitigation Center

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. Water quality deterioration is also a potential problem.

Drought conditions can also cause soil to compact and not absorb water well, potentially making an area more susceptible to flooding.

It is difficult to quantitatively assess drought impacts to Los Alamos County because not many county-specific studies have been conducted. The vulnerability to the County from drought is somewhat different than what might be expected. Typically, drought impacts include a reduction in water supply and/or agricultural losses.

The community's primary water supply is from extremely deep wells that, according to the HMPC, are not impacted by drought conditions. In November 2003, when the USDA declared all 33 counties in New Mexico as designated disaster areas due to losses caused by drought, only Los Alamos County was not considered eligible for financial assistance because LAC had not sustained any quantifiable losses – probably due to the lack of commercial agriculture within the county.

Development Trends

As previously stated, Los Alamos County has access to large quantities of water through deep water wells. However, future population growth in the County will add additional pressure during periods of drought and water shortage. The County will need to continue to plan for and add infrastructure capacity for population growth.

Earthquake Vulnerability Assessment

Likelihood of Future Occurrence—Low
Vulnerability—Medium

Earthquakes represent a low probability, but potentially high consequence hazard for the County. HAZUS is FEMA's loss estimation model that can be used to simulate earthquake consequences.

With the assistance of New Mexico State University Earth Data Analysis Center (EDAC), further analysis and additional information was provided to DHSEM and Los Alamos County regarding the Santa Clara Canyon segments of the Pajarito fault system. A level 1 HAZUS scenario was modeled to estimate the impacts of a Mw 7 event on the Pajarito Fault. The results of this analysis (preliminary as of 8-26-2015) are captured in the table below. Hazus estimates that about 4,070 buildings will be at least moderately damaged. This is over 54% of the buildings in the County. There are an estimated 556 buildings that will be damaged beyond repair. The Rendija Canyon and Guaje Mountain segments of the fault were not included because those segments would add little to the ground motion prediction and damage estimate for an Mw 7 event on the Pajarito Fault and Santa Clara Canyon segments.

Table 4.33 HAZUS-MH Earthquake Loss Estimation M 7 Scenario Results

Type of Impact	Impacts to County
Total Buildings Damaged	Slight: 1,992 Moderate: 2,246 Extensive: 1,268 Complete: 557
Building and Income Related Losses	$711 million 78% of damage related to residential structures 13% of loss due to business interruption
Total Economic Losses (includes building, income and lifeline losses)	$716 million
Casualties (based on 2 a.m. time of occurrence)	Without requiring hospitalization: 156 Requiring hospitalization: 43 Life threatening: 7 Fatalities: 13
Casualties (based on 2 p.m. time of occurrence)	Without requiring hospitalization: 275 Requiring hospitalization: 83 Life threatening: 14 Fatalities: 27
Casualties (based on 5 p.m. time of occurrence)	Without requiring hospitalization: 194 Requiring hospitalization: 57 Life threatening: 10 Fatalities: 18
Damage to Transportation and Utility Systems and Essential Facilities	Some damage to utility pipeline systems including numerous breaks in potable water, waste water, and natural gas lines. 682 households without potable water service; 3,304 households without electric service No damage shown to essential facilities
Displaced Households	717
Shelter Requirements	311

Source: HAZUS-MH: Earthquake Event Report, New Mexico State University Earth Data Analysis Center (EDAC); Pajarito fault, epicenter location:-106.36, 35.84. Attenuation Function: Western US Extensional 2008-Normal

A review of these results from Los Alamos County Emergency Management noted that transportation and displaced population impacts could be greater depending on the time of day. This is due to the large influx of LANL employees from outside the region during the work week, many of whom rely on public transportation. Fire following earthquake would likely be a real possibility in the older neighborhoods on Bathtub row and Hilltop House area. Potable water, wastewater, natural gas, electric and communications impacts would likely be higher. Despite these limitations this initial analysis provides a baseline for the significance of a large earthquake affecting the County.

Development Trends

Building codes substantially reduce the costs of damage to future structures from earthquakes.

LANL has prepared seismic hazard assessments for the purposes of critical and lifeline facility risk assessments and to ensure future facilities are built to account for potential earthquake shaking.

Flood

For the purposes of the assessment, the flood hazard is broken out into two categories: 100/500- year Flood and Localized Stormwater/Flash Flooding**.**

Flood: 100/500-year Vulnerability Assessment

Likelihood of Future Occurrence—Low
Vulnerability—Medium

Flooding is another risk to which LAC is vulnerable to but in a much different manner than wildfire or other hazards. As discussed, the risk potential or likelihood of a flood event occurring in the county increases with the annual onset of monsoons in July and August. The monthly average total precipitation during these months for the period of record, 1942 to 2003, is 3.0 and 3/5+ inches of rainfall respectively.

However, LAC's vulnerability to the 100-year flood (i.e., the FEMA mapped floodplain – the area that has a 1% chance in any given year of being equaled or exceeded) is extremely low. Further, given the topography of the area, a series of fingers of land (mesas) separated by deep canyons, the 500-year floodplain (although not shown on the FIRMs) is located in the same general area as the 100-year floodplain-at the bottom of a steep canyon with no development. As a result, LAC's vulnerability to the 500-year flood is also quite low.

Methodology

Los Alamos County has mapped FEMA flood hazard areas. GIS was used to determine the possible impacts of flooding within the County. The following methodology was followed in determining improved parcel counts and values at risk to the 1% and 0.2% annual chance flood events.

The 2013 Los Alamos County's assessor data and parcel layer were joined together using GIS and used as the basis for the inventory of parcels falling within identified FEMA Flood zones. Property Type categories were assigned to the County Assessor's parcel data and included in this analysis. The Los Alamos County DFIRM, effective 7/18/2011, only has Zone A mapped as a flood zone within small areas of the townsites of Los Alamos and White Rock. Zone A is designated as a FEMA 1% Annual Chance (100-year) flood risk with no base flood elevations. Zone X which designates areas with limited flood hazard risk is the other mapped zone found within the townsites. Santa Fe National Forest and Bandelier National Monument have also been mapped as Zone X. Los Alamos National Laboratory is a No Special Flood Hazard Area. A No Special Flood Hazard Area is an area that is generally in a moderate to low risk flood zone (Zones B, C, X). Table 4.34 explains the difference between mapped flood zones. 05 shows the parcels and value that fall in each of these zones. These zones are shown on Figures 4.49 through 4.51.

Table 4.34 Flood Hazard Zones in Los Alamos County Planning Area

Flood Zone	Description
A	100-year Flood: no base flood elevations provided
X	No flood hazard
NSFHA	No Special Flood Hazard Area - an area that is in a moderate-to-low risk flood zone (Zones B, C, X Pre- and Post-FIRM).

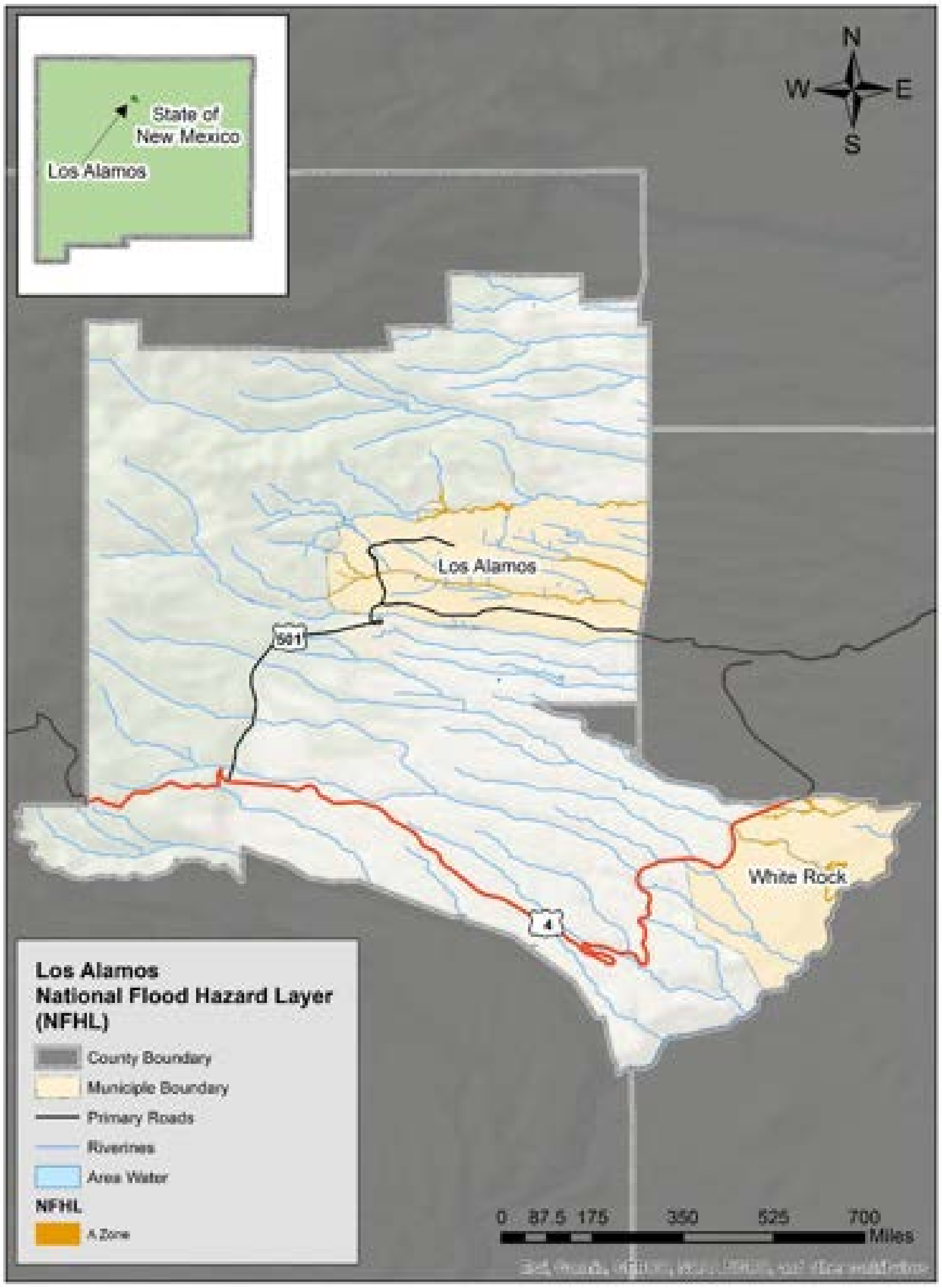
Source: NFIP

Table 4.35 Los Alamos County Planning Area Flood Zone Summary

Land Area/Owner	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value
1% Annual Chance Flood Zone				
Los Alamos townsite	2	0	0	$0
White Rock townsite	17	13	17	$2,276,000
Other County Areas	1	1	3	$100,570
Total	**20**	**14**	**20**	**$2,376,570**
Zone X Flood Zone				
Los Alamos townsite	4,739	4,087	5,345	$1,014,897,190
White Rock townsite	2,484	2,348	3,111	$418,922,150
Other County Areas	5	2	110	$2,860,630
Bandelier National Monument	1	0	15	$0
Santa Fe National Forest	3	0	5	$0
Total	**7,232**	**6,437**	**8,586**	**$1,436,679,970**
No Special Flood Hazard Area Zone				
Los Alamos National Laboratory	20	4	2,708	$4,035,620
Total	**20**	**4**	**2,708**	**$4,035,620**

Source: Los Alamos County 2013 Roll Assessor & Parcel Data; Los Alamos County DFIRM, July 2011

Figure 4.49 Los Alamos County Planning Area DFIRM



In some cases, there are parcels in multiple zones, such as Zone A (or 1% Annual Chance) and Zone X. As a result of some parcels falling within one or more flood zone, GIS was used to create a centroid, or point, representing the center of each parcel polygon, which was overlaid on the floodplain layer. For the purposes of this analysis, the flood zone that intersected the centroid was assigned as the flood zone for the entire parcel. The parcels were segregated and analyzed for the entire Los Alamos County Planning Area. The results are summarized in the tables and maps provided within this vulnerability section.

Using the property type categories assigned to the county assessor's data as previously described, content values estimations utilize Hazus methodologies which estimate content replacement value as a percent of improved structure values by property type. Table 4.36 shows the breakdown of the different property types in Los Alamos County and their estimated content replacement value percentages using Hazus content factors.

Table 4.36 Hazus Content Replacement Value Factors

Property Type	Content Replacement Values
Commercial	100%
Exempt Church	100%
Exempt Commercial	100%
Exempt County	100%
Exempt Federal	100%
Exempt School	100%
Open Area	100%
Residential	50%
Vacant Commercial	0%
Vacant Residential	0%

Source: Hazus 2.1

Values at Risk

This risk assessment of the improved parcel counts and values at risk in Los Alamos County's DFIRM zones is presented in two parts. Flood risks to the County are analyzed in the following way:

A detailed table (Table 4.36) shows the count and improved value of parcels by property type that fall in a floodplain by flood zone and by land area/owner.
A summary table (Table 4.37) sorts the parcel count and value data from the first table to show a loss estimate. Contents values were estimated as a percentage of improved value based on their property type, using FEMA/HAZUS estimated content replacement values shown in Table 4.35. Estimated losses assume that a flood is unlikely to cause total destruction. Actual losses are related to a variety of factors, including flood depth, flood velocity, building type and construction. Using FEMA's recommendations, average damage

is estimated to be 20 percent of the total building and estimated contents value which is based on a two foot flood depth as an estimate of a flood event.

The methodology described previously produced loss estimates for this vulnerability assessment should be used for flood risk mitigation, emergency preparedness, and response and recovery. The methodology and results should be considered "reasonable." Uncertainties are inherent in any loss estimation methodology, and losses will vary depending on the magnitude of the flood event. Other limitations may include incomplete or inaccurate inventories of the built environment. Also, this loss estimation assumes no mitigation and does not account for buildings that may have been elevated above the 1% annual chance event according to local floodplain management regulations.

Tables 4.37 and 4.38 contain flood analysis results for Los Alamos County. These tables show the number of parcels and values at risk to the 1% annual chance flood events for the County. There are no 0.2% annual chance properties in the County.

Table 4.37 Incorporated Los Alamos County - Count and Improved Value of Parcels in 1% Chance Floodplain by Zone and Property Type

Land Area/Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value
Los Alamos townsite	Exempt County	2	0	0	$0	$0	$0
	Total	**2**	**0**	**0**	**$0**	**$0**	**$0**
White Rock townsite	Exempt Church	1	1	3	$382,610	$382,610	$765,220
	Exempt County	4	0	0	$0	$0	$0
	Residential	12	12	14	$1,893,390	$946,695	$2,840,085
	Total	**17**	**13**	**17**	**$2,276,000**	**$1,329,305**	**$3,605,305**
Other County Areas	Exempt County	1	1	3	$100,570	$100,570	$201,140
	Total	**1**	**1**	**3**	**$100,570**	**$100,570**	**$201,140**
	Grand Total	**20**	**14**	**20**	**$2,376,570**	**$1,429,875**	**$3,806,445**

Source: Los Alamos County 2013 Roll Assessor & Parcel Data; Los Alamos County DFIRM, July 2011

Table 4.38 Incorporated Los Alamos County - Flood Loss Estimates

Land Area/Owner	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Estimated Content Value	Total Value	Estimated Loss
Los Alamos townsite	2	0	0	$0	$0	$0	$0
White Rock townsite	17	13	17	$2,276,000	$1,329,305	$3,605,305	$721,061
Other County Areas	1	1	3	$100,570	$100,570	$201,140	$40,228
Total	**20**	**14**	**20**	**$2,376,570**	**$1,429,875**	**$3,806,445**	**$761,289**

Source: Los Alamos County 2013 Roll Assessor & Parcel Data; Los Alamos County DFIRM, July 2011

According to the information in Tables 4.36 through 4037, the Planning Area has 20 improved parcels and roughly $3.8 million of value (of the total assets of the County of $2.4 billion) in the 1% annual chance floodplain. There are no additional improved parcels at risk to the 0.2% annual chance flood.

Applying the 20 percent damage factor as previously described, there is a 1% annual chance of a flood event causing $760,000 in damages in the County. The majority of the flood risk in the County is to residential structures in the White Rock townsite.

Flooded Acres

Also of interest is the land area affected by the various flood zones. The following is an analysis of flooded acres in the County in comparison to total area within the County.

Methodology

GIS was used to summarize acres within FEMA flood zones by land ownership. Zone A is the only 1% annual chance flood zone in the Los Alamos County DFIRM. The Los Alamos County parcel layer and effective DFIRM data were intersected using GIS to identify parcels within potential flood hazard areas. This process was conducted for 1% flood chance areas and their acres. The resulting data tables with flooded acreages were then imported into a database and linked back to the original parcels, including total acres and improvement values, by parcel number. In the tables below each flood zone is represented by Land Owner for their total flooded acres, total improved flooded acres and then broken out by parcel count in each category. Table 4.39 represents the analysis of total acres for each FEMA DFIRM flood zone.

Limitations

One limitation of this analysis is that the parcel layer does not contain right-of-ways. Due to this there are voids of land that are not calculated; thus the analysis only represents total parcel acres. The other limitation created by this type of analysis is that improvements are uniformly found throughout the parcel, while in reality, only portions of the parcel are improved, and improvements may or may not fall within the flood zone portion of a parcel; thus, areas of improvements flooded calculated through this method may be higher or lower than those actually seen in a similar real world event.

Table 4.39 **Los Alamos County– Flooded Acres by Zone and Land Owner**

Flood Zone	Land Area/Owner	Total Parcel Count	Total Acres	Improved Parcel Count	Improved Acres
Zone A	Los Alamos townsite	2	4	0	0
	White Rock townsite	17	48	13	6
	Other County Areas	1	2	1	2
	Total	**20**	**54**	**14**	**8**
Zone X	Los Alamos townsite	4,739	5,814	4,087	1,525
	White Rock townsite	2,481	3,399	2,347	1,527
	Other County Areas	5	605	2	559
	Bandelier National Monument	1	6,653	0	0
	Santa Fe National Forest	3	28,609	0	0
	Total	**7,229**	**45,081**	**6,436**	**3,611**
NSFHA*	Los Alamos National Laboratory	20	24,646	4	10
	Total	**20**	**24,646**	**4**	**10**

Source: Los Alamos County 2013 Assessor & Parcel Data; Los Alamos County DFIRM, July 2011
*NSFHA – No Special Flood Hazard Area

Insurance Coverage, Claims Paid, and Repetitive Losses

Los Alamos County joined the NFIP on September 24, 1984. The County does not participate in the CRS. NFIP insurance data provided by FEMA indicates that as of December 31, 2019, there were 41 policies in force in the County, resulting in $12,614,000 of insurance in force. According to the National Resource Defense Council (NRDC) There have been 10 paid losses totaling $30,867.

Based on this analysis of insurance coverage, Los Alamos County has assets at risk to the 100- year and greater floods. Of the 20 improved parcels within the 100-year floodplain, only 4 (20 percent) of those parcels maintain flood insurance.

Code enforcement data from the Los Alamos County Code enforcement plan chapter 24, the county has adopted NFIP minimum floodplain management criteria and base flood related information on the latest available floodplain mapping dated 7/18/2011. Implementation and enforcement of local floodplain management regulations to regulate and permit development in special flood hazard areas is located within the Code Enforcement Plan.

The Los Alamos County Community Development Department is responsible for providing solution-oriented land use planning, building permitting and inspection processes and housing policy and program development with the highest level of customer service in mind. To ensure code compliance the Community Development Department has individuals assigned as Code Compliance Officers, these officers are in part responsible for insuring compliance with NFIP standards along with building codes.

Repetitive Loss Data

According to the 2022 data from the state on NFIP communities, there are no repetitive loss (RL) or severe repetitive loss (SRL) structures in the County.

Populations at Risk

A separate analysis was performed to determine population in flood zones. Using GIS, the DFIRM Flood dataset was overlayed on the improved residential parcel data. Those parcel centroids that intersect a flood zone were counted and multiplied by the Census Bureau Los

Alamos County household factor (2.33); results were tabulated (see Table 4.40). According to this analysis, there is an estimated population of 26 in the County in the 1% annual chance flood event, and 0 in the 0.2% annual chance flood event.

Table 4.40 Incorporated Los Alamos County - Improved Residential Parcels and Population in Floodplain

1% Annual Chance		
Jurisdiction	**Improved Residential Parcels**	**Population***
Los Alamos townsite	0	0
White Rock townsite	12	26
Other County Areas	0	0
Total	**12**	**26**

Source: DFIRM, US Census Bureau, Los Alamos County 2013 Secured Roll Assessor & Parcel Data
* Census Bureau 2010 average household sizes are: Los Alamos County – 2.33.

Critical Facilities at Risk

GIS was used to identify risk to critical facilities within mapped floodplains. The ice rink is the only identified facility within the 100 year floodplain. It contains a day care (At-Risk Population) but according to the HMPC this facility will no longer include this service after the summer of 2015.

Cultural and Natural Resources at Risk

The Los Alamos County Planning Area has significant cultural and natural resources located throughout the County as previously described. Risk analysis of these resources was not possible due to data limitations. However, natural areas within the floodplain often benefit from periodic flooding as a naturally recurring phenomenon. These natural areas often reduce flood impacts by allowing absorption and infiltration of floodwaters.

Development Trends

Tract A-19-A is located near the intersection of Sherwood Boulevard and NM4 in White Rock, NM. The master plan for this site proposes single family residential, mixed use and retail development. Canada de Buey is a significant arroyo that passes through Tract A-19-A and includes flood hazard areas mapped on FIRM Map No 350035 Panel 0135C. A 2012 master drainage report for Tract A-19-A provides a framework for development of the master plan area in the context of flood and drainage issues on the site. A preliminary analysis of anticipated land treatments, runoff flow rates and trunk storm drain pipes sizes is included in the report (https://www.losalamosnm.us/projects/cdd/Documents/A-19-a%20Drainage%20Report.pdf).
Any development in mapped flood hazard areas would conform to the County's floodplain ordinance to minimize impacts.

Flood: Localized Stormwater/Flash Flooding Vulnerability Assessment

Likelihood of Future Occurrence—High
Vulnerability—High

Historically, the Planning Area has been at risk to flooding primarily during the monsoon season and during times of heavy rainfall. Significant flooding, including flash flooding, outside of the 100-year floodplain has caused temporary utility outages, road closures and major damage to county infrastructure and private property in the area. Based on NFIP claims data, properties located on Alabama Avenue and Yucca Street, located in the northern area of the Los Alamos townsite, have been damaged from flooding. Other areas include street flooding in the townsite of White Rock, based on reports from the Community Collaborative Rain, Hail and Snow Network (http://www.cocorahs.org/ViewData/ListIntensePrecipReports.aspx). Localized flooding also occurs throughout the County at various times throughout the year, but these areas are currently not mapped. A stormwater master plan action proposed in this plan should improve the availability of vulnerability information in the future. Locations of damage from the 2013 flooding are another source of areas vulnerable to flash flooding. Of these sites many of them had more than one FEMA Public Assistance Project Worksheet associated with them. Many sites had multiple categories of emergency work or permanent and mitigation work was awarded after emergency measures were performed. Most of the maintenance that will be required to keep the drainages in good working order will included periodic maintenance of culverts crossing under roadways and an effort to re-vegetate some of the drainages with indigenous species (Willow or Aspen) to decrease runoff coefficients and slow water velocities during larger storm events.

Another area of concern in Canada Del Buey Drainage in White Rock that was not a subject of FEMA funding, however, it is anticipated that this drainage will require periodic maintenance.

Development Trends

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.

Landslide/Rockfall Vulnerability Assessment

Likelihood of Future Occurrence—Medium
Vulnerability—Medium

Based on information provided by the HMPC, rockfall hazard is a concern in the County, though not on County maintained roadways. Although there are certain areas where the risk of rockfall is greatest (i.e., State Highway 502 and State Route 4), no injury or damage to people or property have been reported outside of the one hiker-death in the 1930's. As a result, the HMPC concluded that the vulnerability to LAC from rockfall hazards is low. A GIS analysis was performed during the 2023 update using the USGS national landslide hazard map as best available data. Based on this analysis, there is one parcel centroid in the high hazard and slide zone located in the southeast corner of the County. This parcel is an exempt property type with no improved value (undeveloped), owned by White Rock Town Site. It has a land value of $55,477,450.

Development Trends

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

Severe Weather: Lightning Vulnerability Assessment

Likelihood of Future Occurrence—High
Vulnerability—Medium

The Los Alamos County Planning Area experiences thunderstorms in the summer. These summer storms can include significant amounts of lightning. According to historical hazard data, severe weather is an annual occurrence in Los Alamos 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, ignition of wildfires, and damage to property can be a direct result of these storm events. Given the nature of these types of storms, the entire LAC community is potentially at risk.

However, based on historic information, the primary effect of these storms has not resulted in significant injury or damages to people and property. It is the secondary hazards caused by lightning, such as wildfires, that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in other sections (Section 4.3.12 Wildfire).

Future Development

New critical facilities such as communications towers should be built to withstand lightning. While damages have occurred in the County in the past due to lightning, it is difficult to quantify future deaths, injuries, or damages due to lightning. Future development projects should consider severe weather hazards at the planning, engineering and architectural design stage with the goal of reducing vulnerability. Development trends in the County are not expected to increase vulnerability to the hazard.

Severe Weather: Wind Vulnerability Assessment (Includes High Winds, Straight-Line Winds and Microbursts)

Likelihood of Future Occurrence—High

Vulnerability—Medium

Los Alamos County experiences a stormy season in the summer, often referred to as the "monsoon" season. These summer storms can include high winds. 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 LAC community is potentially at risk. Based on historic information, however, the winds associated with these storms has not resulted in significant injury or damages to people and property.

Future Development

New development designed and constructed in accordance with modern building codes should better withstand future wind events, however construction materials should be secured to prevent flying debris during wind events.

Severe Weather: Thunderstorm (Including Monsoon and Hail) Vulnerability Assessment

Likelihood of Future Occurrence—High
Vulnerability—Medium

The Los Alamos 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 Los Alamos 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 LAC community is potentially at risk. According to the NOAA Atlas 14, Volume 1, Version 5, Los Alamos County experiences a 100-year rainall event if the county receives 2.19 inches of rain over a period of one hour, 2.55 inches over a period of two hours, and 3.19 inches over a period of 24 hours. While it is rare to have hail greater than 1.5 inches in diameter (ping-pong ball sized) in the County, this would be the lower limit of hail extent that could cause damage to vehicles, roofs and physical harm. The caveat to this is that sometimes smaller diameter hail in intense volumes accompanied with high winds can also be damaging. However, based on historic information, the primary effect of these storms has not resulted in significant injury or damages to people and property. Typically hail losses are covered by insurance. It is the secondary hazards caused by weather, such as floods, losses that have had the greatest impact on the County. The risk and vulnerability associated with these secondary hazards are discussed in Section 4.3.6 Flood.

Future Development

New critical facilities such as communications 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 should be considered for all new development. Development trends in the County are not expected to increase vulnerability to the hazard.

Severe Weather: Winter Storm and Cold

Likelihood of Future Occurrence—High
Vulnerability—Low

Impacts to LAC as a result of a winter storm could include damage to infrastructure, particularly overhead power lines, road closures, and interruption in business and school activities. Utility outages can impact anything relying on electricity without a redundant power supply (e.g., a generator), and include secondary impacts such as interruption to water and sewage services, heat and refrigeration, fuel supplies, computers and even cell phones. If interruption to business occurs for an extended period, economic impacts can be severe. Also of concern would be the impact to populations with special needs such as the elderly and those requiring the use of medical equipment. Although typically short-lived, delays in emergencies response services can also be of concern. Depending on the nature of a given storm, all areas within LAC are potentially at risk; however, those areas relying on above ground utilities would potentially suffer the greatest damage.

The National Climatic Data Center (NCEI) has identified reportable damage to people or property as a result of winter storms in the last 50 years. According to the HMPC, school and lab closures generally occur a couple of times each year due to heavy snows.

The extent of winter storms and cold that cause issues in Los Alamos County includes storms forcasted to be Winter Storm Warnings, Wind Chill Warnings or Blizzard Warnings. The National Weather Service in Alburquerque 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 well 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. While rare in Los Alamos County the northeast highlands and northeast plains of New Mexico are the most blizzard-prone areas where the deadly combination of fierce winds and snow can reduce visibility to near zero and create wind chills well below zero. 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.

Development Trends

Future residential or commercial buildings built to code should be able to withstand snow loads from severe winter storms. 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 trends in the county are not expected to increase vulnerability to this hazard.

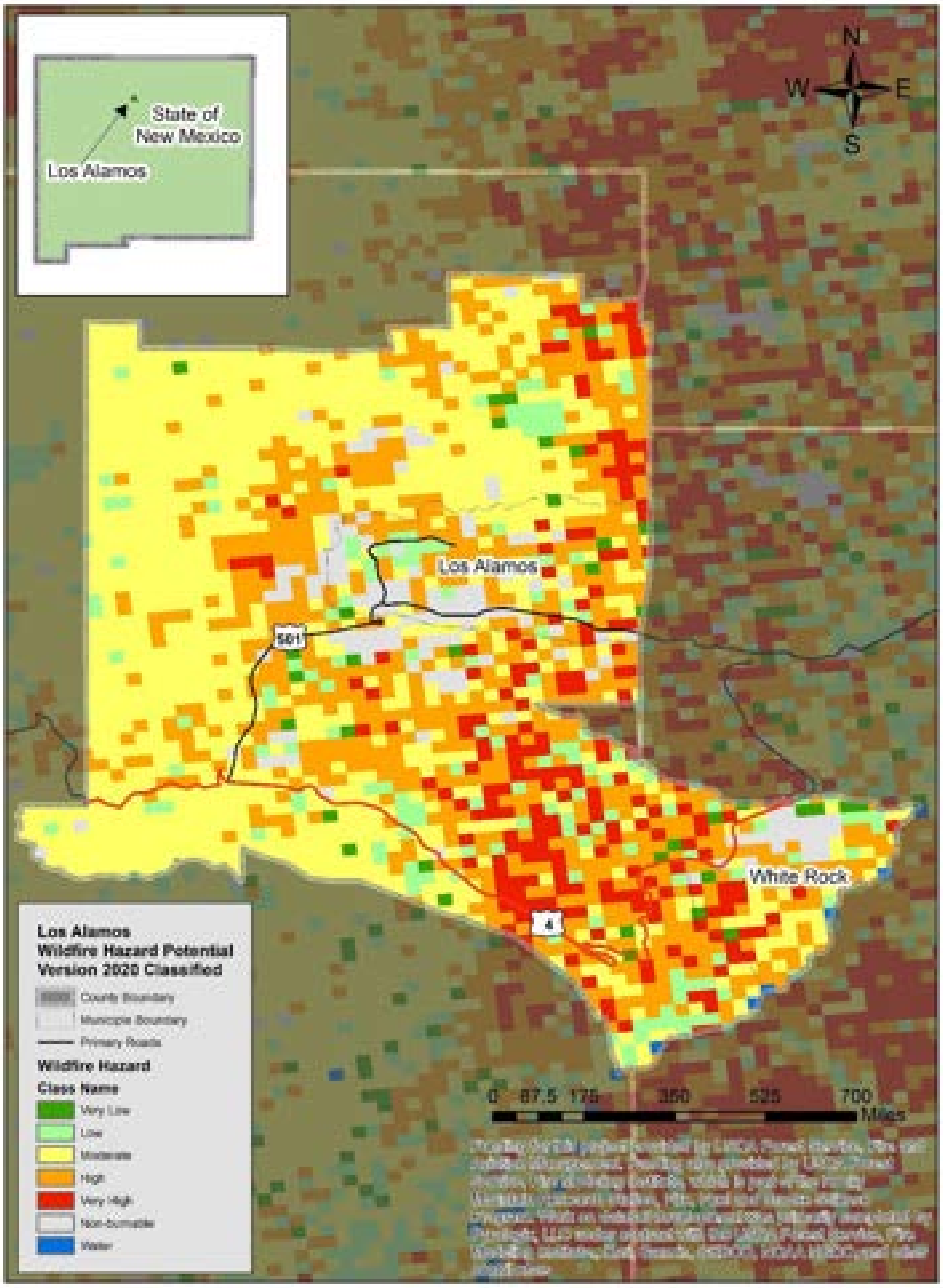
Wildfire Vulnerability Assessment

Likelihood of Future Occurrence—High
Vulnerability—High

Risk and vulnerability to Los Alamos County from wildfire is of significant concern. High fuel loads in the County and interlacing neighborhoods and forest, along with geographical and topographical features, create the potential for both natural and human-caused fires that can result in loss of life and property. These factors, combined with natural weather conditions common to the area, including periods of drought, high temperatures, low relative humidity, and periodic winds, can result in frequent and sometimes catastrophic fires. During the fire season, the dry vegetation and hot and sometimes windy weather results in an increase in the number of ignitions. Any fire, once ignited, has the potential to quickly become a large, out-of-control fire. The HMPC has noted that both developed and undeveloped areas are at risk. Localized road and school closures have been reported during wildfires. Roads, bridges, telecommunications and high voltage transmission lines are also at risk to wildfire. As development continues throughout the County, especially in these interface areas, the risk and vulnerability to wildfires will likely increase.

For the CWPP, the boundaries of the WUI are drawn to include surrounding areas where fuel buildup and fire could threaten the community. As demonstrated in the La Mesa, Dome, Oso, and Cerro Grande fires, wind-driven wildfire spread from southwest to northeast can cover several miles in a single day. Thus, heavily forested land to the south, southwest and west of the urbanized area of Los Alamos are included in the WUI. Figure 4.52 shows the area for which CWPP wildfire data was completed and a WUI was defined. County areas outside of this are not included in this assessment.

Figure 4.52 Los Alamos County Planning Area Boundary and WHP Area



Baseline conditions in the wildland and in the urbanized areas of Los Alamos County have been thoroughly studied and documented. The following assessments are broken down to present conditions that were used in formulating priority treatment areas, implementation actions within the treatment areas, and plans for reducing structural ignitability and strengthening preparedness.

Assessment of Wildland Fire Hazards

This overview of the characterization of existing wildland conditions in Los Alamos County looks at the three components of wildland fire behavior: fuels, weather, and topography. Data were drawn from the Fuel Mitigation/Forest Restoration Project monitoring project by the United States Geological Survey (USGS); the Southwest Environmental Consultants' (SEC) report on defensible space in Los Alamos; from the Bandelier National Monument Fire Plan and from Geographic Information System (GIS) analysis by the Los Alamos County Parks Division.

To make sense of the data, a variety of methods were used to assess fire hazard or to make general predictions about fire behavior. A computer simulation was used to predict future forest conditions and visually display the effects of past forest restoration treatments. A fire model was used to generate scenarios of fire threat based on present conditions. Fire predictions were generated by Behave Plus3 and by the Forest Vegetation Simulator, both of which are commonly used fire modeling applications produced by the USDA Forest Service. Also, GIS was used to synthesize a variety of data and generate maps of areas of greatest potential threat from wildland fire.

In order to analyze the risk and vulnerability of the Los Alamos County Planning Area to wildfire, Integrated Solutions Consulting utilized the data and methodologies contained in the 2009 Community Wildfire Protection Plan (CWPP) for Los Alamos County. Data from the CWPP was then combined with County GIS and assessor data to identify improved and unimproved parcels by area and property type at risk to wildfire. Loss estimates of County assets at risk to wildfire was also developed utilizing this information.

The following section describes the methodologies behind the CWPP data and the maps and tables created for this wildfire vulnerability assessment for purposed of this LHMP Update.

CWPP Results: Wildland Wildfire Hazard

Methodology

Using GIS mapping of open space data, aerial photographs, and GIS spatial data, forested and woodland areas in Los Alamos were assessed for four characteristics and rated for the risk factor for each of the characteristics. The data were generated with a pixel size of 20 feet. Analysis was done in ArcGIS 9.2 using the weighted overlay function in Spatial Analyst.

Wildlands were rated for fuel model, aspect, slope, and inaccessibility to fire suppression equipment. A combined wildfire risk model was the result of this analysis, which ranks areas from low to extreme depending on the combination of various factors. The resulting map (see Figure 4.53) indicates areas adjacent to the Los Alamos townsite where additional fuel reduction treatments are required. It should be noted that even areas randed low or moderate could burn. Typically fires 10 acres or more begin to incur substantial suppression costs, but this is heavily dependent on where the fire burns. Smaller fires in populated areas can have devastating results.

Wildland Risk GIS Analysis

Methodology

2013 Los Alamos County's assessor data and parcel layer (by parcel PIN) were joined together using GIS and used as the basis for the inventory of for this wildland risk analysis. As previously described, property type categories were assigned to the County Assessor's parcel data and included in this analysis. The Los Alamos County CWPP wildland risk raster layer was used to identify fire risk to each parcel that fell within the wildland fire risk raster layer through a spatial analysis tool called extract values to points. This tool extracted cell values of the fire risk raster where the parcel centroids intersected and placed the values in the attribute table for analysis. The raster values were broken out, as shown in Table 4.41, to help show the fire severity breakdown.

Table 4.41 Wildland Risk Raster Classifications

Severity	Range
Low	1-2
Moderate	3-4
Elevated	5-6
High	7-9
Severe	10-10
Extreme	11-16

For the purposes of this analysis, the fire classification that intersected the parcel centroid was assigned as that fire severity classification for the entire parcel. The parcels were segregated and analyzed for the areas around the Los Alamos townsite shown in (see 0). The results of this analysis are summarized in the tables and maps that follow. Table 4.42 shows wildland values at risk in the Los Alamos area in detail.

Table 4.42 Los Alamos County Planning Area - Wildland Fire Risk by Severity, Land Area, and Property Type

Land Area/Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Severe Wildland Fire Risk							
Los Alamos townsite	Exempt County	1	0	0	$0	$0	$0
	Residential	4	3	4	$776,470	$365,550	$1,142,020
	Total	**5**	**3**	**4**	**$776,470**	**$365,550**	**$1,142,020**
Extreme Wildland Fire Risk							
Los Alamos townsite	Residential	3	3	3	$604,010	$206,720	$810,730
	Total	**3**	**3**	**3**	**$604,010**	**$206,720**	**$810,730**
High Wildland Fire Risk							
Los Alamos townsite	Commercial	1	0	0	$0	$27,290	$27,290
	Exempt Church	1	1	1	$267,270	$536,770	$804,040
	Exempt County	11	0	7	$0	$18,138,560	$18,138,560
	Residential	97	92	109	$18,949,690	$8,103,080	$27,052,770
	Vacant Residential	8	0	0	$0	$643,410	$643,410
	Total	**118**	**93**	**117**	**$19,216,960**	**$27,449,110**	**$46,666,070**

Land Area/Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Los Alamos National Laboratory	Exempt Federal	1	0	0	$0	$525,460	$525,460
High Grand Total		**119**	**93**	**117**	**$19,216,960**	**$27,974,570**	**$47,191,530**
Elevated Wildland Fire Risk							
Los Alamos townsite	Commercial	3	0	0	$0	$77,970	$77,970
	Exempt County	13	0	7	$0	$14,106,360	$14,106,360
	Exempt Federal	1	0	3	$0	$890,600	$890,600
	Exempt School	1	1	4	$3,876,140	$1,214,340	$5,090,480
	Open Area	1	0	0	$0	$56,220	$56,220
	Residential	208	204	233	$41,624,070	$18,335,110	$59,959,180
	Vacant Residential	34	0	0	$0	$2,975,230	$2,975,230
	Total	**261**	**205**	**247**	**$45,500,210**	**$37,655,830**	**$83,156,040**
Moderate Wildland Fire Risk							
Los Alamos townsite	Commercial	32	22	42	$19,750,790	$7,227,440	$26,978,230
	Exempt Church	3	3	8	$6,996,670	$1,862,050	$8,858,720
	Exempt Commercial	1	1	2	$255,460	$427,910	$683,370
	Exempt County	42	3	84	$10,085,180	$46,676,110	$56,761,290
	Exempt Federal	2	0	2	$0	$105,120	$105,120
	Exempt School	5	5	27	$19,867,690	$6,610,940	$26,478,630
	Open Area	8	0	1	$0	$886,820	$886,820
	Residential	755	723	889	$135,799,670	$60,611,450	$196,411,120
	Vacant Residential	31	0	0	$0	$4,028,540	$4,028,540
	Total	**879**	**757**	**1,055**	**$192,755,460**	**$128,436,380**	**$321,191,840**
Other County Areas	Exempt County	1	1	3	$100,570	$580,600	$681,170
	Total	**1**	**1**	**3**	**$100,570**	**$580,600**	**$681,170**
City and County of Los Alamos	Total	880	758	1,058	$192,856,030	$129,016,980	$321,873,010
Los Alamos National	Exempt County	1	0	8	$0	$1,355,810	$1,355,810

Land Area/Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Laboratory	Exempt Federal	1	0	0	$0	$3,264,620	$3,264,620
	Total	**2**	**0**	**8**	**$0**	**$4,620,430**	**$4,620,430**
Moderate Grand Total		**882**	**758**	**1,066**	**$192,856,030**	**$133,637,410**	**$326,493,440**
Low Wildland Fire Risk							
Los Alamos townsite	Commercial	92	76	143	$82,019,580	$30,445,250	$112,464,830
	Exempt Church	15	15	24	$19,601,640	$7,763,170	$27,364,810
	Exempt Commercial	4	3	4	$763,270	$919,710	$1,682,980
	Exempt County	165	13	192	$35,301,460	$96,306,460	$131,607,920
	Exempt Federal	2	2	4	$1,986,160	$745,010	$2,731,170
	Exempt School	12	7	33	$45,236,290	$10,500,270	$55,736,560
	Open Area	28	0	14	$0	$2,779,140	$2,779,140
	Residential	3,027	2,906	3,494	$570,315,870	$249,992,300	$820,308,170
	Vacant Commercial	6	0	0	$0	$1,605,870	$1,605,870
	Vacant Residential	116	1	7	$7,850	$13,093,490	$13,101,340
	Total	**3,467**	**3,023**	**3,915**	**$755,232,120**	**$414,150,670**	**$1,169,382,790**
Los Alamos National Laboratory	Exempt County	9	3	13	$738,070	$7,450,440	$8,188,510
	Exempt Federal	5	1	17	$3,297,550	$1,541,590	$4,839,140
	Total	**14**	**4**	**30**	**$4,035,620**	**$8,992,030**	**$13,027,650**
Low Grand Total		**3,481**	**3,027**	**3,945**	**$759,267,740**	**$423,142,700**	**$1,182,410,440**

Source: 2009 Los Alamos County CWPP; 2013 Assessor's Data

Table 4.43 summarizes wildfire risk from Table 4.42.

Table 4.43 Los Alamos County Planning Area - Wildland Fire Risk Summary Table

Total Land Area/Owner	Total Parcel Count	Improved Parcel Count	Structure Count	Improved Value	Land Value	Total Value
Severe Wildland Fire Risk						
Los Alamos townsite	5	3	4	$776,470	$365,550	$1,142,020
Total	**5**	**3**	**4**	**$776,470**	**$365,550**	**$1,142,020**
Extreme Wildland Fire Risk						
Los Alamos townsite	3	3	3	$604,010	$206,720	$810,730
Total	**3**	**3**	**3**	**$604,010**	**$206,720**	**$810,730**
High Wildland Fire Risk						
Los Alamos townsite	118	93	117	$19,216,960	$27,449,110	$46,666,070
Los Alamos National Laboratory	1	0	0	$0	$525,460	$525,460
Total	**119**	**93**	**117**	**$19,216,960**	**$27,974,570**	**$47,191,530**
Elevated Wildland Fire Risk						
Los Alamos townsite	261	205	247	$45,500,210	$37,655,830	$83,156,040
Total	**261**	**205**	**247**	**$45,500,210**	**$37,655,830**	**$83,156,040**
Moderate Wildland Fire Risk						
Los Alamos townsite	879	757	1,055	$192,755,460	$128,436,380	$321,191,840
Other County Areas	1	1	3	$100,570	$580,600	$681,170
Los Alamos National Laboratory	2	0	8	$0	$4,620,430	$4,620,430
Total	**882**	**758**	**1,066**	**$192,856,030**	**$133,637,410**	**$326,493,440**
Low Wildland Fire Risk						
Los Alamos townsite	3,467	3,023	3,915	$755,232,120	$414,150,670	$1,169,382,790
Los Alamos National Laboratory	14	4	30	$4,035,620	$8,992,030	$13,027,650
Total	**3,481**	**3,027**	**3,945**	**$759,267,740**	**$423,142,700**	**$1,182,410,440**

Source: 2009 Los Alamos County CWPP; 2013 Assessor's Data

Assessment of Neighborhood Wildfire Risk

CWPP Neighborhood Wildfire Risk

Using GIS mapping of intersection and open space data, aerial photographs, site visits, and historical documents, each neighborhood in Los Alamos and White Rock was assessed for eight characteristics and rated for the risk factor for each of the characteristics. The data were generated with a pixel size of 20 feet. Analysis was done in ArcGIS 9.2 using the weighted overlay function in Spatial Analyst.

Each neighborhood was rated for street width, access to fire suppression equipment, the defensible space category, proximity to slopes greater than 20 percent, aspect, distance from untreated forest lands, and probability of experiencing wind-driven firebrands.

There were two separate analyses done for the Los Alamos and White Rock townsites because of vegetation types; fire approaching White Rock is very different than fire coming into Los Alamos. A fast-moving fire through piñon and juniper hits the perimeter lots in White Rock before there can be much of a suppression response, whereas it takes a while to crank up a crown fire in ponderosa. The classifications are different to make certain those differences were expressed in the map.

The resulting maps indicate the areas at the greatest risk of wildfire. These neighborhoods should be the initial focus of continued efforts for treatments and improvements on private land, particularly in relation to the home ignition zone. Neighborhoods rated extreme and severe should receive priority.

Neighborhood Fire Risk Methodology and Analysis

2013 Los Alamos County's assessor data and parcel layer (by parcel PIN) were joined together using GIS and used as the basis for the inventory for this neighborhood fire risk analysis. As previously described, property type categories were assigned to the county assessor's parcel data and included in this analysis. The Los Alamos County CWPP Neighborhood Risk raster layers were used to identify fire risk to each parcel that fell within the neighborhood fire risk raster layers through a spatial analysis tool called extract values to points. This tool extracted cell values of the fire risk raster where the parcel centroids intersected and placed the values in the attribute table for analysis. The raster values were broken out in Tables 4.44 and 4.45 to help show the fire severity breakdown.

Table 4.44 Los Alamos Townsite Area

Severity	Range
Low	1-4
Moderate	5-10
Elevated	11-14.9
High	15-19.9
Severe	20-22
Extreme	23-37

Table 4.45 White Rock Townsite Area

Severity	Range
Low	0-5
Moderate	6-16
Elevated	17-18
High	19-20
Severe	21-27.9
Extreme	28-28

For the purposes of this analysis, the fire classification that intersected the parcel centroid was assigned as that fire severity classification for the entire parcel. The parcels were segregated and analyzed for the areas around the Los Alamos and White Rock townsites shown in Figures 4.54 and 4.55. The results are summarized in the maps and tables that follow.

Table 4.46 shows the wildfire risk and associated values at risk in the County by property type.

Table 4.46 Los Alamos County Planning Area - Neighborhood Fire Risk by Severity, Land Area, and Property Type

Land Area/Owner	Property Type	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Severe Neighborhood Fire Risk							
White Rock townsite	Exempt County	4	0	0	$0	$181,940	$181,940
	Residential	41	41	71	$9,823,180	$7,402,420	$17,225,600
	Total	**45**	**41**	**71**	**$9,823,180**	**$7,584,360**	**$17,407,540**
Extreme Neighborhood Fire Risk							
Los Alamos townsite	Commercial	25	6	16	$2,724,420	$3,037,180	$5,761,600
	Exempt Church	7	7	10	$8,684,990	$3,237,200	$11,922,190
	Exempt County	64	1	56	$545,940	$58,787,850	$59,333,790
	Exempt Federal	1	0	1	$0	$57,830	$57,830
	Exempt School	3	2	8	$5,937,010	$1,825,540	$7,762,550
	Open Area	19	0	7	$0	$1,407,470	$1,407,470
	Residential	1,487	1,415	1,738	$275,455,850	$118,352,910	$393,808,760
	Vacant Residential	88	0	3	$0	$8,889,380	$8,889,380
	Total	**1,694**	**1,431**	**1,839**	**$293,348,210**	**$195,595,360**	**$488,943,570**
White Rock townsite	Exempt County	2	0	0	$0	$286,430	$286,430
	Residential	1	1	4	$233,920	$307,920	$541,840
	Total	**3**	**1**	**4**	**$233,920**	**$594,350**	**$828,270**
City and County of Los Alamos	Total	1,697	1,432	1,843	$293,582,130	$196,189,710	$489,771,840
Los Alamos National Laboratory	Exempt Federal	1	0	2	$0	$37,880	$37,880
Extreme Grand Total		**1,698**	**1,432**	**1,845**	**$293,582,130**	**$196,227,590**	**$489,809,720**
High Neighborhood Fire Risk							
Los Alamos townsite	Commercial	11	9	18	$3,100,670	$2,648,750	$5,749,420
	Exempt Church	2	2	2	$2,890,520	$1,095,040	$3,985,560

Total Land Area/Owner	Property Type	Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
	Exempt Commercial	1	1	1	$170,020	$273,850	$443,870
	Exempt County	75	1	163	$321,370	$24,054,420	$24,375,790
	Exempt Federal	1	0	1	$0	$47,290	$47,290
	Exempt School	5	5	36	$47,189,280	$8,391,590	$55,580,870
	Open Area	10	0	8	$0	$1,235,820	$1,235,820
	Residential	1,904	1,845	2,191	$341,081,690	$157,938,820	$499,020,510
	Vacant Residential	69	0	3	$0	$6,477,800	$6,477,800
	Total	**2,078**	**1,863**	**2,423**	**$394,753,550**	**$202,163,380**	**$596,916,930**
White Rock townsite	Commercial	3	2	3	$767,480	$345,990	$1,113,470
	Exempt County	15	0	0	$0	$9,403,910	$9,403,910
	Residential	312	312	652	$70,841,900	$50,011,480	$120,853,380
	Vacant Residential	2	0	1	$0	$260,600	$260,600
	Total	**332**	**314**	**656**	**$71,609,380**	**$60,021,980**	**$131,631,360**
City and County of Los Alamos	Total	2,410	2,177	3,079	$466,362,930	$262,185,360	$728,548,290
Los Alamos National Laboratory	Exempt Federal	1	0	1	$0	$77,360	$77,360
High Grand Total		**2,411**	**2,177**	**3,080**	**$466,362,930**	**$262,262,720**	**$728,625,650**
Elevated Neighborhood Fire Risk							
Los Alamos townsite	Commercial	26	21	34	$16,145,040	$7,518,830	$23,663,870
	Exempt Church	3	3	3	$2,096,230	$1,081,850	$3,178,080
	Exempt Commercial	1	1	1	$348,860	$364,670	$713,530
	Exempt County	29	4	29	$11,781,320	$18,573,050	$30,354,370
	Exempt School	5	3	6	$2,546,870	$2,865,420	$5,412,290
	Open Area	4	0	0	$0	$641,750	$641,750
	Residential	588	564	671	$121,054,820	$49,052,460	$170,107,280
	Vacant Residential	17	1	1	$7,850	$1,725,040	$1,732,890
	Total	**673**	**597**	**745**	**$153,980,990**	**$81,823,070**	**$235,804,060**
White Rock	Commercial	1	0	0	$0	$35,150	$35,150

Total Land Area/Owner	Property Type	Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
townsite	Exempt County	3	0	0	$0	$126,400	$126,400
	Residential	53	53	62	$10,112,050	$4,826,480	$14,938,530
	Total	**57**	**53**	**62**	**$10,112,050**	**$4,988,030**	**$15,100,080**
City and County of Los Alamos	Total	730	650	807	$164,093,040	$86,811,100	$250,904,140
Los Alamos National Laboratory	Exempt County	1	0	1	$0	$663,060	$663,060
Elevated Grand Total		**731**	**650**	**808**	**$164,093,040**	**$87,474,160**	**$251,567,200**
Moderate Neighborhood Fire Risk							
Los Alamos townsite	Commercial	47	43	90	$59,679,000	$18,071,950	$77,750,950
	Exempt Church	5	5	11	$8,335,700	$2,975,850	$11,311,550
	Exempt Commercial	3	2	4	$499,850	$709,100	$1,208,950
	Exempt County	33	9	23	$21,160,100	$33,618,290	$54,778,390
	Exempt Federal	2	2	4	$1,986,160	$745,010	$2,731,170
	Exempt School	2	1	2	$3,432,360	$2,166,540	$5,598,900
	Open Area	1	0	0	$0	$111,650	$111,650
	Residential	50	44	61	$11,154,870	$4,427,200	$15,582,070
	Vacant Commercial	2	0	0	$0	$244,260	$244,260
	Vacant Residential	6	0	0	$0	$2,623,540	$2,623,540
	Total	**151**	**106**	**195**	**$106,248,040**	**$65,693,390**	**$171,941,430**
White Rock townsite	Commercial	43	20	58	$11,958,280	$6,367,780	$18,326,060
	Exempt Church	11	11	17	$7,423,460	$4,734,140	$12,157,600
	Exempt County	47	2	18	$1,532,940	$80,286,000	$81,818,940
	Exempt School	2	2	15	$10,429,110	$2,573,550	$13,002,660
	Open Area	7	0	1	$0	$666,910	$666,910
	Residential	1,918	1,916	2,183	$297,919,940	$144,041,490	$441,961,430
	Vacant Commercial	1	0	0	$0	$86,290	$86,290
	Vacant Residential	19	0	0	$0	$1,306,520	$1,306,520

Total Land Area/Owner	Property Type	Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Total		**2,048**	**1,951**	**2,292**	**$329,263,730**	**$240,062,680**	**$569,326,410**
Other County Areas	Exempt County	1	1	3	$100,570	$580,600	$681,170
	Total	**1**	**1**	**3**	**$100,570**	**$580,600**	**$681,170**
City and County of Los Alamos	Total	2,200	2,058	2,490	$435,612,340	$306,336,670	$741,949,010
Los Alamos National Laboratory	Exempt Federal	2	0	2,666	$0	$139,921,900	$139,921,900
Moderate Grand Total		**2,202**	**2,058**	**5,156**	**$435,612,340**	**$446,258,570**	**$881,870,910**
Low Neighborhood Fire Risk							
Los Alamos townsite	Commercial	19	19	27	$20,121,240	$6,501,240	$26,622,480
	Exempt Church	2	2	7	$4,858,140	$1,772,050	$6,630,190
	Exempt County	29	1	19	$11,577,910	$32,429,270	$44,007,180
	Exempt School	3	2	12	$9,874,600	$3,076,460	$12,951,060
	Open Area	3	0	0	$0	$325,490	$325,490
	Residential	39	37	46	$9,251,490	$3,736,570	$12,988,060
	Vacant Commercial	4	0	0	$0	$1,361,610	$1,361,610
	Vacant Residential	6	0	0	$0	$746,430	$746,430
	Total	105	61	111	$55,683,380	$49,949,120	$105,632,500
White Rock townsite	Commercial	1	0	0	$0	$530,160	$530,160
	Exempt County	9	0	0	$0	$3,480,870	$3,480,870
	Exempt Federal	2	0	0	$0	$1,331,200	$1,331,200
	Residential	1	1	1	$155,890	$70,710	$226,600
	Vacant Residential	1	0	0	$0	$74,640	$74,640
	Total	14	1	1	$155,890	$5,487,580	$5,643,470
Other County Areas	Residential	1	1	101	$42,940	$1,575,630	$1,618,570
	Total	1	1	101	$42,940	$1,575,630	$1,618,570
City and County of Los Alamos	Total	120	63	213	$55,882,210	$57,012,330	$112,894,540
Los Alamos National	Exempt County	10	3	20	$738,070	$9,336,950	$10,075,020

Total Land Area/Owner	Property Type	Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Laboratory	Exempt Federal	4	1	14	$3,297,550	$1,951,810	$5,249,360
	Total	**14**	**4**	**34**	**$4,035,620**	**$11,288,760**	**$15,324,380**
Low Grand Total		**134**	**67**	**247**	**$59,917,830**	**$68,301,090**	**$128,218,920**

Source: 2009 Los Alamos County CWPP; 2013 Assessor's Data

Table 4.47 summarizes the previous table and shows values at risk to wildfire by land area/owner.

Table 4.47 Los Alamos County Planning Area - Neighborhood Fire Risk Summary Table

Land Area/Owner	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
Severe Neighborhood Fire Risk						
White Rock townsite	45	41	71	$9,823,180	$7,584,360	$17,407,540
Total	**45**	**41**	**71**	**$9,823,180**	**$7,584,360**	**$17,407,540**
Extreme Neighborhood Fire Risk						
Los Alamos townsite	1,694	1,431	1,839	$293,348,210	$195,595,360	$488,943,570
White Rock townsite	3	1	4	$233,920	$594,350	$828,270
Los Alamos National Laboratory	1	0	2	$0	$37,880	$37,880
Total	**1,698**	**1,432**	**1,845**	**$293,582,130**	**$196,227,590**	**$489,809,720**
High Neighborhood Fire Risk						
Los Alamos townsite	2,078	1,863	2,423	$394,753,550	$202,163,380	$596,916,930
White Rock townsite	332	314	656	$71,609,380	$60,021,980	$131,631,360
Los Alamos National Laboratory	1	0	1	$0	$77,360	$77,360
Total	**2,411**	**2,177**	**3,080**	**$466,362,930**	**$262,262,720**	**$728,625,650**
Elevated Neighborhood Fire Risk						
Los Alamos townsite	673	597	745	$153,980,990	$81,823,070	$235,804,060

Land Area/Owner	Total Parcel Count	Improved Parcel Count	Total Structure Count	Improved Value	Land Value	Total Value
White Rock townsite	57	53	62	$10,112,050	$4,988,030	$15,100,080
Los Alamos National Laboratory	1	0	1	$0	$663,060	$663,060
Total	**731**	**650**	**808**	**$164,093,040**	**$87,474,160**	**$251,567,200**
Moderate Neighborhood Fire Risk						
Los Alamos townsite	151	106	195	$106,248,040	$65,693,390	$171,941,430
White Rock townsite	2,048	1,951	2,292	$329,263,730	$240,062,680	$569,326,410
Other County Areas	1	1	3	$100,570	$580,600	$681,170
Los Alamos National Laboratory	2	0	2,666	$0	$139,921,900	$139,921,900
Total	**2,202**	**2,058**	**5,156**	**$435,612,340**	**$446,258,570**	**$881,870,910**
Low Neighborhood Fire Risk by Land Area/Owner and Property Type						
Los Alamos townsite	105	61	111	$55,683,380	$49,949,120	$105,632,500
White Rock townsite	14	1	1	$155,890	$5,487,580	$5,643,470
Other County Areas	1	1	101	$42,940	$1,575,630	$1,618,570
Los Alamos National Laboratory	14	4	34	$4,035,620	$11,288,760	$15,324,380
Total	**134**	**67**	**247**	**$59,917,830**	**$68,301,090**	**$128,218,920**

Source: 2009 Los Alamos County CWPP; 2013 Assessor's Data

Critical Facilities at Risk

Using GIS, the neighborhood fire risk layer was overlaid on the critical facilities layer. Those that intersected a zone of at least moderate are noted in the following table.

Table 4.50. Critical Facilities at Risk to Wildfire

Neighborhood Fire Risk	Facility Name	Facility Category
Severe	Quemazon Montessori School	At-Risk Population
Severe	PRV 34	Essential Facility
Severe	Quality Auto body	HAZMAT
Elevated	Mountain Elementary	At-Risk Population
Elevated	Canyon Glen Bridge	Essential Facility
Elevated	PRV 18	Essential Facility
Elevated	NAPA - Knect Automotive	HAZMAT
Moderate	Aspen Ridge Lodge Assisted Living	At-Risk Population
Moderate	Sombrillo Nursing Home	At-Risk Population
Moderate	Ark Child Development Center	At-Risk Population
Moderate	Children's Montessori Preschool	At-Risk Population
Moderate	Horizon Preschool Day Care	At-Risk Population
Moderate	Little Forest Playschool	At-Risk Population
Moderate	Mesa Public Library	At-Risk Population
Moderate	Ice Rink	At-Risk Population
Moderate	Aspen Elementary	At-Risk Population
Moderate	Bilingual Montessori School	At-Risk Population
Moderate	Canyoncito Montessori School	At-Risk Population
Moderate	Chamisa Elementary	At-Risk Population
Moderate	Pinion Elementary	At-Risk Population
Moderate	Ponderosa Montessori School	At-Risk Population
Moderate	Sage Montessori School	At-Risk Population
Moderate	Century Link Communications	Essential Facility
Moderate	Century Link Communications	Essential Facility
Moderate	TA-3 Substation	Essential Facility
Moderate	Townsite Substation	Essential Facility
Moderate	Police Station Admin EOC	Essential Facility
Moderate	Fire Administration	Essential Facility
Moderate	Fire Station 6	Essential Facility
Moderate	Fire Station 2	Essential Facility
Moderate	Fire Station 3 Police Substation White Rock	Essential Facility
Moderate	Ashley Pond	Essential Facility
Moderate	County Municipal Building	Essential Facility
Moderate	Fuller Lodge	Essential Facility
Moderate	Natural Gas City Gate	Essential Facility
Moderate	PRV 1	Essential Facility

Moderate	PRV 33	Essential Facility
Moderate	PRV 36	Essential Facility
Moderate	PRV 7	Essential Facility
Moderate	Pump Station	Essential Facility
Moderate	Schools Administration	Essential Facility
Moderate	White Rock Sub Station Electric	Essential Facility
Moderate	Pueblo Canyon Drainage Tunnel	Essential Facility
Moderate	Urgent Care	Essential Facility
Moderate	Barranca Tank 2	Essential Facility
Moderate	Group 12 Tank	Essential Facility
Moderate	North Mesa/Hawk Tank	Essential Facility
Moderate	Otowi Bstr 2 Tank	Essential Facility
Moderate	Otowi Well 4 Tank	Essential Facility
Moderate	Pajarito Bstr Sta 2 Tank	Essential Facility
Moderate	Pajarito Bstr Sta 3 Tank	Essential Facility
Moderate	Pajarito Tank 1	Essential Facility
Moderate	Pajarito Well 5 Tank	Essential Facility
Moderate	Water Tank	Essential Facility
Moderate	Western Tank	Essential Facility
Moderate	Pajarito Well #2	Essential Facility
Moderate	Conoco Quick Stop	HAZMAT
Moderate	Giant Shell Service Station	HAZMAT
Moderate	Metzgers Mobil Gas Station	HAZMAT
Moderate	Metzger's True Value/Mobil Gas Station	HAZMAT
Moderate	Smith’s Fuel Center	HAZMAT
Moderate	Los Alamos Monitor	HAZMAT
Moderate	Ace Hardware Los Alamos Home Improvement	HAZMAT
Moderate	Auto Zone	HAZMAT
Moderate	Frank's Supply Company	HAZMAT
Moderate	Metzger's Hardware	HAZMAT
Moderate	Canyon Vista Pool Association	HAZMAT
Moderate	East Park Pool	HAZMAT
Moderate	Los Alamos County Aquatic Center	HAZMAT
Moderate	Pinon Park Pool Association, Inc.	HAZMAT

Cultural and Natural Resources at Risk

The Los Alamos County Planning Area has substantial cultural and natural resources located throughout the County as previously described. In addition, there are other natural resources at risk when wildland-urban interface fires occur. One is the watershed and ecosystem losses that occur from wildland fires. This includes impacts to air quality. Another is the aesthetic value of the area. Major fires that result in visible damage detract from that value. Other assets at risk include wildland recreation areas, wildlife and habitat areas, and timber resources. The loss to these natural resources can be significant.

Development Trends

The pattern of increased damages is directly related to increased urban growth spread into historical forested areas that have wildfire as part of the natural ecosystem. Many WUI fire areas have long histories of wildland fires that burned only vegetation in the past. However, with new development, a wildland fire following a historical pattern now burns developed areas. WUI fires can occur where there is a distinct boundary between the built and natural areas or where development or infrastructure has encroached or is intermixed in the natural area. WUI fires may include fires that occur in remote areas that have critical infrastructure easements through them, including electrical transmission towers, railroads, water reservoirs, communications relay sites or other infrastructure assets. Recent wildfires have altered the fire regime for many parts of Los Alamos. The formerly forested areas to the west and north of town are now oak grasslands. Fires in such grasslands are fast-moving, low intensity fires that require a quick response. Stand density and fuel loads of the mature pine forests in the canyons within the community have been reduced through thinning and pile burning operations, but there is a continuing hazard from firebrands blown into adjacent neighborhoods from torching trees in a wildfire situation.

Volcano Vulnerability Assessment

Likelihood of Future Occurrence—Low
Vulnerability—Medium

Although LAC is situated on the flanks of a volcanic cone, known as the Valles Caldera, the risk from renewed volcanic activity resulting in an eruption is unlikely. Should an eruption occur, however, the potential impact to LAC would likely be catastrophic. In the event of a cataclysmic eruption, the entire County would truly be at risk, and the vulnerability would be the total values of all development, infrastructure and cultural and natural resources within LAC (and beyond).

The Valles Caldera is presently considered a dormant volcano, but based on recent studies and the long history of the Jemez volcanic field predictions are that it will probably erupt again. A notable increase in seismic activity would be a likely indicator of changing conditions. If that occurs, the community should reevaluate its options. Given the low probability though extremely high consequence of this hazard, the HMPC has determined it would not be cost effective or technically feasible to further address the implications associated with the volcanic hazard, other than continuing the monitoring by LANL, and required of DOE facilities.

The Volcanic Explosivity Index was developed by the United States Geological Survey and the

University of Hawaii to provide a relative measure of the explosiveness of volcanic eruptions. The Index determines the explosivity value of a volcano using factors including product volume, eruption cloud height, and qualitative observations of the eruption. The scale is logarithmic from VE2 and up; an increase of 1 index indicates an eruption is 10 times as powerful as the previous rating. The specific eruption volumes are as follows:

VE0 – Less than 10,000 cubic meters of ejecta volume; described as “effusive;” plume less than 100 meters; constant frequency; tropospheric injection negligible; no stratospheric injection.

VE1 – Between 10,000 and 100,000 cubic meters of ejecta volume; described as “gentle;” plume between 100 meters and 1 kilometer; daily frequency; minor tropospheric injection; no stratospheric injection.

VE2 – Between 100,000 and 1,000,000 cubic meters of ejecta volume; described as “explosive;” plume between 1-5 kilometers; weekly frequency; tropospheric injection moderate; no stratospheric injection.

VE3 – Between 1,000,000 and 10,000,000 cubic meters of ejecta volume; described as “catastrophic;” plume between 3-15 kilometers; frequency every few months; substantial tropospheric injection; possible stratospheric injection.

VE4 – Between 10,000,000 cubic meters and .1 cubic kilometer; described as “cataclysmic;” plume greater than 10 kilometers; frequency approximately 1 year; substantial tropospheric injection; definite stratospheric injection.

VE5 – Between .1 and 1 cubic kilometer ejecta volume; described as “paroxysmic;” plume greater than 10 kilometers; frequency approximately every 10 years; substantial tropospheric injection; substantial stratospheric injection.

VE6 – Between 1 and 10 kilometers ejecta volumner; described as “colossal;” plume greater than 20 kilometers; frequency approximately every 100 years; substantial tropospheric injection; substantial stratospheric injection.

VE7 – Between 10 and 100 cubic kilometer ejecta volume; described as “super-colossal;” plume greater than 20 kilometers; frequency approximately every 1,000 years; substantial tropospheric injection; substantial stratospheric injection.

VE8 – Greater than 1,000 cubic kilometers of ejecta volume; described as “mega-colossal;” plume greater than 20 kilometers; frequency approximately every 10,000 years; vast tropospheric injection; vast stratospheric injection.

Los Alamos County is susceptible to an eruption that measures up to VE8 on the Volcanic Explosivity Index, though the probability of an event occurring to that magnitude is extremely low. The effects that this could cause on Los Alamos County could be cataclysmic.

Development Trends

Because of Los Alamos County's proximity to a potential volcanic eruption, it would be extremely difficult to steer development in ways that mitigate the risk from this hazard.

Los Alamos County's Mitigation Capabilities

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, objectives, 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.

This section presents Los Alamos County's mitigation capabilities and discusses select state and federal mitigation capabilities that are applicable to Los Alamos County.

Similar to the HMPC's effort to describe hazards, risks, and vulnerability of Los Alamos 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 5.

Los Alamos County's Regulatory Mitigation Capabilities

Table 4.51 lists planning and land management tools typically used by local jurisdictions to implement hazard mitigation activities, and indicates those that are in place in Los Alamos County. Excerpts from applicable policies, regulations, and plans and program descriptions follow to provide more detail on existing mitigation capabilities.

Table 4.51 Los Alamos County Regulatory Mitigation Capabilities

Regulatory Tool (Ordinances, Codes, Plans)	Y/N	Date	Comments
Comprehensive plan	Y	1987	Completed 2016
Zoning ordinance	Y		
Subdivision ordinance	Y		
Growth management ordinance	Y		
Floodplain ordinance	Y		
Other special purpose ordinance (stormwater, steep slope, wildfire)	Y		
Building code	Y		New Mexico State Building codes 2023
BCEGS Rating	Y		
Fire department ISO rating	Y		Los Alamos County Fire Department – ISO Class 1
Erosion or sediment control program	Y		
Stormwater management program	Y		
Site plan review requirements	Y		
Capital improvements plan	Y		
Economic development plan	Y		
Local emergency operations plan	Y		Being updated in at same time as HMP
Community Wildfire Protection Plans	Y	2014	Updated 2016
Flood insurance study or other engineering study for streams	Y		
Elevation certificates			
Other			

As indicated in the table above, Los Alamos County has several plans and programs that guide the County's mitigation of development of hazard-prone areas. Starting with the Los Alamos County Comprehensive 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. Building codes adopted and enforced by Los Alamos County align with hazard mitigation initiatives to reduce impacts from hazards by ensuring all measures are taken to avoid future development in hazard prone areas.

Los Alamos County Comprehensive Plan

The Los Alamos County Comprehensive Plan 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. While the Community Development Department and the P & Z have updated some sections of the plan over the last several years, other sections still date to the last complete revision in 1987. The County's Comprehensive Plan was updated in 2016:

Los Alamos Land Use Map
White Rock Land Use Map
Vision Statement and Policy
Los Alamos Downtown Element
White Rock Center Element
Historic Preservation Plan
Economic Vitality Element Remaining

sections to be updated include:

Affordable Housing
Land Use Map
Parks, Open Space, Recreation and Culture
Transportation
Public Facilities
Utilities
Sustainable Development

Los Alamos County Ordinances

The Los Alamos County Comprehensive Plan provides policy direction for land use, development, open space protection, and environmental quality; however, this policy direction must be carried out through numerous ordinances, programs, and agreements. The following ordinances are among the most important tools for implementing the Comprehensive Plan and/or are critical to the mitigation of hazards identified in this plan.

Buildings and Building Regulation (Los Alamos County Code Chapter 10)

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, 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.

Flood Damage Prevention (Los Alamos County Chapter 24)

The flood hazard areas of the Incorporated County of Los Alamos, Los Alamos, New Mexico (County) 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.

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:

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.
Implementing the substantial improvements/substantial damage provisions of the floodplain management regulations after an event: A tracking process occurs and if a residence exceeds 50% of the value of the structure in improvements or damages the current effective flood regulations would apply. Substantial Improvement/Substantial Damage is treated as new construction, all regulations pertaining to new construction would apply. Substantially damaged/improved properties will adhere to all floodplain management requirements set forth in the flood damage/prevention ordinance.

Fire Prevention and Protection (Los Alamos County Code Chapter 22)

These are adopted by the incorporated county for the purpose of prescribing regulations governing conditions hazardous to life, the environment and property from fire or explosion, those certain codes known as:

The NFPA 1 Uniform Fire Code, and Annexes D, H, I and J published by the Western Fire Chiefs Association and the National Fire Protection Association, being particularly the 2003

editions excepting only chapter 17 regarding "Wildland Urban Interface" which are not adopted and integrated by reference;
The Life Safety Code (NFPA-101) published by the National Fire Protection Association, being particularly the 2003 edition and the whole of such code; which codes are hereby referred to, adopted and made a part of this article, as if fully set out in this article. The provisions of such codes shall be controlling within the limits of the incorporated county, except those areas under the exclusive ownership and control by the United States of America. A copy of the codes adopted by reference in this section shall be maintained in the office of the authority having jurisdiction, the office of the county clerk and shall be made available for review by the public upon request.

The adopted codes including all inspections and permits authorized thereunder, and the provisions of this chapter of the county code shall be enforced by the authority having jurisdiction through its fire marshal.

Development Code (Los Alamos County Code Section 16)

The purpose and scope of this chapter is to encourage the implementation of the comprehensive plan as follows:

Promote the health, safety and welfare of the county;
Facilitate orderly growth and development of the county consistent with the goals, concepts, strategies and policies of the comprehensive plan or amendments thereto;
Provide adequate light and air; minimize congestion in the streets and public ways; secure safety from fire, panic and other dangers; avoid undue concentration of population; and prevent the overcrowding of lands;
Facilitate adequate provision for transportation, utilities, schools, parks and other public requirements;
Conserve the value of buildings and land pursuant to NMSA 1978, § 3-21-5.B, and to encourage the most appropriate use of land throughout the county;
Establish land use districts and provide for the appropriate regulation of land use within those districts;
Divide the county into zoning districts according to the use of land and structures and the intensity of such use;
Guide the location and use of structures and land for commercial, industrial, public and residential uses where they are, or can be made to be, compatible with neighboring land uses;
Provide for harmonious development in the county;
Provide for coordination of street plans;
Provide for needed school and park lands;
Provide for safety in the community;
Preserve the natural beauty, vegetation and topography, and prevent the pollution of air, water and the general environment;

Ensure adequate drainage and availability of utility resources and facilities;
Create conditions preserving the health, safety, order and convenience, and promoting the prospering and general welfare of the community;
Control and abate the unsightly use of buildings or land;
Provide flexible regulations which encourage compatible, creative and efficient uses of land;
Provide for the administration and enforcement of this chapter; and
Provide service to applicants and property owners in understanding and working with the provisions and procedures of this chapter.

Zoning and Subdivision Ordinance (Los Alamos County Code Section 16-6)

Zoning. The purpose and authority to regulate the use of land shall be as follows:

Promote the health, safety and welfare of the county;
Facilitate orderly growth and development of the county consistent with the goals, concepts, strategies and policies of the comprehensive plan or amendments thereto;
Provide adequate light and air; minimize congestion in the streets and public ways; secure safety from fire, panic and other dangers; avoid undue concentration of population; and prevent the overcrowding of lands;
Facilitate adequate provision for transportation, utilities, schools, parks and other public requirements;
Conserve the value of buildings and land pursuant to NMSA 1978, § 3-21-5.B, and to encourage the most appropriate use of land throughout the county;
Establish land use districts and provide for the appropriate regulation of land use within those districts;
Divide the county into zoning districts according to the use of land and structures and the intensity of such use;
Guide the location and use of structures and land for commercial, industrial, public and residential uses where they are, or can be made to be, compatible with neighboring land uses;
Provide for harmonious development in the county;
Provide for coordination of street plans;
Provide for needed school and park lands;
Provide for safety in the community;
Preserve the natural beauty, vegetation and topography, and prevent the pollution of air, water and the general environment;
Ensure adequate drainage and availability of utility resources and facilities;
Create conditions preserving the health, safety, order and convenience, and promoting the prospering and general welfare of the community;
Control and abate the unsightly use of buildings or land;
Provide flexible regulations which encourage compatible, creative and efficient uses of land;
Provide for the administration and enforcement of this chapter; and

Provide service to applicants and property owners in understanding and working with the provisions and procedures of this chapter.

Subdivisions. The scope and authority to regulate the subdivision of land shall be as follows:

The regulations governing the subdivision of land shall have been adopted by the county council following consideration of recommendations by the planning and zoning commission.
The planning and zoning commission shall be the official body to hear and act upon subdivision requests as set forth in this chapter.
The community development director shall be the official person or body to hear and act upon summary plat requests as set forth in this chapter.

Regulation of Weeds, Brush, Rubbish and Outdoor Furniture and the Storage of Outdoor Materials (Los Alamos County Code Section 18-41)

All weeds, brush piles, refuse and rubbish on a property within the county are hereby declared to be a nuisance and a menace to the health and safety of the inhabitants of the county.

It is unlawful for the owner or occupants of any property to permit refuse, rubbish or brush piles to accumulate on any part of the property.

Allegations that weeds upon a property constitute a nuisance pursuant to subsection (a) shall set forth with particularity which plants are deemed weeds, why, and the abatement measures required, all of which shall be included in the notice issued pursuant to this chapter 18

The property owners and the prime contractors in charge of any construction site shall maintain the construction site in such a manner that refuse and rubbish will be prevented from being carried by the elements to adjoining premises. All refuse and rubbish from construction or related activities shall be picked up at the end of each workday and placed in containers which will prevent refuse and rubbish from being carried by the elements to adjoining premises.

The accumulation of weeds, grasses, refuse and rubbish which constitutes or create a fire, health or safety hazard is unlawful and is hereby declared to be a nuisance.

The owner or occupant of any premises within the county, whether business, commercial, industrial or residential premises, shall maintain the property in a neat, tidy, methodical, systematic, clean and orderly condition, permitting no deposit or accumulation of materials other than those ordinarily attendant upon the use for which the premises are legally intended. If a property is used for a purpose (including, without limitation, a junkyard) which, by its fundamental nature, cannot be maintained as required above, then, in lieu thereof, such property, or any affected portion thereof, shall be screened from public view and from the view of any abutting property that is used for residential purposes.

Los Alamos County Plans/Studies

Los Alamos County Emergency Operations Plan (currently under revision)

The Los Alamos County Office of Emergency Services coordinates planning, preparedness, response, and recovery efforts for disasters in Los Alamos County. The Los Alamos County Emergency Operations Plan addresses the County's planned response to extraordinary emergency situations associated with natural disasters, technological incidents and national security emergencies in or affecting Los Alamos County. The County is updating the EOP concurrently with the 2023 update to the LHMP.

Los Alamos Canyon Dam Emergency Action Plan (2010)

An EAP was completed for the Los Alamos Canyon Dam in 2010. The plan includes a detailed analysis of the dam, and an evacuation map for those who would possibly be affected by a failure of the Los Alamos Canyon Dam.

Community Wildfire Protection Plan 2016

The Los Alamos CWPP is designed to define, prioritize, and outline implementation strategies for the wildland/urban interface in Los Alamos. The plan defines the forested area that, with an uncontrolled ignition, has the potential to threaten life and property in Los Alamos and White Rock, as well as Los Alamos National Laboratory (LANL). It assesses the wildfire risk of individual neighborhoods, and describes priority actions for the reduction of fuels through forest thinning, prescribed fire, and mitigation actions within home ignition zones.

Rather than a standing document designed to last ten years, this CWPP will adhere to the principles of adaptive management. The plan will be reviewed annually in December and revised based on changes in climate, residential and commercial development, unexpected delays in implementation, citizen response, and available funding.

Goals for the CWPP are as follows:

To the extent feasible, reduce the risk to human health and safety, and to homes and other structures in Los Alamos and LANL from future forest fires by reducing hazardous fuels on county and federal lands within and adjacent to the wildland urban interface and along highways, forest roads, and trails
Minimize the risk of crown fires entering Los Alamos, White Rock, LANL, and important natural areas such as Bandelier National Monument and Santa Fe National Forest
Reduce the fire risk from firebrands in Los Alamos neighborhoods
Improve conditions for suppression efforts in the event of a wildfire
Utilize the opportunities and progress made in the wake of the Cerro Grande fire to continue active management of fuel loads on wildlands, to foster interagency cooperation, to promote

forest health, improve watershed conditions, and to increase public awareness of and involvement in protection against wildland fire

To meet these stated goals, a mitigation action plan summary was agreed upon. Mitigation actions would be related to the following

Continue fuel reduction projects on public lands on all jurisdictions through mechanical and hand thinning.
Where and when appropriate, continue prescribed burning through broadcast and pile burn operations on public lands on all jurisdictions.
Provide education to homeowners on the home ignition zone through site visits and public information campaigns.
Continue community outreach through public schools, local nature centers, service learning projects, print media, and Internet resources.

Los Alamos County Evacuation Procedures/Plan

As part of the Los Alamos County Emergency Operations Plan, Annex F, Appendix 8 includes the Los Alamos County Evacuation Plan. The primary agencies tasked with this are the Los Alamos Police Department, Public Works, Traffic Engineering, and the Fire Department. Actions include:

Transmit evacuation notices using all media possible, enlisting the Public Information Officer's assistance.
Certain areas such as the Betty Ehart Senior Center, Sombrillo Nursing Home and Los Alamos Medical Center may require additional advance notice. Consider notifying and/or evacuating these institutions first, or last.
EOC staff should be in regular contact with Traffic staff and Police officers in the field and support their efforts at guiding evacuation.

The routes by which the Los Alamos townsite is evacuated depends upon the nature of the incident and the available egress routes. The order in which zones are evacuated will also depend on the nature of the incident. The town is divided into eight zones. These zones have distinct routes associated with them.

The routes by which the White Rock townsite is evacuated depends upon the nature of the incident and the available egress routes. The order in which Zones are evacuated will also depend on the nature of the incident. The town is divided into five zones. These five zones have distinct routes associated with them.

Los Alamos Community Trail Plan

The Los Alamos Community Trail Plan evaluates the current conditions and layout of the network, and makes recommendations for specific projects to improve not only individual trails but also the organization of the entire network. It calls out more than 25 specific projects that would enhance the network. These range from network-wide improvements, like upgraded signage, to specific maintenance projects, such as consolidating the trails in Graduation Canyon

Los Alamos Open Space Management Plan

The Los Alamos County Open Space Management Plan provides a guiding framework for effective stewardship of the county's outstanding open space resources by identifying a County Open Space System and by suggesting projects to restore or maintain ecosystem health and to provide outdoor recreations experiences while maintaining flexible long-term strategies that adapt to changing biotic and abiotic conditions so that residents and visitors of Los Alamos can revel in their surroundings through the 21st century and beyond.

Los Alamos Utilities Department Distribution Integrity Management Plan

Los Alamos County is required by the Pipeline and Hazardous Materials Administration (PHMSA) to have a Distribution Integrity Management Program (DIMP) that evaluates all risks associated with its natural gas distribution system, and sets forth mitigation processes for each identified threat. The written DIMP is maintained by the Department of Public Utilities (DPU) Engineering Section. In addition to the DIMP program, the County has emergency plans for its utility infrastructure; these plans are updated on a regular basis.

County Departments/Agencies

Los Alamos 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.

Los Alamos County Office of Emergency Management (OEM)

The Los Alamos County Office of Emergency Management (OEM) is responsible for the administration of the county emergency management program on a day to day basis and during disasters. The office is charged with providing the necessary planning, coordination, response support and communications with all agencies affected by large scale emergencies or disasters. OEM helps enhance public safety by assisting other County departments with disaster preparedness, mitigation, response and recovery. 2023 OEM projects include expanding means of alerting the community in the event of a disaster, educating the public on emergency preparedness, and using federal homeland security and emergency planning funds to the improve the County's overall disaster and terrorism preparedness. OEM works closely with the NM Department of Homeland Security and Emergency Management, LANL Emergency Management & Response, the Los Alamos Medical Center, Los Alamos Public Schools, the American Red Cross, the Los Alamos Amateur Radio Club, and all County departments to help protect those who live, work, and visit here.

OEM runs an Emergency Alert radio station. Broadcasting 24/7 on AM 1610, WQFJ 525 is the County's emergency alert advisory radio station. Purchased with a Homeland Security Grant, Los Alamos Emergency Management Radio went on the air in November 2006 playing a recorded loop of the National Weather Service in addition to local public service announcements. The signal is audible in most of the Los Alamos townsite, White Rock and much of the Laboratory. This is a low-power AM signal and, it's subject to radio propagation. Totally non- commercial, this is strictly a tool via which OEM can use to disseminate information to the public. The following emergency alert advisories are broadcast:

Alerts and Notifications
Coordination and Control
Communication
Emergency Public Information
Evacuation Procedures
Emergency Sheltering Locations
Emergency Response
Controlled-burn Information
Winter-storm Warnings
Road Closures
Electrical and Telephone Outages

When there are no emergency activities in progress, this station broadcasts:

Emergency Preparedness Tips
Weather

OEM also provides updated emergency-related information to the public on their website (shown in Figure 4.57). This site provides guidance on protecting your homes and businesses from flooding, monsoons, and preparation for what to do before, during and after floods, etc. Also provided are links to national, state, and local information on fires, earthquakes, highway and road information, and general federal and state emergency information.

Figure 4.57 Los Alamos County Preparedness Website

Source: http://www.losalamosnm.us/emo/Pages/PreparednessPlanning.aspx

County Sheriff

The Sheriff's Office enforces all Federal, State, and County laws. The Office is also responsible for response and recovery support. The Office is also responsible for the service of legal process from various courts and court support services.

Fire Department

Los Alamos Fire Department (LAFD) is the second largest career fire department in the state of New Mexico. The department provides a multi-disciplined, multi-dimensional mission of fire, rescue, emergency medical, public education and life safety services to the citizens and visitors of Los Alamos County. Included in the services LAFD provides are the protection of the Los Alamos National Laboratory (LANL), a large nuclear research and development complex; protection of the communities of Los Alamos and White Rock; and assistance in the provision of emergency response for an extensive urban wildland interface. Currently, LAFD operates 6 fire

Stations.

Los Alamos County Community and Economic Development

The Community & Economic Development Department was formed by merging the former Community Development Department, Capital Projects & Facilities Department, and transferring Economic Development staff from the County Administrator's Office in May 2012. This Department contains eight Divisions which are:

Administration includes the Department Director and administrative support for all department divisions except Planning & Building Safety who have their own administrative support within their divisions.
Building Safety issues Building Permits, provides Plan Reviews (residential & commercial), conducts Inspections, and provides Code Enforcement of the Nuisance Code (Municipal Code Chapter 18) with support from the Fire, Police, and Public Works & Utilities Departments.
Capital Projects manages Major Facility Maintenance (MFM) and Capital Projects from the study phase through construction completion. Staff is liaison to the Fuller Lodge Historic Districts Advisory Board.
Custodial provides building cleaning services for all County owned facilities, heating/cooling systems support, and support for all special events held at County buildings in collaboration with Community Services. They support Public Works in snow removal operations.
Economic Development manages the County's Self-Sufficiency fund to invest in the future sustainability of Los Alamos County's GRT through opportunities to re-develop DOE land transferred to the County, the LEDA grants and loan program, managing contracts with the LACDC, and the marketing/branding of our community. Staff acts as liaison to the Creative District Advisory Committee.
Facilities Maintenance maintains all County buildings with heating/cooling systems including preventive/routine maintenance, repair maintenance and response to work orders submitted by building occupants. They support Public Works in snow removal operations.
Housing supports the Economic Development and Planning Divisions in all housing related initiatives and expands the current affordable housing plan to address all types of housing needs. They implement programs to improve and increase the housing stock in the County to attract and retain more people to live here – especially students and a workforce for our local businesses. More senior housing and short term/high quality housing is also in demand. Staff is liaison to the Lodgers' Tax Advisory Board and the White Rock Master Plan Implementation Committee.
Planning acts in an advisory role to appointed and elected officials in providing professional review, analysis, and recommendations regarding all land use related matters including the following applications: residential and commercial site plans, re-zoning, waivers, special use permits, subdivisions, Comprehensive Plan changes, and Development Code (Municipal

Code Chapter 16) changes. With support from the Inter Departmental Review Committee (IDRC), Planning staff acts as case managers for most land use and placement permit applications. The IDRC is comprised of representatives from many County departments. Staff acts as liaison to the Planning & Zoning Commission and the Board of Adjustment and issues local business licenses.

Los Alamos County Public Works Department

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

The Engineering Division provides professional engineering technical services and project management for County projects. Responsibilities include the design and management of the Capital Improvement Program (CIP) for Streets; maintenance of as-built and construction drawings and plats; Certificate of Occupancy inspections; oversight of County drainage ways; performs boundary, design, and construction surveys; provides drafting, drawing, and mapping support services; develops and maintains design and construction standards; and provides engineered cost estimates. The Division also manages various consultant contracts for architect-engineering design and technical support and provides assistance in the subdivision planning review process.

Fleet Management is responsible for purchasing and maintenance of all County equipment, the County's Radio Communication system, maintaining the fueling system and providing fuel for Los Alamos County and Los Alamos Public Schools.

The Traffic and Streets Division oversees traffic and street operations, including maintenance of traffic signals, school flashers, site distance, streetlights, signs, traffic safety, and pavement markings, potholes, concrete curb and gutter, drivepads (apron area where the driveway meets the street), sidewalk repair, and right-of-way vegetation control. This Division also performs professional traffic engineering services including traffic impact studies, traffic counts, speed studies, pedestrian walkability, bicycle accessibility, and various other traffic engineering studies and reports. This Division also provides interdepartmental support within the County and manages the Neighborhood Traffic Management Program, a program designed to help residents address neighborhood traffic problems, such as speeding. The Traffic and Streets Division also publishes the annual Snow and Ice Control Plan that establishes guidelines for winter storm emergency response.

Los Alamos County Department of Utilities

Los Alamos County owns and operates a number of utility systems including its natural gas distribution system, which provides service to approximately 7,486 residential and 433 commercial/municipal customers. The natural gas system is comprised of both steel and plastic distribution mains and service lines ranging in size from ½” to 8” in diameter. There are approximately 38 miles of coated steel pipeline primarily in the White Rock community and at various locations in the Los Alamos Towns site. The vast majority of steel pipeline facilities in around the Los Alamos Townsite are in the Barranca Mesa area. The remaining 87 miles of pipeline are plastic. These mains serve approximately 2816 steel service lines and 4969 plastic service lines.

The County systems are supplied from transmission pipelines owned and operated by New Mexico Gas Company. The White Rock Community has a City Gate Station which is also owned by NMGC. It is located east of the intersection of NM State Road 4 and Rover Blvd. The delivery pressure to this station operates at pressures between 500-700 PSIG. The NMGC transmission main route begins at the New Mexico 502 and the State Road 4 interchange. It is a 4” steel pipeline and is the sole supply transmission pipeline for White Rock. The community of White Rock service line’s operating pressure is 58 psig with an MAOP of 60 psig. The Los Alamos Township is fed from NMGC’s transmission system. There are two sources of supplies available for Los Alamos. The first City Gate Station and is located at the East Gate station located directly across from Camino Entrada along State Road 502, and the second City Gate Station is located in the Quemazon subdivision. The transmission lines are capable of feeding Los Alamos from either or both transmission pipelines. The Los Alamos Mainline feeds up from Santa Fe, and the Old DOE Mainline feeds from the Cuba side; both originate in the San Juan Basin near Farmington. Recent improvements made by the Utilities Department have enhanced the County’s capability to provide a sustainable supply of natural gas throughout the system by completing a high pressure loop to 18 district regulator stations.

The County has established and maintains an emergency plan required to comply with federal regulations. The County has established a means for receiving, identifying and classifying notices of events.

Los Alamos County’s Administrative/Technical Mitigation Capabilities

Table 4.52 identifies the County personnel responsible for activities related to mitigation and loss prevention in Los Alamos County.

Table 4.52 Los Alamos County Administrative/Technical Mitigation Capabilities

Personnel Resources	Yes/No	Department/Position	Comments
Planner/Engineer with knowledge of land development/land management practices	Y		
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y		
Planner/Engineer/Scientist with an understanding of natural hazards	Y		
Personnel skilled in GIS	Y		
Full time building official	Y		
Floodplain Manager	Y		
Emergency Manager	Y		

Personnel Resources	Yes/No	Department/Position	Comments
Grant writer			
Other personnel	Y		
GIS Data – Hazard areas	Y		
GIS Data - Critical facilities	Y		
GIS Data – Building footprints	Y		
GIS Data – Land use	Y		
GIS Data – Links to Assessor's data	Y		
Warning Systems/Services (Reverse 9-11, cable override, outdoor warning signals)	Y		

Los Alamos County's Fiscal Mitigation Capabilities

Table 4.53 identifies financial tools or resources that the County could potentially use to help fund mitigation activities.

Table 4.53 Los Alamos County Fiscal Mitigation Capabilities

Financial Resources	Accessible/Eligible to Use (Y/N)	Comments
Community Development Block Grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Incur debt through general obligation bonds	Y	
Incur debt through special tax bonds	Y	
Incur debt through private activities	N	
Withhold spending in hazard prone areas	N	

Los Alamos County ability to expand and improve the identified capabilities to achieve mitigation.

Tables 4.52 and 4.53 provide existing capabilities to achieve mitigation activities, the county reserves the right to expand upon these capabilities as needed to achieve identified mitigation goals and objectives.

Mitigation Outreach and Partnerships

Other federal agencies have been involved in mitigation actions in the County. The USDA Forest Service performs fuel mitigation work on County land, and the County provides the funding for their work through a Collection Agreement. The work is accomplished by staff from the Santa Fe National Forest.

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.

This section describes the mitigation strategy process and mitigation action plan for the Los Alamos County Local Hazard Mitigation Plan update. 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

Mitigation Strategy: Overview

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 the mitigation strategy and mitigation action plan for this LHMP update. As part of the plan update process, a comprehensive review and update of the mitigation strategy portion of the plan was conducted by the HMPC. T he mitigation actions from 2016 were reviewed and assessed for their value in reducing risk and vulnerability to the planning area from identified hazards and evaluated for their inclusion in this plan update (See Section 2 What's New). Section 5.2 below identifies the new goals and objectives of this plan update and Section 5.4 details the new mitigation action plan.

Taking all of the above into consideration, the HMPC developed the following umbrella mitigation strategy for this LHMP update:

Communicate the hazard information collected and analyzed through this planning process as well as HMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
Implement the action plan recommendations of this plan.
Use existing rules, regulations, policies, and procedures already in existence.
Monitor multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

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 and exercises 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 Los Alamos 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 goals update of this plan HMPC members were provided a worksheet with the list of goals from the 2016 plan. Related plan goals were listed on the worksheet including the State of New Mexico Multi-Hazard Mitigation Plan (2018) and the Los Alamos County Community Wildfire Protection Plan (2016) This review was to ensure that this plan's mitigation strategy was aligned and integrated with existing plans and policies. They were told that they could use, combine, or revise the goals and objectives provided or develop new ones, keeping the risk assessment in mind. Based on discussion at the HMPC meeting the group felt that the 2016 plan goals and objectives were comprehensive and still valid.

Based on the risk assessment review and goals update process, the HMPC identified the following goals and objectives, which provide the direction for reducing future hazard-related losses within the Los Alamos County Planning Area.

Goal 1: Minimize Risk from Natural Hazards

Objective 1.1: Develop, sponsor and undertake programs to protect developed property and community infrastructure from hazard related losses.

Objective 1.2 Develop a Multi-Hazard Public Education Program to inform citizens about the natural hazard risks in Los Alamos County and what actions they can take to minimize hazard impacts.

Objective 1.3 Minimize impacts to natural and cultural resources

Objective 1.4 Reduce the fire risk from firebrands in Los Alamos neighborhoods

Goal 2: Improve & Sustain Capacity to Mitigate Hazard/Disaster Impacts

Objective 2.1 Develop an on-going and coordinated hazard mitigation program that is integrated throughout the policies and activities of Los Alamos County and those of neighboring property owners/managers (LANL, USFS, NPS, and NMSF).

Objective 2.2 Improve conditions for suppression efforts in the event of a wildfire.

Goal 3: Improve and Sustain Emergency Management Capabilities

Objective 3.1 Develop a coordinated emergency management communications system, both external and internal.

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.

In order to identify and select mitigation actions to support the mitigation goals, each hazard identified in Section 4.1 Identifying Hazards: Natural Hazards was evaluated.

The HMPC analyzed viable mitigation options that supported the identified goals and objectives. 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.

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 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. Also utilized in the review of possible mitigation measures is FEMA's publication on Mitigation Ideas, by hazard type. 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 existing capabilities of jurisdictions, and the overall political, technical, and financial feasibility of the potential actions, the HMPC came to consensus on new 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 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.

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.

While the preference is to provide definitive costs (dollar figures) for each mitigation strategy/action, this is not possible for every mitigation strategy/action. Therefore, the estimated costs for the mitigation initiatives identified in this plan are identified as high, medium, or low, using the following ranges:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (e.g., bonds, grants, and fee increases).
- **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—The project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

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 updated 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.

Progress on Previous Mitigation Actions

During the 2023 update process the HMPC reviewed and evaluated the 2016 mitigation strategy to determine the status of the actions. The purpose of this was to measure progress by determining which actions were completed, and to revisit the remaining actions to determine if they should be carried forward or removed from the plan.

The 2016 mitigation strategy contained 13 separate mitigation actions. Of these 13 actions, 11 have been completed; seven are continuing. One has not yet been started due to a variety of reasons such as changes in priorities, lack of funding, or changes to the projects themselves, and one action deleted after it was determined that it was not cost effective to the County. Because many of these projects are implemented on an annual or other continuous basis, seven 2006 projects have been identified to be carried forward, with some modification, in this plan update. Figure 5.1 provides a status summary of the mitigation action projects from the 2006 LHMP. Following the table are descriptions of the status of each project, noting success stories where applicable. Projects marked “complete” have been implemented. Projects marked “continuing” have been implemented, but require annual maintenance to continue. Projects indicated as carrying on into the 2023 update build off the initial implementation of 2016 initiatives.

*Actions carried forward or modified from 2016 Plan

Figure 5.1. Los Alamos County Mitigation Action Summary Table

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
1	Multi-Hazard Shelter for Domestic Animals and Livestock to Enhance Overall Public Safety	Wildfire; Winter Storm and Severe Cold	Animal Control	Both	Low	1, 3	Shelter trailer purchased for LAPD PSA's (Ongoing) -
2	Utility Curtailment/Bury utility lines	Earthquake; Lightning; Thunderstorms-Hail; High Wind; Severe Cold	DPU	Both	Low	2	Ongoing amended in 2023 to include burying lines.
3	Critical Utility Systems Protection	Flood; Earthquake; Dam Failure	DPU	Existing	High	1	Ongoing
4	Gas System Pressure-Reducing Stations Wildfire Protection	Wildfire	DPU	Existing	Low	1	Ongoing
5	Critical Facility Backup Electric Generation	Earthquake; High Wind; Severe Cold; Lightning; Thunderstorms; Flood; Landslide/Rock Fall; Dam Failure; Volcano; Wildfire; Hail	DPU	Existing	Medium	2	Ongoing
6	All-Hazards Community Resilience*	Dam Failure; Drought; Earthquake; High Wind;	LAEM/Fire/Police/PIO	Both	Low	1	Ongoing

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
		Landslide/Rockfall; Lightning; Thunderstorms-Hail; Volcano; Wildfire; Winter Storm and Severe Cold					
7	Community Emergency Response Team (CERT) Implementation	Dam Failure; Earthquake; Winter Storm and Severe Cold; Wildfire	LAEM	Both	Low	2	Ongoing
8	Community Shelters	Dam Failure; Earthquake; Winter Storm and Severe Cold; Wildfire; Volcano, High Wind, Flood	LAEM	Both	Low	3	Shelter assessments with ARC completed (Ongoing)
9	Vulnerable Population Planning	Earthquake; Winter Storm and Severe Cold; Wildfire	LAEM	Both	Medium	3	Completed (Ongoing)
10	Multi Hazard Communication and Warning Systems*	Dam Failure; Earthquake; Flood; Thunderstorms-Hail; Winter Storm and Severe Cold; Volcano; Wildfire; Drought; High Wind; Lightning; Wildfire; Landslide/Rock Fall	LAEM	Both	Medium	3	Completed (Ongoing)
11	Neighborhood Wildfire Mitigation and Public Education	Wildfire	LAFD	Both	High	1	Ongoing
12	Pre and Post	Flood	Public Works	Existing	Low	1	Ongoing

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
	Disaster Flood Mitigation for County Roads and At-risk Facilities						
13	Landslide/Debris Flow Risk Reduction	Landslide/Rock Fall; Earthquake	Public Works	Existing	Low	1	Ongoing
14	North Mesa Rock Fall Mitigation*	Landslide/Rock Fall; Earthquake	Public Works	Existing	Low	1	Ongoing
15	Los Alamos Townsite Evacuation	Flood; Wildfire; Earthquake; Volcano; Landslide/Rock Fall; Dam Failure	Public Works	Existing	High	3	Ongoing (yearly) Resurfacing of Rendija Canyon Road complete
16	Fuels Management	Wildfire	LAFD	Both	Medium	1	Ongoing
17	Open Space Management *	Drought; Flood; Wildfire	Community Services Department, Recreation and Open Space Division	Both	High	1	Ongoing
18	Los Alamos National Labs (LANL) Seismic and Volcanic Monitoring and Warning Program*	Earthquake; Volcano; Landslide/Rock Fall	LANL	Both	Medium	1	Ongoing
19	Countywide Stormwater Management*	Flood, Thunderstorm - Monsoon	Public Works	Both	Medium	1	Ongoing
20	Enhance county mitigation/removal of flammable items inc. abandoned vehicles, trees, brush, trash	Wildfire	Los Alamos County Fire Department	Both	High	1,2,3	New
21	Enhance defensible space at certain LAPS	Wildfire	LAPS	Both	Medium	1,3	New

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
	school properties						
22	Move repeater from Barranca Mesa water tower at elementary school to old water tower at top of hill at entrance of Barranca Mesa	Dam Failure; Earthquake; Flood; Thunderstorms-Hail; Winter Storm and Severe Cold; Volcano; Wildfire; Drought; High Wind; Lightning; Wildfire; Landslide/Rock Fall	Los Alamos ARC/Los Alamos County	Existing	High	3	New
23	Upgrade Evacuation route in Rendija Canyon. Resurface road entering canyon and grade dirt road at least every 6 months to allow lower clearance vehicles to access	Earthquake, Landslides, Wildfire, Volcano	Los Alamos County Public Works	Both	Medium	1,2,3	New
24	Convert bus fleet to electric to eliminate above ground fuel dependency in time of hazardous event (flood, etc)	Floods, (100 year and local), Severe Weather: High Winds, Thunderstorm (Hail/Monsoon) Winter Storm and Extreme Cold	Public Works/Atomic City Transit	Both	Low	1,2,2	New
25	Prescribed burning by state of NM	Wildfire	State Fire Marshals	Both	High	2	New
26	Jernez Mountain Fire Protection Project. Provide consistent water supply for wildfire	Dam Failure; Earthquake; Flood; Thunderstorms-Hail; Winter Storm and Severe Cold;	Los Alamos County Dept. Public Utilities	Both	High	1,2,3	New

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
	suppression on western flank of Los Alamos County and at LANL, underground camp may overhead electrical line for fire mitigation, provide potable water fo ski area/campground, provide water for snowmaking at ski area	Volcano; Wildfire; Drought; High Wind; Lightning; Wildfire; Landslide/Rock Fall					
27	Provide mechanisms (email, phone, text, etc, potentially through Tyler 311,) for trail users to report dead/leaning trees so trees can be removed	Drought, Wildfire	Los Alamos County Parks and Recreation	Both	Medium	1,2	New
28	Provide redundant/backup major HVAC equipment in county buildings	Severe Weather: Winter storm and Extreme Cold	Los Alamos County OEM	Both	High	1,2,3	New
29	(Purchase) water buffalo for rapid deployment during wildfire	Wildfire	Los Alamos County Fire Department	Both	High	1,2,3	New
30	Public education and outreach for all hazard community	Severe Weather: High Winds, Lightning,	Los Alamos County OEM	Both	High	1,2,3	New

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
	preparedness	Thunderstorms (Hail/Monsoon,) Winter Storm/Extreme cold, Wildfire					
31	Hardening buildings for wildfire- require stronger building materials resistant to fire. Class A roofs, double paned windows, metal netting around openings, Codes, incentives, require new buildings to comply	Wildfire	Building Dept. Wildland Division, Fire Marshal's office	Both	Med/High	1	New
32	Widening of truck route and state road to accommodate Evacuation surges	Earthquake, Landslides, Wildfire, Volcano	State Dept. of Transportation	Both	Medium	2,3	New
33	Slope stabilization and clearing of growth along the canada del Buey in White Rock due to increased development (Mirador) and improve drainage into the area	Localized Stormwater/Flash Flooding	Los Alamos County OEM	Both	Medium	1	New
34	Clear trees near powerlines	Dought, Severe Weather: High Winds, Lightning,	Los Alamos County Utilities	Existing	High	1,2	New

Action ID	Action Title	Hazard(s) Mitigated	Lead Agency	Address Existing or Future Development	Priority	Related Goal	2023 Status
		Thunderstorms (Hail/Monsoon), Winter Strom and Extreme Cold, Wildfire					
35	Inundation analyses and updated H&H Study associated with the Los Alamos Canyon Dam	Dam Failure	OSE Dam Safety Bureau	Existing and Future	Medium	1,2 and 3	New

*Actions carried forward or modified from 2016 Plan

Los Alamos County Action #1

Action Title: Multi-Hazard Shelter for Domestic Animals and Livestock to enhance overall Public Safety

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Los Alamos County residents are familiar with disasters and have evacuated twice in the last fifteen years due to wildfires. Currently Los Alamos County does not have a Companion Animal and Pet Sheltering plan for the overall management, coordination and prioritization of statewide resources that support the care that pets and livestock need before, during and following a declared emergency. In the event of an impending disaster or evacuation, the assumption is that 10-20% of the population is in the transportation-disadvantaged category, and these populations will require expanded services of assistance for domestic and livestock animals. Should a disaster occur, it would likely overwhelm the capacity of Animal Control as some pets become separated from their owners requiring rescue and sheltering assistance from other organizations. *Conversely, many citizens will not go to public shelters if it means separation from their pet.* Los Alamos County should develop a displaced pet/shelter plan for domestic animals and livestock to include tracking of lost pets, quarantine of Animals, collocating of pets and citizens, and pet disaster shelters should pets require containment separate from their owners.

Implementation:

- Assessment of facilities to support sheltering people and their pets.

Public Education-Fact sheets need to written to ID Shelter animals and give important information (such as medical or behavioral problems) to include ID tags to make for easy reunification.

Development of Rescue Teams (recruit, organize and train) to assist with rescuing and moving pets and livestock.

Training of staff and Exercising of plan

Pet shelter trailers (stockpile of shelter supplies)

Establish MOUs with agencies for assistance, climate controlled vehicles, facilities

Supply public shelters with generators

Other Alternatives: The American Red Cross is in the process of developing a pet shelter operations plan; utilize the Red Cross plan instead of developing a Los Alamos-specific plan

Responsible Agency: Los Alamos County Animal Control

Partners: Department of Agriculture, Neighboring Animal Shelters, Friends Of The Shelter (Volunteers), Stable Club & Animal Protection of NM

Potential Funding: State Homeland Security Grant Program, County General Funds

Cost Estimate: High

Benefits:

(Losses Avoided) Increased compliance (higher likelihood of citizen evacuation), decreased life safety issues, increased partnerships, decreased staffing requirements, decreased public health concerns (zoonotic diseases)

Timeline: Shelter trailer purchased for LAPD PSA's (Ongoing 2023)

Los Alamos County Action #2

Action Title: **Utility Curtailment**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Los Alamos County Department of Public Utilities (LAC-DPU) has developed curtailment plans for each of the lifeline utilities: Gas, Water and Electric systems. The curtailment plans provide for first stage measures to impact government institutions and entities such as County Government Facilities, Public Schools and Los Alamos National Laboratory. Second stage measures, if necessary, would begin to impact private residences and commercial establishments. A number of Los Alamos County lifeline utilities (electrical power) reside in arroyos susceptible to flooding. The plan needs to be regularly exercised.

Implementation: Los Alamos County ordinances and policies have been developed and implemented such that, in the event that curtailment is necessary, the policies can be enforced to ensure public compliance.
Relocate utilities, power lines, gas and sewer that are susceptible to flooding, high wind, earthquake, dam failure and winter storm and severe cold.
Eliminate Bayou Canyon Lift Station by building new sewer mains to maintain critical infrastructures.
Implement and test plan on an annual basis. Periodically review and revise based on

exercising.

Other Alternatives: Increase hazard resistance when repairing or replacing utility infrastructure; incorporate hazard mitigation into capital improvement programs

Responsible Agency: Department of Public Utilities

Partners: Department of Energy/Los Alamos National Laboratory

Potential Funding: Annual County Department of Public Utilities rate payer based operation & maintenance funding and Grant funding.

Cost Estimate: High

Benefits: Curtailment

(Losses Avoided)

Timeline: Exercise plan on an annual basis.

Los Alamos County Action #3

Action Title: Critical Utilities Systems Protection

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background:

Los Alamos County Department of Public Utilities (LAC_DPU) has a limited number of critical facilities located within a flood or dam failure inundation zone. These facilities are limited to underground pipelines (gas, water & sewer). Pipeline washouts are inspected and repaired immediately under emergency authority. Sewer shut off is not an option so temporary bypass with surface pipelines is accomplished. For water and gas distribution, key isolation valves have been identified and are inspected on a routine basis in the event they are needed for shut down or startup of a particular section of the system. Both natural gas and potable water are non-toxic and do not pose a threat to the environment.

Utility facilities subject to earthquake damage will be dependent on the magnitude and epicenter of the earthquake. Existing facilities were constructed to the building codes at the time of construction. Many of the remote utility facilities were constructed in the 1950's and 1960's and appear to be very robust structures. LAC-DPU personnel are experienced in emergency response from past fire and flood events. Critical isolation valves are monitored and exercised routinely.

Implementation: This project would entail evaluating options to further assess risk to these critical lifelines. This might include options to elevate, relocate or otherwise protect electrical and mechanical systems to minimize or eliminate service disruption. In some cases it could mean relocating, hardening or retrofitting facilities or infrastructure to reduce risk

Asset management activities include preventive maintenance and testing and reporting of all abnormal operating conditions that may exist. Continue excellence in operations and maintenance through intimate knowledge of all systems for all emergency standby personnel. Continue 24/7/365 GWS standby crew stationing on site.

Install additional water gauges and warning systems for water production facilities prone to flooding.

Construct overhead power line across LA Canyon (TA-3 to Townsite hub) for TC1 and TC2 manhole failure (electrical distribution).

Other Alternatives: No action

Responsible Agency: Department of Public Utilities

Partners: None
Potential Funding: Annual County Department of Public Utilities rate payer based operation & maintenance funding and Grant funding.

Cost Estimate: High

Benefits:
(Losses Avoided) Minimization of the loss of natural gas or potable water. Limiting the quantity of a raw wastewater spill. Avoidance of potential regulatory fines (environmental or gas pipeline safety) through quick response and detailed reporting pursuant to regulatory requirements

Timeline: Continue operation, maintenance and monitoring (Ongoing)

Los Alamos County Action #4

Action Title: **Gas System Pressure Reducing Stations Wildfire Protection**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: The natural gas distribution system operated by Los Alamos County Department of Public Utilities (LAC_DPU) is fed from high pressure gas feeders from Gas Company of New Mexico and is distributed throughout the County in a high pressure pipeline backbone system. Individual lower pressure service areas, which connect to service lines feeding natural gas customers, are fed through Pressure Reducing Valve stations. LAC-DPU gas system pressure reducing valve (PRV) stations have been built to ensure safe and reliable operations and must meet federal gas pipeline safety requirements for design, operation and maintenance. Station design includes limited access, overpressure protection, redundancy, locking devices and remote isolation valves.

Each individual lower pressure service area is fed from at least two separate and geographically spaced PRV stations. If one PRV station is damaged due to vandalism or a hazard situation then the remaining PRV station is sized to enable continued service to all customers within that individual service area. Access to each PRV station is limited by locked chain link fencing with wood privacy slats or a block wall with steel plate access doors.

Implementation: Wildfire mitigation should be incorporated into PRV stations that are due for rehabilitation or replacement. Gas system PRV stations that need rehabilitation or replacement should have the chain link fencing removed and new block wall installed for increased security and fire protection. Continue routine preventative maintenance and testing and reporting of all abnormal operating conditions that may exist. Stations are inspected on an annual basis to ensure safe operating conditions exist; including weed (fire suppression) control and the reporting of abnormal operating conditions.

Other Alternatives: No action

Responsible Agency: Department of Public Utilities

Partners: None

Potential Funding: Annual County Department of Public Utilities rate payer based operation & maintenance and capital improvement program (CIP) funding and Grant funding

Cost Estimate: $35,000 annually plus $15,000 per station for new block wall and steel doors, as necessary

Benefits: (Losses Avoided)	Damage to a gas distribution system PRV station could result in a discharge of gas and possibly a serious fire if an ignition source were present. This type of situation could lead to serious injury or death both to the public and County Utility personnel having to respond.

Timeline: continue annual operation & maintenance activities that mitigate impacts from wildfires and vandalism. (Ongoing)Los Alamos County Action #5

Action Title: Critical Facility Backup Electric Generation

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: The water production and wastewater collection and treatment systems are dependent on electric power for their operation, but not all elements of these systems have a backup power source. The water distribution system is gravity powered and the natural gas distribution system is fully pressurized. Neither of the water or gas distribution systems have electrically controlled valves. The County needs to ensure that all critical utility facilities that are dependent on electric powered equipment have adequate standby power sources available to them in case power is out due to a hazard situation.

Facilities with dedicated standby power are Los Alamos & White Rock WWTP; Bayo Canyon Sewer Lift Station; Pajarito Well 4; Guaje Fill Water Booster Station. Mobile trailer mounted standby power gen-sets, one in Water Production and one in GWS, provide mobile power to remote facilities through a separate standby power connection.

Implementation: Continue routine preventive maintenance and testing of all existing standby power systems. Use existing staff for routine work. Contract for outside maintenance and testing of specialty equipment or for repairs of equipment outside the scope of existing personnel capabilities. Additional power generation is required for critical facilities.

Install back up power generator and/or generator quick connects to critical facilities to include Municipal Building, sewer lift stations, wells and waste water plant.

Add additional gauges

Protection of electric transmission lines.

Other Alternatives: No action

Responsible Agency: Department of Public Utilities

Partners: None

Potential Funding: Annual County Department of Public Utilities rate payer based operation & maintenance funding, General fund and Grants.

Cost Estimate: $50,000/year

Benefits: (Losses Avoided) Potential catastrophic loss of facility function. Environmental damage from wastewater spills due to power loss to wastewater facilities. Health and safety concerns, including potential loss of firefighting water volume, for power loss to water production facilities. Continuous supply of clean water, safe natural gas distribution and sustained wastewater collection and treatment would benefit the community during any hazard incident.

Timeline: Monthly and annual operation & maintenance activities; evaluate needs for additional generators and infrastructure improvements. (Ongoing)

Los Alamos County Action #6

Action Title: All-Hazards Community Resilience

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Increase community resiliency through focused education programming efforts. This effort would supplement existing outreach efforts with additional web-based technology, emergency notification systems and exercises related to all hazards. Consistent with DOE requirements, in case of an operational emergency with an actual or potential significant hazardous materials release, LANL may communicate Protective Action Recommendations (PARs) to Los Alamos County for consideration for protection of residents. Due to the proximity of the Laboratory to Los Alamos County, PARs conveyed from LANL to the LAC Consolidated Dispatch Center must be sent quickly and clearly. To aid in both the speed and clarity of these communications, representatives worked together to pre-designate emergency sectors. These sectors have been loaded into the LAC CodeRed system to expedite any emergency communication of PARs to residents.

Implementation:

- Update EM website to include hazard information, personal preparedness information, emergency preparedness guides, resources and tools.

Develop Facebook page, twitter account and RSS feeds to increase outreach efforts and information flow to educate public and stakeholders and promote resiliency prior to and during an emergency.

Update CodeRed System and exercise the system to ensure community preparedness.

Become a Storm Ready community.

Educate citizens on lightning hazard awareness/safety and hail storm safety.

Educate public on landslide hazards and appropriate risk reduction alternatives.

Expand road maintenance and debris management capabilities.

Enhance situational awareness and improve early warning capabilities through the investment of a county wide video camera system. This would be useful for evacuations, flooding (monitoring areas for evacuation), traffic control, terrorist activities (situational awareness), crisis communications, crowd control, search and rescue, active shooter (schools).

Educate public on dam failures and evacuation routes by providing information on inundation zones and high risk areas via public outreach.

Educate public on drought hazards and appropriate conservation techniques on ways to conserve water.

Educate public on volcano and earthquake hazards to understand risks and apply mitigation techniques such as window and door seals, earthquake building codes, securing heavy items, and participating in National Shakeout Day. Educate public on winter cold and storms mitigation techniques such as winterizing homes, insulating pipes, structural ability of roofs, family communication plans, roofing via community education flyers.

Other Alternatives: No action

Responsible Agency: Los Alamos County Office of Emergency Management

Partners: Fire/Police/PIO/All planning partners

Potential Funding: Grants (SHSP and HMGP), local and in-kind staff time

Cost Estimate: Staff time, outreach material cost Low

Benefits: (Losses Avoided) Benefits include reduced impacts to life, limb and property as a result of a more hazard aware and better prepared community. A better prepared community will reduce the impacts on emergency services during hazard events. Reduction in flood insurance rates for business and private property owners.

Timeline: Implemented annually 2023-2028 (Ongoing)

Los Alamos County Action #7

Action Title: CERT Implementation

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: 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.

Implementation: -Train and qualify CERT instructors and program manager
-Recruit instructors
-Coordinate CERT curriculum and team/program management with community partners

Other Alternatives: No action

Responsible Agency: Los Alamos County Office of Emergency Management

Partners: Los Alamos Police Department (LAPD), Los Alamos Fire Department (LAFD), American Red Cross, New Mexico Department of Homeland Security and Emergency Management (DHSEM), Los Alamos Medical Center (LAMC)

Potential Funding: Local and Grants (SHSGP and EMPG)

Cost Estimate: $45,000

Benefits: (Losses Avoided) Community resiliency, immediate first aid, assistance with evacuations and traffic control, community awareness of potential hazards and preparedness measures and supplementation of staffing at special events.

Timeline: Implemented annually 2023-2028 (Ongoing)

Los Alamos County Action #8

Action Title: **Community Shelters**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: The county has developed systems to alert the public when there is an emergency or disaster using CodeRed and AM1610. There is a shelter plan that provides for the protection and care of the population from the effects of disasters and other hazards through the activation of shelters and provision of mass care and social service for those sheltered but the plan is outdated, does not identify shelter locations for emergency situations and the County has not established MOUs with shelter facilities. Although Los Alamos County has overall responsibility for their jurisdiction, where possible, Red Cross will serve as the principle organization for mass sheltering. Issues: Local mass care and shelters must comply with ADA requirements and provide functional needs support services, families should not be separated, individuals may arrive with an illness, and service animals should not be separated from their owners. A fraction of those individuals seeking shelter will require transportation. There is currently a lack of SafeRooms for public protection during high winds, winter storms and severe cold, wildfires and earthquakes.

Implementation:

- Identify and Survey Shelter Facilities

Establish MOUs with facilities (Shelter Agreements)
Establish MOU with Red Cross
Designate a County Care and Shelter Coordinator
Train Shelter Staff
Develop community education (social media, website, newsletters)
Develop Shelter Plan
Exercise Shelter Plan (Coordinate shelter evacuation practice drills annually)
Ensure the Shelter Operations Plan is reviewed annually and updated as needed.
Obtain mobile generators to ensure continuous power.
Identify and strengthen facilities that function as SafeRooms in White Rock Fire Station 3 and White Rock Public Library for public safety during high winds, dam failure, wildfires and earthquakes, warming centers for winter storm and severe cold, and volcano.
Install back up power generation to include generator and quick connect emergency generator hook-ups for SafeRooms.

Other Alternatives: No action

Responsible Agency: Los Alamos County Office of Emergency Management

Partners: Community Partners, Red Cross, Volunteer Organizations, LAPD, LAMC, NMDOT, LAPS

Potential Funding: Grants; County General Funds

Cost Estimate: High

Benefits:
(Losses Avoided) Life Safety, improved and coordinated evacuation to shelters, response and recovery. Knowledge of shelter location and access to these locations.

Timeline: Shelter assessments with ARC completed (Ongoing Annual Review)

Los Alamos County Action #9

Action Title: Vulnerable Populations Planning

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Individuals in the community with physical, mental or medical care needs who may require assistance before, during, and/or after a disaster or emergency after exhausting their usual resources and support network. Special needs populations may also include economically or culturally isolated populations within the community. It is anticipated that a majority of special needs individuals will need evacuation assistance and transportation. Many special needs care facilities will not have the resources to evacuate and will need assistance from the county.

Implementation:
- Launch an outreach campaign

Develop warning messages with provisions made for special needs, including blind, hearing impaired and non-English speakers
Exercise messaging systems
Develop Special Needs Population Registry
Coordination plans with Skilled Nursing Facilities (SNF), Schools, Hospitals and Health Clinics
Prioritize Special Needs Issues
Train staff and volunteers on emergency procedures
Educate general public on multi hazards and evacuation

Other Alternatives: No action

Responsible Agency: Los Alamos County of Emergency Management

Partners: LAFD, Los Alamos County Sheriff, Red Cross, Public Works/Roads, Humane Society, DHSEM, LANL, UNM-LA, LAPS, SNF, LAMC, Community Partners and Daycares

Potential Funding: Grants; County General Fund

Cost Estimate: Limited direct financial costs through use of existing staff time, Low

Benefits: (Losses Avoided) Benefits include reduced impacts to life and property as a result of a better prepared community, increased preparedness, and response and recovery capabilities.

Timeline: 1-5 years; evaluated annually at plan review (Completed/Ongoing)

Los Alamos County Action #10

Action Title: **Multi Hazard Communication and Warning Systems**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: The County of Los Alamos (LAC) is at risk from Hazards that could threaten public health, public safety, private property and government assets. A reliable communications system is essential to obtain information on emergencies and to direct and control LAC resources responding to those situations. In almost every case, the 9-1-1- communications center will be a citizen's first point of contact when faced with an emergency or crisis situation. The CDC provides that vital link between citizen and public safety agencies that depend on a dedicated staff to quickly, accurately and efficiently relay and maintain vital emergency response information. The Los Alamos County Consolidated Dispatch Center provides service for 9-1-1, public safety, police, fire, EMS, and EMD. LAC does not have backup capabilities for the consolidated dispatch center (CDC) and the current CDC network structure exposes the county to a single point of failure. Any situation due to imminent threat that puts the CDC out of service will essentially shut down all dispatch capabilities in Los Alamos County and will be routed to Santa Fe NM, thereby delaying all public safety services. The 9-1-1 and seven digit public telephone numbers for the CDC should have the capability of being re-routed and the CAD network should be accessible from an alternate location. The radio transmitter and receiver sites should be linked to the backup location.

Implementation:

- Purchase, program and install backup dispatch capabilities at Fire Station 3 to include Radio and CAD.

Purchase, program and install EOC communications systems
Develop County Continuity of Operations Plans for mission critical emergency applications.
Test and exercise back up functionality.
Upgrade existing towers in the county.
Increase communications alternatives, distribute NOAA radios to critical facilities and vulnerable populations.
Enhance community alert notifications and warning systems.
Install emergency alert warning system at Dam to include backup UPS and/or generator.
Install emergency alerting signage throughout Los Alamos County.
Install additional radio coverage capabilities on existing tower at White Rock Fire Station 3, which could include NOAA all hazard radio and emergency communications.

Other Alternatives: No action

Responsible Agency: Los Alamos Police Department

Partners: LAFD, LANL, Utilities, DHSEM, NOAA

Potential Funding: Grant (SHSP and HMG and County General Fund

Cost Estimate: Medium

Benefits:
(Losses Avoided) Improved response time, minimized disruptions of basic service, reduced impacts to life safety, improved coordination, improved resource allocation and tracking.

Timeline: Completed/Ongoing

Los Alamos County Action #11

Action Title: Neighborhood Wildfire Mitigation and Public Education

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: The Los Alamos Fire Department will lead wildfire mitigation activities by working with individual neighborhoods on assessments, prescription, mitigation, reassessment, and evaluation. Once these actions have been completed, the department will move to the next neighborhood.

This action also includes wildfire mitigation public education efforts including Fire Wise, Fire Adapted Communities, Ready, Set, Go, Defensible Space, Home Assessments, and education in public schools (including seeding using area math and field trips of mitigation).

Implementation: LAFD recently launched a Facebook page, giving the department better social media options for public education on concepts of defensible space.

Utilize Firewise literature, distribute via paper, radio, etc. to improve public outreach and education of citizens in communities at risk.

Utilize prescribed burning and presuppression fire breaks where applicable. Utilize other fuel modifications or reduction (chipping, valuing and piling).

Other Alternatives: No action

Responsible Agency: Los Alamos Fire Department

Partners: PIO

Potential Funding: Departmental budget and Grant Funding

Cost Estimate: Approximately $5,000 annually

Benefits: (Losses Avoided) Reduced risk to people and property from damaging wildfires

Timeline: Implement on an annual basis 2023-2028 (Ongoing)

Los Alamos County Action #12

Action Title: **Pre and Post Disaster Flood Mitigation for County Roads and At-risk Facilities**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background:

Over the last 15 years wildfires have greatly affected the landscape in and around Los Alamos County. As a result of the wildfire activity in the area, the runoff coefficient for the watershed surrounding Los Alamos has been greatly affected. In September of 2013, a flood was experienced that caused a substantial amount of damage in the area. As a result of this event, a presidential disaster declaration was issued and FEMA was activated. There were many sites within Los Alamos County where FEMA claims were submitted for repair under the Public Assistance Program. While the PA program (Section 406 of the Stafford Act) pays for public infrastructure repairs under certain cases funding can be increased to mitigate losses during the restoration of damaged facilities and infrastructure. Other areas that were not damaged but remain at risk may be potential candidates for the Pre Disaster Mitigation grant or Hazard Mitigation Grant Program.

As a result of the September 2013 flood event, 13 sites across Los Alamos County were identified as areas eligible for FEMA funding. The sites identified are as follows:

Los Alamos Airport
Bayo Canyon
Camp May Road
Entrada Pond
Guaje Canyon
Los Alamos County Landfill
North Road Drainage
PCS Pond
Quemazon Drainage
Guaje Canyon Road
School Canyon Drainage
Upper Rendija Canyon
White Rock Visitors Center

Of the sites listed above, many of them had more than one FEMA worksheet associated with them. Many sites had multiple categories of emergency work or permanent and mitigation work was awarded after emergency measures were performed. Maintenance that will be required to keep the drainages in good working order will include periodic maintenance of culverts crossing under roadways. Additional effort is needed to decrease runoff coefficients and slow water velocities during larger storm events.

Another area of concern in Canada Del Buey Drainage in White Rock that was not a subject of FEMA funding, however, it is anticipated that this drainage will require stream stabilization and periodic maintenance.

Another area of concern is the Ice Rink facility, which was identified in the risk assessment as being located within the 1% annual chance floodplain of Los Alamos Creek. Pre-disaster mitigation options should be explored to reduce flood risk to this facility, which might include floodproofing, containment ponds, drainage improvements, and/or warning and evacuation procedures.

The West Road area is another problem spot and candidate for mitigation. Additional pre-disaster mitigation would be to install additional stream gauges for the purposes of flood detection and warning. The installation of a detection system and alarm at the Los Alamos Reservoir could enhance outdoor warning when spillway flows are released.

Implementation: Continue The Los Alamos County Public Works Department, Traffic & Streets Division Right of Way Maintenance Program.

Improve structure protection and erosion control of Los Alamos Reservoir Road. This road is the only access point to Los Alamos Dam and is susceptible to flooding.

Other Alternatives: None

Responsible Agency: Los Alamos County Public Works Department, Traffic & Street Division

Partners: NMDOT, San Ildefonso Pueblo, Santa Clara Pueblo, Los Alamos National Laboratory, US Forest Service, Los Alamos Public School System

Potential Funding: Los Alamos County General Fund and Grant funding

Cost Estimate: $100,000/year

Benefits:
(Losses Avoided) FEMA funding to date as a result of the September 2013 flooding is in excess of $3 Million; the benefits include reduced losses through regular maintenance and upkeep to keep culverts clear.

Timeline: Primary work takes place March-October each year (Ongoing)

Los Alamos County Action #13

Action Title: Landslide/Debris Flow Risk Reduction

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Over the last 15 years wildfires have greatly affected the landscape in and around Los Alamos County. As a result of the wildfire activity in the area, the runoff coefficient for the watershed surrounding Los Alamos has been greatly affected. The increased runoff has produced flooding events during the past several years that have affected the stability of some sloped areas within Los Alamos County. In addition, the spring freeze/thaw cycle and earthquakes can affect steep slopes and trigger landslides.

As a result of the increased runoff during the past several years, several areas around Los Alamos County are monitored for slope stability. Areas identified as an increased risk are assessed and mitigated. The County has successfully completed the first phase of mitigation in one area of concern and is considering the installation of rock bolts into the rock face in question. An additional area of concern is currently being assessed. The New Mexico State Department of Transportation has mitigated one area within Los Alamos County that is within State Highway right-of-way. The County is also coordinating with Los Alamos National Laboratory.

Los Alamos County staff continuously monitors areas of potential concern and mitigates these areas as issues arise.

Implementation: The Los Alamos County Public Works Department, Traffic & Streets Division Right of Way Maintenance Program.

Identify and Implement debris flow measures to reduce risk (stabilization, energy dissipation and flow control) and Implement monitoring mechanisms on areas at risk.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works Department, Traffic & Street Division

Partners: NMDOT, LANL

Potential Funding: Grant and County funding

Cost Estimate: $75,000 for rock bolting. $20,000/year monitoring and maintenance;

Benefits: (Losses Avoided) Public safety; avoidance of property damage

Timeline: Ongoing

Los Alamos County Action #14

Action Title: **North Mesa Rock Fall Mitigation**

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Over the last 15 years wildfires have greatly affected the landscape in and around Los Alamos County. As a result of the wildfire activity in the area, the runoff coefficient for the watershed surrounding Los Alamos has been greatly affected. The increased runoff has produced flooding events during the past several years that have affected the stability of some sloped areas within Los Alamos County. In addition, the spring freeze/thaw cycle has a tendency to affect steep slopes with southern exposure. There is an exposed cliff area along San Ildefonso Road south of Diamond Drive that is subject to runoff erosion and rock fractures due to spring freeze/thaw cycles. Earthquakes could also trigger rockfalls and landslides in this area.

This area has been identified as an area of concern and is currently being assessed for mitigation activity. Currently, County Staff is considering the installation of ditch/clearing existing debris against the rock face and the installation of concrete barricades adjacent to a pedestrian sidewalk and motor vehicle roadway. Other mitigation strategies are also being explored, including cutting trees that may weaken the structure of the rock slope, and covering the entire slope with wire mesh.

Implementation: The Los Alamos County Public Works Department, Engineering Division and Traffic & Streets Division Right of Way Maintenance Program.

Expand road maintenance and debris management capabilities.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works Department, Traffic and Street Division

Partners: NMDOT, LANL

Potential Funding: County Funding and Grant funding.

Cost Estimate: $150,000

Benefits: (Losses Avoided) Public safety; Avoidance of property damage

Timeline: Ongoing

Los Alamos County Action #15

Action Title: Los Alamos Townsite Evacuation

Jurisdiction: Los Alamos Townsite

Priority: High

Project Description, Issue and Background: Over the last 15 years wildfires have greatly affected the landscape in and around Los Alamos County. As a result of the wildfire activity in the area, the runoff coefficient for the watershed surrounding Los Alamos has been greatly affected leading to an increased number of flash flood events. In addition, there is limited means of evacuation from Los Alamos and a dirt access road through Rendija Canyon and Guaje Canyon has been used as an evacuation route in the past.

Since Rendija Canyon Road and Guaje Canyon Road are dirt and in canyons, they are susceptible to flooding damage. This situation is exasperated due to the increased runoff from the recent water shed damage resultant from wildfire activity. These roads were used as an evacuation route during the Cerro Grande Fire and again during the Las Conchas Fire. In September of 2013 a substantial flood event was experienced in Los Alamos County that lead to a FEMA disaster declaration. During this flood event, large sections of these roads were destroyed and left impassible due to flood waters and subsequent debris flows. Portions of this road have received limited FEMA funding and engineering for mitigation measures are anticipated to start in the near future. It is anticipated that implementation of these measures will be complete by the fall of 2015.

Additionally, County Staff monitors and periodically maintains these roads since they are not only used as an evacuation route, they also serve as access to several wells that service the community's water system. The lower portion of Guaje Canyon Road crosses through San Ildefonso Tribal property. Verbal agreements have been made between the County and the Tribe, however, an effort is being made to generate a formal Memorandum of Understanding between the two entities.

Implementation: Integration with other county planning activities and MOU development. Tribe and local government collaboration to improve transportation corridor and coordinate evacuation.

This project will also include:

Development of evacuation routes and signage. Preplanning prime evacuation points and

shelter locations. Enhanced road stabilization and erosion control.

Investment in road improvements.

Install automatic barricade arms for evacuation routes and road closures.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works Department, Traffic & Streets Division

Partners: Santa Clara Pueblo, San Ildefonso Pueblo, Los Alamos National Laboratory, US Forest Service, Santa Fe County, Rio Arriba County

Potential Funding: Grant funding; Los Alamos County funding

Cost Estimate: $350,000 initial investment; $30,000 yearly maintenance

Benefits:
(Losses Avoided) Public Safety

Timeline: Ongoing (yearly) Resurfacing of Rendija Canyon Road complete

Los Alamos County Action #16

Action Title: **Fuel Management**

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Overgrown forests in the Los Alamos area have contributed to two large and destructive wildfires. Los Alamos has many neighborhoods on the wildland-urban interface, and many of the homes were constructed in the 1940s and 1950s when fire codes were far less effective than at present. During the Cerro Grande fire, these factors contributed to the loss of more than 400 homes.

Beginning with the post-Cerro Grande FEMA-funded Fuel Mitigation and Forest Restoration Project in 2004, Los Alamos has engaged in active fuel reduction on County-owned land within the community. Between 2004 and 2006, about 1,500 acres of forest were thinned with mechanical and hand treatments. Continuing fuel reduction with County funding began with prescribed burn operations in 2006 with the cooperation of the USDA Forest Service. Broadcast and pile burn operations further reduced the firebrand and crown fire hazards in the thinned and some un-thinned areas.

After initial treatments, in 2009 Los Alamos developed a Community Wildfire Protection Plan (CWPP) to guide continuing fuel reduction operations. The plan was approved by the State Forest in 2010. The CWPP used GIS analysis to prioritize treatments to protect high hazard neighborhoods from firebrand and crown fire hazards. Fuels management has been documented to be effective in reducing wildfire threats in general, and cost-effective in reducing threats in the Los Alamos selected fuels sites. The current effort is
limited by funding and by the "treatable acres."

Implementation: Implement through the Community Wildfire Protection Plan.

This project may also include:

Constructing a new fire training center.

Developing a structural protection plan.

Increased fire hazard mitigation crew funding

Prescribed burning and presuppression fire breaks.

Other Alternatives: No action

Responsible Agency: Los Alamos Fire Department

Partners: USFS, NPS, LANL, Rio Grande Water Fund

Potential Funding: Continued county funding; Community Forest Restoration Grants; Rio Grande Water Fund and Grant funding.

Cost Estimate: $200,000/year

Benefits:
(Losses Avoided) Fire suppression and post-Cerro Grande community reconstruction costs were over $100 million.

Timeline: Implement annually contingent upon funding availability. (Ongoing)

Los Alamos County Action #17

Action Title: Open Space Management

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: With a trend of continuing long-term drought, warming climate, and disruption of normal storm patterns, the natural landscape in and around Los Alamos is changing. Wildfire has removed vegetation cover from about 100,000 acres in the Los Alamos area, invasive species have increased their coverage, drought-related insect infestations have killed hundreds of old-growth ponderosa pines, and damaging runoff during summer storms is not unusual. As temperature increases and precipitation patterns are altered, tree species are shifting their elevation ranges higher into the mountains.

To mitigate flood and wildfire hazards, open space around Los Alamos must be managed effectively. The Open Space Management Plan identifies current problems on open space and proposed actions to correct or mitigate the issues. Addressed in the plan are invasive species management, protection of contiguous wildlife corridors, revegetation of disturbed areas using drought tolerant vegetation, continued trail improvements to reduce sediment transport, and maintenance of access roads to reduce runoff and erosion. The Community Wildfire Protection Plan is based on forest health measures established in the Open Space Management Plan. The plan had been written, reviewed by the public, commented on by the County Council, and revised based on feedback received. The plan was adopted in May 2015.

Implementation: Implement the recommendations of the Open Space Management Plan and related CWPP and Trails Master Plans as elements of the LAC Strategic Leadership Plan.

Other Alternatives: No action

Responsible Agency: Community Services Department; Parks, Recreation & Open Space Division

Partners: LANL, USFS, Rio Grande Water Fund

Potential Funding: County budget; forest restoration grants; Rio Grande Water Fund and Grant funding.

Cost Estimate: Medium

Benefits: (Losses Avoided) Reduced sediment clean up; reduced legacy waste transport; increased water infiltration to the aquifer; attractive outdoor recreation

Timeline: Annually for next 5 years. (Ongoing)

Los Alamos County Action #18

Action Title: Los Alamos National Labs (LANL) Seismic and Volcanic Monitoring and Warning System

Jurisdiction: LANL

Priority: Medium

Project Description, Issue and Background: DOE requires seismic monitoring systems for its critical facility sites containing hazardous materials (DOE O 420.1). For LANL, these systems should be capable of monitoring/detecting low level seismicity and recording on-scale strong ground motion for the purposes of: (1) monitoring seismic activity on known or unknown faults (location, magnitude, mechanism); (2) detecting volcanic related earthquakes/tremors; (3) establishing site effects and shallow crustal attenuation based on recorded earthquakes; (4) establishing whether a facility design basis may have been exceeded following a large earthquake.

Project Description: In addition to a facility-based strong motion array, the laboratory now has 4 broadband microseismic monitoring stations, 3 broadband seismo-acoustic stations, 1 broadband strong motion vertical array, 6 short-period microseismic monitoring stations, and 1 short-period seismo-acoustic monitoring station. During an event LANL Emergency Management and Response notifies LANL staff and LAC Emergency Management for warning dissemination.

Implementation: Leverage existing monitoring program to function as a planning tool to aid in seismic mitigation efforts.

Establish seismic and volcano monitoring and warning system for Los Alamos County to provide early warning to residents.

Set up GPS base station to support mapping and monitoring of hazard areas including landslide, rockfall, liquefaction, storm water drainage and flooding.

Other Alternatives: None

Responsible Agency: LANL Design Engineering and Los Alamos County GIS

Partners: Los Alamos County Emergency Management

Potential Funding: General funds and Grant Funding

Cost Estimate: $50,000

Benefits: Meet DOE Orders and requirements; collect and interpret seismic data to avoid unnecessary and costly conservatisms in facility design.

(Losses Avoided)

Timeline: Ongoing

Los Alamos County Action #19

Action Title: Countywide Stormwater Management

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Stormwater Management Plans plan address run-off and flooding resulting from “normal” rainfall events. Generally, the plans are made for sub-watersheds, and include master drainage planning, construction and maintenance elements. They can also propose new development regulations and drainage utility fees to pay for the necessary improvements. Their overall intent is to allow a community to address increasing runoff due to increases in impervious surfaces (roofs, sidewalks, roads, parking lots), and to plan for drainage in a comprehensive manner so development in one area has minimal impacts on another, minimizing future flood damage.

The National Pollutant Discharge Elimination System (NPDES) requires communities to analyze and manage watershed and drainage basins in a similar manner in order to improve water quality standards and minimize point and non-point pollution sources, illicit discharges, and erosion and sediment issues. Since NPDES is an unavoidable requirement, coordination with a stormwater management program will provide additional benefits to the community. At a minimum, there is overlap between Hazard Mitigation and the NPDES requirements, in that public input and public education are fundamental elements of both programs, and monitoring equipment can serve both programs.

Implementation: The Stormwater Management Plan should evaluate:

Clean out of debris that is blocking streamflow.

Culvert upsizing.

Installation of erosion control measures.

Upgrade and / or expand watershed capabilities.

Install, reroute, increase capacity of storm drainage systems.

Other Alternatives: No action

Responsible Agency: Public Works –Engineering

Partners: EPA, NM Environment Department

Potential Funding: EPA Clean Water Act 319 Grant

Cost Estimate: $150,000 for watershed studies and storm water feasibility analysis

Benefits: (Losses Avoided) Even though the County has not been identified as a MS4 community required to follow NPDES Phase II requirements, it will be a benefit to the community and State if protection measures are implemented.

Timeline: Ongoing

2023 New Actions

Los Alamos County Action #20 (New)

Action Title: **Enhance County Mitigation/removal of flammable items inc. abandoned vehicles, trees, brush, trash**

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: Enact program to remove flammable items including vehicles, trees , brush and trash. Enhancing defensible spaces around properties both public and private throughout the county.

Implementation: County OEM and Fire Service will coordinate programs and activities.

Other Alternatives: TBD

Responsible Agency: LAC Fire

Partners: LAC OEM

Potential Funding: Local funds and Grants funding

Cost Estimate: Medium

Benefits:
(Losses Avoided) Increase defensible space around all identified at risk properties throughout the county.

Timeline: Ongoing 2026

Los Alamos County Action #21 (NEW)

Action Title: **Install tornado warning devices (system) communication, training, incorporate public outreach**

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Implement warning system for tornado and severe weather alerts.

Implementation: Review of feasible locations for outdoor warning sirens.

Other Alternatives: TBD

Responsible Agency: LAC OEM

Partners: TBD

Potential Funding: HMGP, BRIC

Cost Estimate: Medium

Benefits:
(Losses Avoided) Provide early warnings/notifications to residents of severe weather events.

Timeline 2028

Los Alamos County Action #22 (NEW)

Action Title: Defensible space at certain LAPS school properties

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Identify vulnerable LAPS school properties, that need enhancements for defensible space.

Implementation: Develop priories for identifying locations and implement enhancements.

Other Alternatives: TBD

Responsible Agency: LAPS

Partners: LAC Fire

Potential Funding: Local Funds, Grant funding (BRIC, HMGP)

Cost Estimate: Medium

Benefits:
(Losses Avoided) Increased defensible space around schools to mitigate wildfire hazard.

Timeline: Ongoing 2028

Los Alamos County Action #23 (NEW)

Action Title: Upgrade Evacuation route in Redenija Canyon.

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Resurface road entering canyon and grade dirt road at least every 6 months to allow lower clearance vehicle access.

Current canyon road conditions are not conducive to lower clearance vehicle s being able to readily access the area.

Implementation: Development of plans to resurface roads and evacuation route.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works

Partners: Los Alamos County OEM

Potential Funding: Local and Grants

Cost Estimate: Medium

Benefits: (Losses Avoided) assistance with evacuations and traffic control

Timeline: 2026

Los Alamos County Action #24 (NEW)

Action Title: Convert Bus fleet to electric

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Eliminate
Above ground fuel dependency in times of hazardous events.

Implementation: Systematically eliminate current fossil fuel bus fleet and replace with electric busses.

Other Alternatives: No action

Responsible Agency: Los Alamos Public Works/Atomic City Transit

Partners: TBD

Potential Funding: Local and Grants

Cost Estimate: High

Benefits: (Losses Avoided) Community resiliency, assistance with evacuations and traffic control

Timeline: 2028 (Ongoing)

Los Alamos County Action #25 (NEW)

Action Title: Prescribed burning by State of NM

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: Reduce fuel sources to mitigate wildfires via prescribed burns throughout the county.

Implementation: -partner with State of NM to identify areas of high risk to wildfire and plan prescribed burns.

Other Alternatives: No action

Responsible Agency: NM State Forestry

Partners: Los Alamos County Fire and OEM

Potential Funding: State Funding

Cost Estimate: High

Benefits: (Losses Avoided) Decrease fuel sources for wildfires.

Timeline: 2025 (Ongoing)

Los Alamos County Action #26 (NEW)

Action Title: Jernez Mountain Fire Protection Project

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: Provide consistent water supply for wildfire suppression on western flank of Los Alamos county and LANL underground camp. Provide potable water for ski area/campground and provide water for snow making at ski area.

Implementation: **-**Identify water source
-Develop action to actions to implement water supply

Other Alternatives: No action

Responsible Agency: Los Alamos County Fire

Partners: TBD

Potential Funding: Local and Grants

Cost Estimate: Medium

Benefits: (Losses Avoided) Consistent water supply to aid in fire suppression

Timeline: 2028

Los Alamos County Action #27 (NEW)

Action Title: Provide mechanisms for reporting trail tree removal needs

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Provide mechanisms (phone, email, text through Tyler 311) for trail users to report dead/leaning trees for removal.

Implementation: partner with Tyler 311 to develop and implement reporting system.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works

Partners: Tyler 311

Potential Funding: Local and Grants (HMGP)

Cost Estimate: Low

Benefits: (Losses Avoided) Provide an expedited reporting system for on the ground users to report incidents.

Timeline: 2026

Los Alamos County Action #28 (NEW)

Action Title: Backup HVAC equipment at county buildings

Jurisdiction: Countywide

Priority: Low

Project Description, Issue and Background: Reduce public risk from lack of HVAC at county buildings, by supplying redundant systems.

Implementation: -Identify county buildings that are priority

-Purchase and install backup HVAC systems.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works

Partners: Los Alamos Police Department (LAPD), Los Alamos Fire Department (LAFD), American Red Cross, New Mexico Department of Homeland Security and Emergency Management (DHSEM), Los Alamos Medical Center (LAMC)

Potential Funding: Local and Grants (HMGP and BRIC))

Cost Estimate: High

Benefits: (Losses Avoided) Community resiliency

Timeline: 2028

Los Alamos County Action #29 (NEW)

Action Title: Purchase Water Buffalo

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: Purchase water buffalo for rapid deployment during wildfire events.

Implementation: -Secure funding to purchase water buffalo

-Purchase water buffalo

Other Alternatives: No action

Responsible Agency: Los Alamos County Fire

Partners: Los Alamos County OEM

Potential Funding: Local and Grants (SHSGP)

Cost Estimate: $45,000

Benefits: (Losses Avoided) Community resiliency, immediate assistance with wildfire prevention and response

Timeline: 2025

Los Alamos County Action #30 (NEW)

Action Title: **Public Education**

Jurisdiction: Countywide

Priority: High

Project Description, Issue and Background: Public education and outreach for all hazard community preparedness

Implementation:

-Identify strategies for outreach

-Purchase needed materials for handouts

-Direct public to relevant news and social media sites for information

Other Alternatives: No action

Responsible Agency: Los Alamos County Office of Emergency Management

Partners: Los Alamos Police Department (LAPD), Los Alamos Fire Department (LAFD), American Red Cross, New Mexico Department of Homeland Security and Emergency Management (DHSEM), Los Alamos Medical Center (LAMC)

Potential Funding: Local and Grants (SHSGP and EMPG)

Cost Estimate: Low

Benefits: (Losses Avoided) Community resiliency, community awareness of potential hazards and preparedness measures and supplementation of staffing at special events.

Timeline: Implemented annually 2023-2028 (Ongoing)

Los Alamos County Action #31 (NEW)

Action Title: **Hardening public buildings for wildfire**

Jurisdiction: Countywide

Priority: Medium/High

Project Description, Issue and Background: Hardening public buildings for wildfire resistance including double paned windows, and metal netting around opening

Implementation: -require new construction to use stronger building materials resistant to fire

Other Alternatives: No action

Responsible Agency: Los Alamos County Code Enforcement

Partners: Los Alamos County OEM, LAFD

Potential Funding: Local and Grants (HMGP and BRIC)

Cost Estimate: High

Benefits: (Losses Avoided) Community resiliency

Timeline: Implemented annually 2023-2028 (Ongoing)

Los Alamos County Action #32 (NEW)

Action Title: Widening of truck route

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Widening of truck route and state road to accommodate evacuations for all hazards.

Implementation: -Identify main evacuation routes

-Secure funding to enhance evacuation routes.

Other Alternatives: No action

Responsible Agency: Los Alamos County Public Works

Partners: Los Alamos County OEM, NM State DOT

Potential Funding: Grant Funding (State and Federal)

Cost Estimate: High

Benefits: (Losses Avoided) Community resiliency, evacuations

Timeline: 2028\

Los Alamos County Action #33 (NEW)

Action Title:	**Slope Stabilization and Drainage Improvement**
Jurisdiction:	Countywide
Priority:	Medium
Project Description, Issue and Background:	Slope stabilization and hardening along the Canada del Buey in White Rock due to increased development (Mirador) and improve drainage into the area.
Implementation:	-Slope stabilization hardening -Enhance drainage capacity
Other Alternatives:	No action
Responsible Agency:	Los Alamos County Public Works
Partners:	White Rock Townsite
Potential Funding:	Grants (HMGP and BRIC)
Cost Estimate:	Medium
Benefits: (Losses Avoided)	Community resiliency
Timeline:	2028

Los Alamos County Action #34 (NEW)

Action Title:	**Tree Removal**
Jurisdiction:	Countywide
Priority:	High
Project Description, Issue and Background:	Clear trees near power lines to enhance defensible space around power lines to prevent loss of power during all hazard events.
Implementation:	-removal of trees around power line right of ways

Other Alternatives: No action

Responsible Agency: Los Alamos County public works

Partners: TBD

Potential Funding: Local and Grants

Cost Estimate: Medium

Benefits:
(Losses Avoided) Community resiliency .

Timeline: Implemented annually 2023-2028 (Ongoing)

Los Alamos County Action #35 (New)

Action Title: Inundation analyses and updated H&H Study associated with the Los Alamos Canyon Dam

Jurisdiction: Countywide

Priority: Medium

Project Description, Issue and Background: Inundation analyses and H&H Study for the Los Alamos Canyon Dam and downstream impact areas.

Implementation: Upon funding sources received full study to be conducted.
Other Alternatives: TBD

Responsible Agency: OSE Dam Safety Bureau

Partners: DEM, Public Works, and Public Utilities

Potential Funding: FEMA, FMA, HMGP and BRIC

Cost Estimate: Medium

Benefits: Implement flood analyses and modeling

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 Los Alamos 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. The Los Alamos County Council has adopted this Local Hazard Mitigation Plan by passing a resolution. A copy of the resolution is included in Appendix C.

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.

Section 3.0 Planning Process includes information on the implementation and maintenance process since the 2016 plan was adopted. This section includes information on the implementation and maintenance process for this plan update.

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.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the comprehensive plan and community wildfire protection plan for Los Alamos County. 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.

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 multi-objective, win-win benefits to each program and the Los Alamos County community and its stakeholders. This effort is achieved through the routine actions of monitoring agendas, attending 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.

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. Los Alamos 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 LHMP Update 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 Los Alamos County Council; 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 Council 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).

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.

Maintenance Schedule

The Los Alamos 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, Los Alamos 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.

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 2026 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 by July 2028.

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 Los Alamos County Council. 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.

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 have and will use existing plans and/or programs to implement hazard mitigation actions. As previously stated in Section 7.1 of this plan, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. The point is re-emphasized here. 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 Comprehensive Plan
County Emergency Operations Plan
County ordinances
Community Wildfire Protection Plan
Capital improvement plans and budgets
Rio Grande Water Fund Comprehensive Plan for Wildfire and Water Source Protection
Other plans, regulations, and practices with a mitigation aspect

HMPC members involved in these other planning mechanisms have been and 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 routine actions of:

Monitoring other planning/program agendas;
Attending other planning/program meetings;
Participating in other planning processes; and
Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy requires constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Examples of incorporation of the Local Hazard Mitigation Plan into existing planning mechanisms include:

Integration of Wildfire actions identified in this mitigation strategy with the actions and implementation priorities established in existing Community Wildfire Protection Plans
Using the risk assessment information to update the hazard analysis in the Los Alamos County Emergency Operations Plan.

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.

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.

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Appendix A PLANNING PROCESS

Table A.1. List of HMPC and Stakeholders

Department	Contact	Title	Email	Kickoff Meeting	Stakeholder Workshop
LAC - OEM	Ulrich, Cody	Deputy Director	cody.ulrich@lacnm.us	X	X
LAC - Managers Office	Matteson, Linda	Deputy Manager	linda.matteson@lacnm.us		X
LAC - Managers Office	Laurent, Anne	Deputy Manager	anne.laurent@lacnm.us		X
LAC – Utilities	Philo Shelton	Public Works Director	Philo.shelton@lacnm.us	X	X
LAC – Attorney	Leaphart, Alvin	County Attorney	alvin.leaphart@lacnm.us		X
LAC – Risk/Safety	Klepeis, Steven	Risk Manager	steven.klepeis@lacnm.us		X
LAC – PIO	Bucklin, Leslie	Assistant Director	Le.bucklin@lacnm.us	X	X
LAC - Utilities	D'Anna, Cathy	Public Relations Manager	catherine.danna@lacnm.us		X
LAC- Environmental Services	Gabaldon, Armando	Manager	Armondo.gabaldon@lacnm.us		X
LAC-Facilities	Zerr, James	Manager	Jim.zerr@lacnm.us	X	X
LAC-Parks	Parker, Wendy	Superintendent	Wendy.parker@lacnm.us	X	X
LAC-Transit Div,	Granillo, Annette	Operations Manager	annette.granillo@lacnm.us	X	X
LAC- Environmental	Levings, Joshua	Office Manager	Joshua.levings@lacnm.us		X
Services	Servey, Wendy	Deputy Chief	Wendy.servey@lacnm.us		X
LAC-Transit	Barrela, James	Transit Supervisor	James.barella@lacnm.us		X
LAC-Public Works	Martinez, Eric	Engineer	Eric.martinez@lacnm.us		X
LAC-Airport	Rodgers, Geoff	Airport Manger	Geoff.rodgers@lacnm.us		X
LAPD	Morris, Oliver	Assistant Chief	Oliver.morris@lacnm.us		X
LAPD	Roberts, Daniel	Operations Commander	Daniel.roberts@lacnm.us		X
Volunteer	Zoltai, John	LAARC	John@zoltai.com		X
LAC- OEM	Beverley Simpson	Emergency Manager	Beverley.simpson@lacnm.us	X	X
LAC- Managers Office	Salazar, Jacqueline	Executive Assistant	jacqueline.salazar@lacnm.us	X	

X: denotes meeting attendance

AGENDAS AND SIGN IN SHEETS

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Los Alamos County NM, 2022 Hazard Mitigation Plan Update

Kick-Off Meeting
September 28, 2022, | 10:00 – 11:30 AM (Mountain)

AGENDA

- **Introductions**
  - Name, Department/Agency
  - What previous experience do you have (if any) with hazard planning?
  - In your opinion, what is the top hazard/threat to Los Alamos County?
- **Hazard Mitigation Planning**
  - Brief introduction to hazard mitigation planning
  - Mitigation benefits and common projects/measures
- **2022 Plan Update Process**
  - FEMA recommended process and requirements
  - 2022 Plan Update focus areas
  - First steps: hazard events to include, goals of the mitigation plan
- **Roles and Expectations**
- **Public & Stakeholder Involvement**
  - Identify key contacts
  - Define "public" for involvement in plan development
  - Local practices for public involvement
- **Project Timeline**
- **Data Requests**
- **Next Steps**

Support Team Contact
Matt Stanley
Integrated Solutions Consulting
Matt.Stanley@i-s-consulting.com
504.645.1616

Los Alamos County NM, 2022 Hazard Mitigation Plan Update

Jurisdictional Workshop
February 8, 2023, | 1:00 – 4:30 PM (Mountain)

AGENDA

Meeting Purpose: The purpose of this meeting is to engage and collect information from the participating jurisdictions within Los Alamos County.

- **Introductions**
- **Mitigation Overview/Recap**
- **Hazard Summary Worksheet Review**
- **Mitigation Goals**
- **Mitigation Strategies**
- **Review Ongoing Mitigation Actions/Projects**
- **Identify New Mitigation Actions**

Support Team Contact
Jake Halley
Integrated Solutions Consulting
Jacob.Halley@i-s-consulting.com
318.381.3429

- *SIGN-IN SHEET:* Hazard Mitigation Plan Update -

Hazard Mitigation Plan: Jurisdictional Workshop (02/08/2023)

Los Alamos County, New Mexico

Name	Agency	Phone	E-mail
Cody Ulrich	Los Alamos County OEM	505 709 0436	cody.ulrich@lacnm.us
John Halley	ISC	318.381.3429	jacob.halley@i-s-consulting.com
Bill Boedeker	Los Alamos ARC	505-695-9882	boedeker@cybermesa.com
David Martinez	Los Alamos CDD	505-709-7100	david.martinez@lacnm.us
Carter Payne	LA Pub. Sch.	505-663-2228	j.payne@laschools.net
Steven Klepper's	Risk/Safety	505-662-8192	steven.klepper@lacnm.us
Leslie E. Bucklin	County	505-412-0825	le.bucklin@lacnm.us
Cathy D'Anna	Dept. of Pub. Utilities	505-709-8646	catherine.danna@lacnm.us
[illegible]	LAC Public Works	505709[illegible]	amanda.[illegible]@lacnm.us
James Zarr	LAC Facilities	505-690-0380	jm.zarr@lacnm.us
Wendy Parker	Parks Div.	505.709.5958	wendy.parker@lacnm.us
Annette Granillo	Transit Div	505-709-7098	annette.granillo@lacnm.us
Joshua Levings	Environmental Svcs	505-707-7663	joshua.levings@lacnm.us
Wendy Servey	Los Alamos Fire Dept	505 695-3643	wendy.servey@lacnm.us
Linda Matteson	County Mgr. Office	505-662-8086	linda.matteson@lacnm.us
Parker Twiss	ISC		parker.twiss@i-s-consulting.com
James Barela	Los Alamos County Atomic City Transit	505-663-1770	james.barela@lacnm.us

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Los Alamos County NM, 2022 Hazard Mitigation Plan Update

Jurisdictional Workshop
February 9, 2023, | 9:00 AM– 12:00 PM (Mountain)

AGENDA

<u>Meeting Purpose:</u> The purpose of this meeting is to engage and collect information from the participating jurisdictions within Los Alamos County.

- **Introductions**
- **Mitigation Overview/Recap**
- **Hazard Summary Worksheet Review**
- **Mitigation Goals**
- **Mitigation Strategies**
- **Review Ongoing Mitigation Actions/Projects**
- **Identify New Mitigation Actions**

Support Team Contact
Jake Halley
Integrated Solutions Consulting
Jacob.Halley@i-s-consulting.com
318.381.3429

- *SIGN-IN SHEET:* **Hazard Mitigation Plan Update** -

Hazard Mitigation Plan: Jurisdictional Workshop (02/08/2023)

Los Alamos County, New Mexico

Name	Agency	Phone	E-mail
Cody Ulrich	LAC OEM	505 709 0436	cody.ulrich@lacnm.us
ERIC MARTINEZ	PW	505-662-9101	eric.martinez@lacnm.us
Geoff Rodgers	PW-Airport	505 709 [illegible]	geoff.rodgers@lacnm.us
OLIVER MORRIS	LAPD	(505) 412-2921	oliver.morris@lacnm.us
Daniel Roberts	LAPD	505 663 [illegible]	Daniel.Roberts@lacnm.us
John Zoltai	LAARC	505-412-3640	john@zoltai.com

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Los Alamos County NM, 2022 Hazard Mitigation Plan Update

Public Meeting
February 8, 2023, | 5:00 – 6:30 PM (Mountain)

AGENDA

- **Introductions**
- **What is Hazard Mitigation?**
- **Hazard Mitigation Plan Overview**
- **Hazards of Greatest Concern for Citizens of Los Alamos County**
- **Examples of Home-Owner/Individual Mitigation Actions**
- **Question/Answer Session**

Support Team Contact
Jake Halley
Integrated Solutions Consulting
Jacob.Halley@i-s-consulting.com
318.381.3429

- *SIGN-IN SHEET:* Hazard Mitigation Plan Update -

Hazard Mitigation Plan: Public Meeting Los Alamos (02/08/2023)

Los Alamos County, New Mexico

Name	Agency	Phone	E-mail
KEN KUNTZ	N/A	717-476-2263	KenKuntz@[illegible]
Marla Brooks	consultant	505-412-9993	[illegible]@live.com
Cody Ulrich	LAC OEM	505 709 0436	Cody.Ulrich@lacNM.us
Jacob Halley	ISC	318.381.3429	jacob.halley@i-s-consulting.com
Cindy Mazur	self	717 476 2242	cindy[illegible]mazur@gmail.com

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Los Alamos County NM, 2022 Hazard Mitigation Plan Update

Public Meeting
February 9, 2023, | 12:00 – 1:00 PM (Mountain)

AGENDA

- **Introductions**
- **What is Hazard Mitigation?**
- **Hazard Mitigation Plan Overview**
- **Hazards of Greatest Concern for Citizens of Los Alamos County**
- **Examples of Home-Owner/Individual Mitigation Actions**
- **Question/Answer Session**

Support Team Contact
Jake Halley
Integrated Solutions Consulting
Jacob.Halley@i-s-consulting.com
318.381.3429

- *SIGN-IN SHEET:* Hazard Mitigation Plan Update -

Hazard Mitigation Plan: Public Meeting Los Alamos (02/08/2023)
Los Alamos County, New Mexico

Name	Agency	Phone	E-mail
Liz Aicher	Citizen	505 500 6469	e.aicher@q.com
David Hampton	–	505-412-2969	dehampton@comcast.net
Jake Holling	JSC		
Cody ulrich	LAC OEM	505 709 0436	cody.ulrich@lacnm.us

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PUBLIC OUTREACH DOCUMENTATION

LOS ALAMOS DAILY POST

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County Public Meetings For Hazard Mitigation Plan Feb. 8-9

LOS ALAMOS

COUNTY News:

Los Alamos County Emergency Management (EM) Division is working with Integrated Solutions Consulting (ISC) to hold two in-person public meetings regarding the importance of hazard mitigation planning and an overview of the County's Plan.

Citizens are encouraged to attend either meeting 5-6:30 p.m., Feb. 8 at Fuller Lodge at 2132 Central Ave in Los Alamos or noon to 1 p.m., Feb. 9 at the White Rock Fire Station #3 at 129 N.M. in White Rock.

The purpose of hazard mitigation planning is to identify policies and actions that can be implemented before a disaster occurs to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to break the cycle of disaster damage, reconstruction and repeated damage.

During the public meetings, representatives from ISC will provide an overview of the Hazard Mitigation Plan, share results from the Hazard Mitigation Survey conducted in fall 2022, provide examples of individual mitigation actions citizens can take to ensure their homes and families are prepared, and conduct a question-and-answer session. Light refreshments will be provided.

Direct questions to Cody Ulrich at 505.662.8280.

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lacmanager@lacnm.us
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1h
Hazard Mitigation Plan public meetings Feb. 8 & 9
Los Alamos County Emergency Management (EM) Division is working with Integrated Solutions Consulting (ISC) to hold two in-person public meetings regarding the importance of hazard mitigation planning and an overview of the County's Plan. Citizens are encouraged to attend either meeting on February 8 from 5-6:30 p.m. at Fuller Lodge (2132 Central Ave. Los Alamos), or February 9 from noon-1 p.m. at the White Rock Fire Station ... See more

https://losalamosreporter.com/2023/01/27/county-hazard-mitigation-plan-public-meetings-slated-for-feb-8-9/

COUNTY NEWS RELEASE

Los Alamos County Emergency Management (EM) Division is working with Integrated Solutions Consulting (ISC) to hold two in-person public meetings regarding the importance of hazard mitigation planning and an overview of the County's Plan. Citizens are encouraged to attend either meeting on February 8 from 5-6:30 p.m. at Fuller Lodge (2132 Central Ave, Los Alamos), or February 9 from noon-1 p.m. at the White Rock Fire Station #3 (129 NM-4, White Rock).

The purpose of hazard mitigation planning is to identify policies and actions that can be implemented before a disaster occurs to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to break the cycle of disaster damage, reconstruction, and repeated damage.

During the public meetings, representatives from ISC will provide an overview of the Hazard Mitigation Plan, share results from the Hazard Mitigation Survey conducted in fall 2022, provide examples of individual mitigation actions citizens can take to ensure their homes and families are prepared, and conduct a question-and-answer session. Light refreshments will be provided.

If you have any questions, please contact Cody Ulrich at (505) 662-8290.

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JANUARY 27, 2023

County: Hazard Mitigation Plan Public Meetings Slated For Feb. 8 & 9

COUNTY NEWS RELEASE

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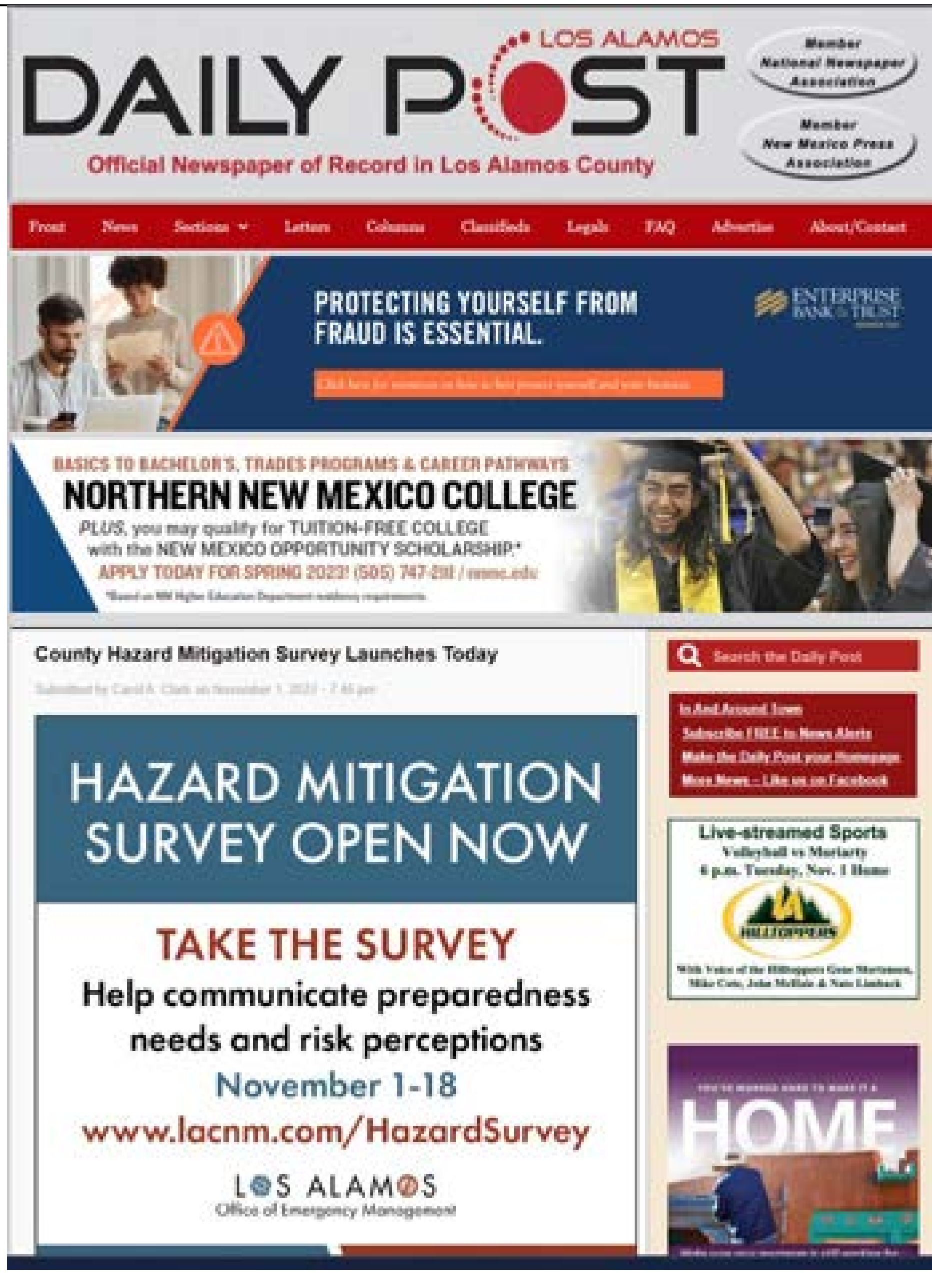

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November 1-18
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County Hazard Mitigation Survey Launches Today

Submitted by Carol A. Clark on November 1, 2022 - 7:46 pm

COUNTY News:

Los Alamos County Emergency Management (EM) Division is conducting a study to better understand the preparedness needs and risk perceptions of those who live and work in the County as part of the Hazard Mitigation Plan update process.

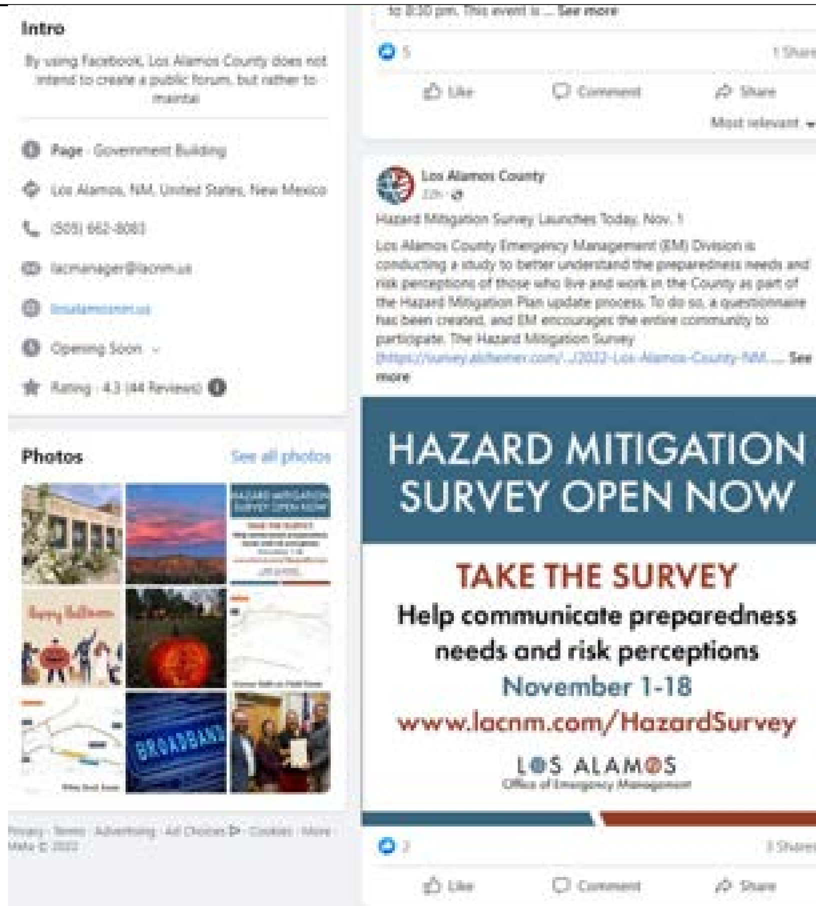
To do so, a questionnaire has been created, and EM encourages the entire community to participate. The Hazard Mitigation Survey is open to the public today, Nov. 1-18.

The purpose of hazard mitigation planning is to identify policies and actions that can be implemented before a disaster occurs to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to break the cycle of disaster damage, reconstruction, and repeated damage.

"Understanding community perceptions when assessing potential risks will help us prioritize and plan mitigation projects accordingly," explains Cody Ulrich, Los Alamos County Emergency Management Specialist.

The questionnaire should only take about 10 minutes to complete. All responses will be kept confidential, and the community's participation is strictly voluntary. The public's input will enable the County to better serve the community through the Hazard Mitigation Plan update process.

Members of the public with any questions, contact Cody Ulrich at 505.662.8290.


Intro
By using Facebook, Los Alamos County does not intend to create a public forum, but rather to maintai
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Los Alamos, NM, United States, New Mexico
Opening Soon
Photos
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Hazard Mitigation Survey Launches Today, Nov. 1
Los Alamos County Emergency Management (EM) Division is conducting a study to better understand the preparedness needs and risk perceptions of those who live and work in the County as part of the Hazard Mitigation Plan update process. To do so, a questionnaire has been created, and EM encourages the entire community to participate. The Hazard Mitigation Survey
HAZARD MITIGATION SURVEY OPEN NOW
TAKE THE SURVEY
Help communicate preparedness needs and risk perceptions
November 1-18
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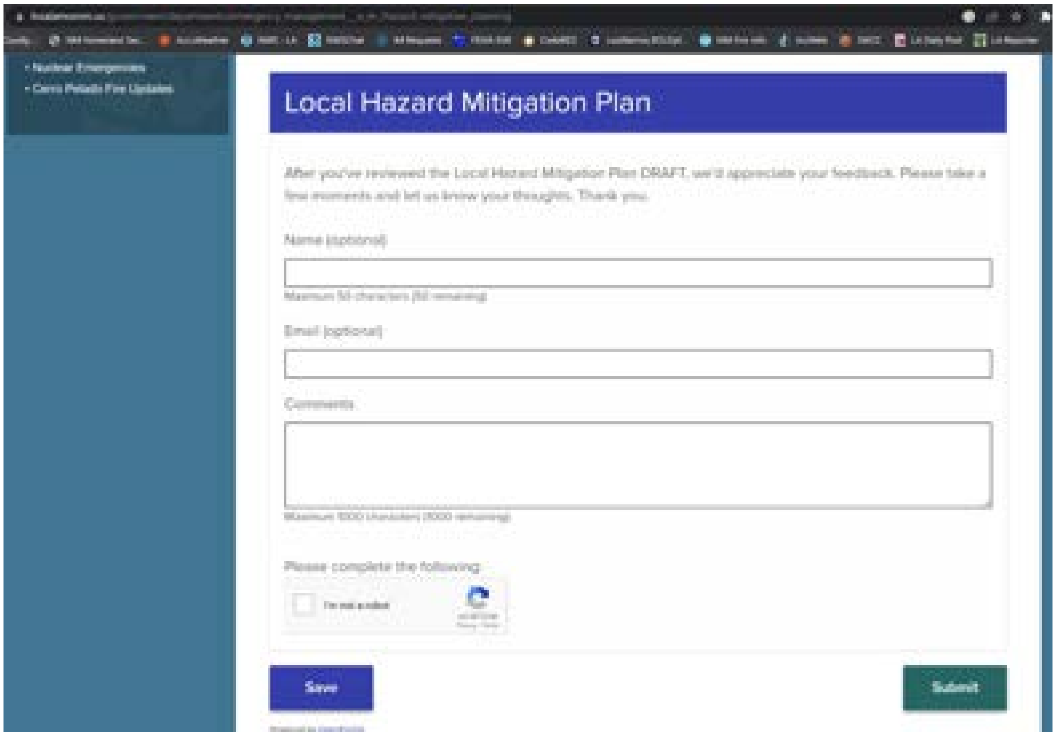
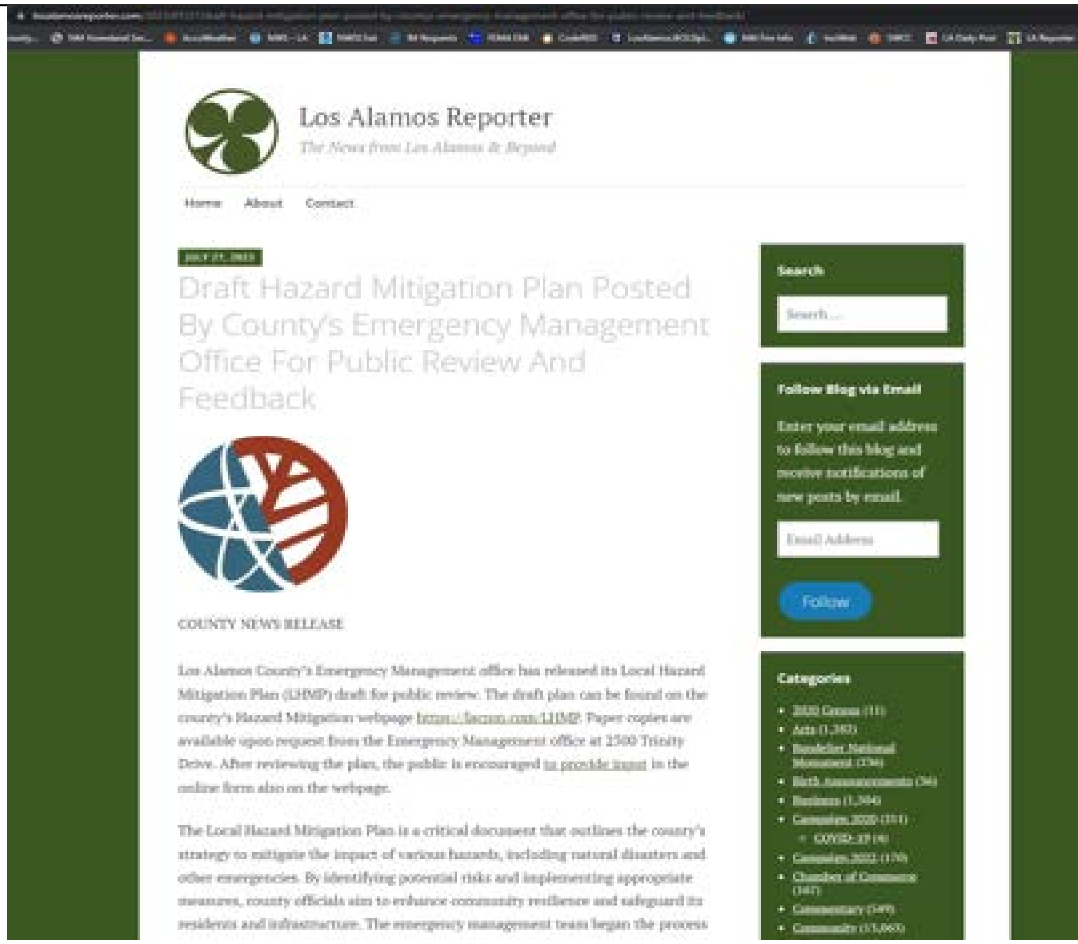
Hazard Mitigation Planning
Local Hazard Mitigation Plan (LHMP)
What is a Local Hazard Mitigation Plan?
We're updating our Local Hazard Mitigation Plan
2023 Local Hazard Mitigation Plan - DRAFT
Local Hazard Mitigation Plan



• Nuclear Emergencies
• Cerro Pelado Fire Updates
Local Hazard Mitigation Plan
After you've reviewed the Local Hazard Mitigation Plan DRAFT, we'd appreciate your feedback. Please take a few moments and let us know your thoughts. Thank you.
Name (optional)
Email (optional)
Comments
Please complete the following
Save
Submit

Los Alamos County: Draft Hazard Mitigation Plan Posted For Public Review And Feedback
LOS ALAMOS
where discoveries are made
Live-streamed Sports



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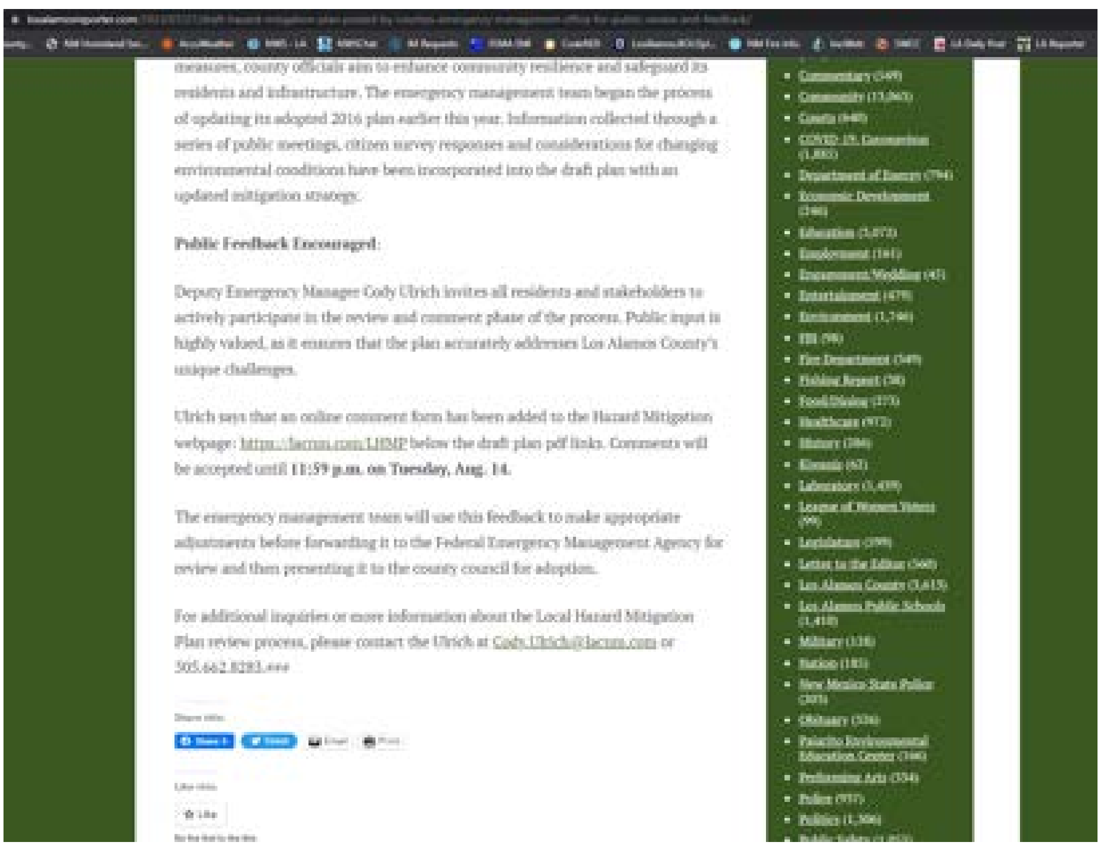
JULY 27, 2023

Draft Hazard Mitigation Plan Posted By County's Emergency Management Office For Public Review And Feedback

COUNTY NEWS RELEASE

Los Alamos County's Emergency Management office has released its Local Hazard Mitigation Plan (LHMP) draft for public review. The draft plan can be found on the county's Hazard Mitigation webpage https://lacnm.com/LHMP. Paper copies are available upon request from the Emergency Management office at 2500 Trinity Drive. After reviewing the plan, the public is encouraged to provide input in the online form also on the webpage.

The Local Hazard Mitigation Plan is a critical document that outlines the county's strategy to mitigate the impact of various hazards, including natural disasters and other emergencies. By identifying potential risks and implementing appropriate measures, county officials aim to enhance community resilience and safeguard its residents and infrastructure. The emergency management team began the process



measures, county officials aim to enhance community resilience and safeguard its residents and infrastructure. The emergency management team began the process of updating its adopted 2016 plan earlier this year. Information collected through a series of public meetings, citizen survey responses and considerations for changing environmental conditions have been incorporated into the draft plan with an updated mitigation strategy.

Public Feedback Encouraged:

Deputy Emergency Manager Cody Ulrich invites all residents and stakeholders to actively participate in the review and comment phase of the process. Public input is highly valued, as it ensures that the plan accurately addresses Los Alamos County's unique challenges.

Ulrich says that an online comment form has been added to the Hazard Mitigation webpage: https://lacnm.com/LHMP below the draft plan pdf links. Comments will be accepted until **11:59 p.m. on Tuesday, Aug. 14.**

The emergency management team will use this feedback to make appropriate adjustments before forwarding it to the Federal Emergency Management Agency for review and then presenting it to the county council for adoption.

For additional inquiries or more information about the Local Hazard Mitigation Plan review process, please contact the Ulrich at Cody.Ulrich@lacnm.com or 505.662.8283.###

Clarification on Terminology to be used during the Hazard Mitigation Planning Process

HAZARD – Something that is potentially dangerous

> Natural – dangerous situations or events driven by the conditions of nature
> Man-made – dangerous incidents driven by human interaction with the physical environment.

MITIGATION –_Hazard Mitigation means any sustained action taken to reduce or eliminate long-term risk to human life and property from natural hazards.

PLANNING PROCESS – This is the method in which AMEC uses to makes sure all the required components of the plan are included so that the State and FEMA approval process is successful.

AMEC'S 10 STEP PLANNING PROCESS USES A COMBINATION OF THREE RECOMMENDED PROCESSES – DMA, FMA AND COMMUNITY RATING SYSTEM (CRS)

FEMA Phases	Hazard Mitigation Grant and Pre-Disaster Mitigation Grant Programs (DMA, 44 CFR 201)	Flood Mitigation Assistance Program (44 CFR 78.5)	Community Rating System Floodplain Management Planning (10-Step Process)
Phase I Organize Resources	Coordination among agencies	Coordination with other agencies or organizations	Organize to prepare the plan
	Integration with other planning efforts	Involve the public, including a description of the planning process. Public involvement may include workshops, public meetings, or hearings	Coordination with other agencies
	Involve public throughout the planning process		Involve the public
Phase II Assess Risks	Identify all hazards	Flood hazard area inventory that identifies the flood risk, including estimates of the number and types of structures at risk and repetitive-loss properties	Assess the (flooding) hazard
	Profile hazard events		
	Assess vulnerability	Problem identification, including a description of the existing flood hazard, the extent of flood depth and damage potential, and the applicant's floodplain management goals	Assess the problem
	Estimate potential losses		
Phase III Develop the Mitigation Plan	Documentation of planning process	Review of possible mitigation actions, including the identification and evaluation of cost-effective and technically feasible mitigation actions	Set goals
	Capability assessment		Review possible activities
	Develop hazard mitigation goals		Draft an action plan
	Identification and analysis of mitigation measures		

FEMA Phases	Hazard Mitigation Grant and Pre-Disaster Mitigation Grant Programs (DMA, 44 CFR 201)	Flood Mitigation Assistance Program (44 CFR 78.5)	Community Rating System Floodplain Management Planning (10-Step Process)
	Funding sources		
Phase IV Implement and Monitor Progress and Project Management/ Project Tracking	Adoption	Documentation of the formal plan adoption by the legal entity submitting the plan (e.g., governor, mayor, county executive)	Adopt the plan
	Implementation of mitigation measures		Implement, evaluate, and revise the plan
	Monitoring, evaluating, and updating the plan		
	Continued public involvement		

RISK – A combination of hazard, vulnerability, and exposure. The impact 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.

VULNERABILITY – Being open to damage or attack. The likelihood that an area or sector will be negatively affected by a hazard event.

IMPACT - Measured or observed affect of a hazard event that could include social, economic, and environmental sectors.

MITIGATION CAPABILITIES - In the context of hazard mitigation, mitigation capabilities relate to loss prevention mechanisms implemented by a jurisdiction or community that act to reduce hazard-related impacts from a hazard event.

MITIGATION STRATEGY – As a part of the planning process, each participating jurisdiction is required to identify their specific mitigation goals, objectives and actions (collectively referred to as the mitigation strategy) designed to reduce the risk and vulnerability of a community to identified hazards.

Goals are a broader statement of what a jurisdiction would like to work toward accomplishing. Such as: "Reduce impacts from natural hazards on life, wildlife, property and the environment."
Objectives provide more specifics on how to obtain the goal. Such as: "Increase awareness about natural hazards."
Actions are specific projects that will need to be implemented to successfully accomplishing identified goals and objectives. Such as: "Develop a natural hazards public outreach program."

PARTICIPATING JURISDICTIONS – A participating jurisdiction may be defined as a geographical area over which a governing body has the power and right to exercise authority as in a County, City, Township, Parish, Borough, Tribal and Special District; however, there might not be a distinct political boundary as in a watershed or metropolitan district. A participating jurisdiction for purposes of this LHMP update include any jurisdiction that is willing to meet the plan participation requirements and is seeking approval of the plan for their jurisdiction.

3

HAZARD MITIGATION PLANNING COMMITTEE (HMPC) - The HMPC is a committee made up of local representation from all the jurisdictions, who want to participate in the planning process, that are located within an identified geographical boundary (i.e., Los Alamos County Planning Area. For example: this includes representation for each municipality, city, town, and special district within a county, as well as representation for the county government and/or any special district and/or unincorporated area within the county. Also included on the HMPC are other agencies, neighboring jurisdictions, and other public and private stakeholders with an interest in the Los Alamos County LHMP update process.

OVERVIEW

The contents of this workbook have been designed to assist Los Alamos County in collecting necessary background information to support the hazard mitigation planning process pursuant to the Federal Disaster Mitigation Act (DMA) of 2000.

The essential information needed to support the planning process includes background information about Los Alamos County in general and relative to hazards, risks, vulnerabilities, and mitigation capabilities as previously described.

The planning process is heavily dependent on the data submitted back to AMEC by each of the participating jurisdictions represented. 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 the needs of each participating jurisdiction, as well as the requirements of DMA and CRS and that contains a list of projects that may be eligible for federal mitigation funding, pre and post disaster.

PARTICIPATION

The DMA planning regulations and guidance stress that **each** jurisdiction seeking the required FEMA approval of their mitigation plan must:

- Participate in the process;
- Provide details about their specific geographical planning area where the risk in their area differs from that experienced by 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 Local 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 WORKBOOK

This workbook contains an explanation of the types of hazard mitigation or loss prevention data that is needed for the hazard mitigation planning process. This workbook identifies specific requirements for general community information, the Risk Assessment Process (ie., Hazard Identification and Profiles; Vulnerability Assessment; Capability Assessment), as well as defines requirements for development of the Mitigation Strategy.

The worksheets have been developed to facilitate the data collection process. This needs to be completed by a representative from Los Alamos County and returned as soon as possible. Completion of the data collection workbook will serve two purposes:

1) They will help facilitate the collection of the necessary information from the local perspective; and
2) They will function as evidence of "participation" in the planning process.

Hazard Ranking Worksheet Completed by Stakeholders at workshops:

Hazards

Name:_______________________________; E-mail: ______________________________________;
Jurisdiction/Organization/Agency: ____

Please describe any specific and/or unique concerns/risks that this hazard poses to your jurisdiction and/or organization. For example, are there properties that are at risk of repetitive damages from this hazard? Are certain population groups in your jurisdictions more vulnerable to this hazard? Are there specific neighborhoods or areas in your community that are more at risk from one of these hazards?

Spatial Extent
Limited*:* Less than 10% of planning area
Significant: 10-50% of planning area
Extensive: 50-100% of planning area

Hazard	Limited	Significant	Extensive	2016 Rank	2023 Rank
Dam Failure				Limited	
Drought				Extensive	
Floods: 100/500 Year				Extensive	
Flood: Localized Stormwater/Flash Flooding				Limited	
Landslides (includes Rockfall)				Significant	
Severe Weather: High Winds				Limited	
Severe Weather: Lightning				Extensive	
Severe Weather: Thunderstorms (Hail/Monsoon)				Limited	
Severe Weather: Winter Storm and Extreme Cold				Extensive	
Wildfire				Extensive	
Volcanoes				Significant	

Probability of Future Occurrences
Low: Occurs less than once every 10 years or more
Medium*:* Occurs less than once every 5 to 10 years
High: Occurs once every year or up to once every five years

Hazard	Low	Medium	High	2016 Rank	2023 Rank
Dam Failure				Low	
Drought				Medium	
Earthquake				Low	
Floods: 100/500 Year				Low	

Flood: Localized Stormwater/Flash Flooding				High	
Landslides (includes Rockfall)				Medium	
Severe Weather: High Winds				High	
Severe Weather: Lightning				High	
Severe Weather: Thunderstorms (Hail/Monsoon)				High	
Severe Weather: Winter Storm and Extreme Cold				High	
Wildfire				High	
Volcanoes				Low	

Magnitude/Severity
Low: Negligible property damages (less than 5% of all buildings and infrastructure) Negligible loss of quality of life. Local emergency response capability is sufficient to manage the hazard.
Medium: Moderate property damages (15% to 50% of all buildings and infrastructure) Some loss of quality of life. Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to involve one or more counties.
High: Property damages to greater than 50% of all buildings and infrastructure. Significant loss of quality of life Emergency response capability, economic and geographic effects of the hazard are of sufficient magnitude to require federal assistance

Hazard	Low	Medium	High	2016 Rank	2023 Rank
Dam Failure				Medium	
Drought				Low	
Earthquake				High	
Floods: 100/500 Year				Medium	
Flood: Localized Stormwater/Flash Flooding				Medium	
Landslides (includes Rockfall)				Low	
Severe Weather: High Winds				Low	
Severe Weather: Lightning				Low	
Severe Weather: Thunderstorms (Hail/Monsoon)				Medium	

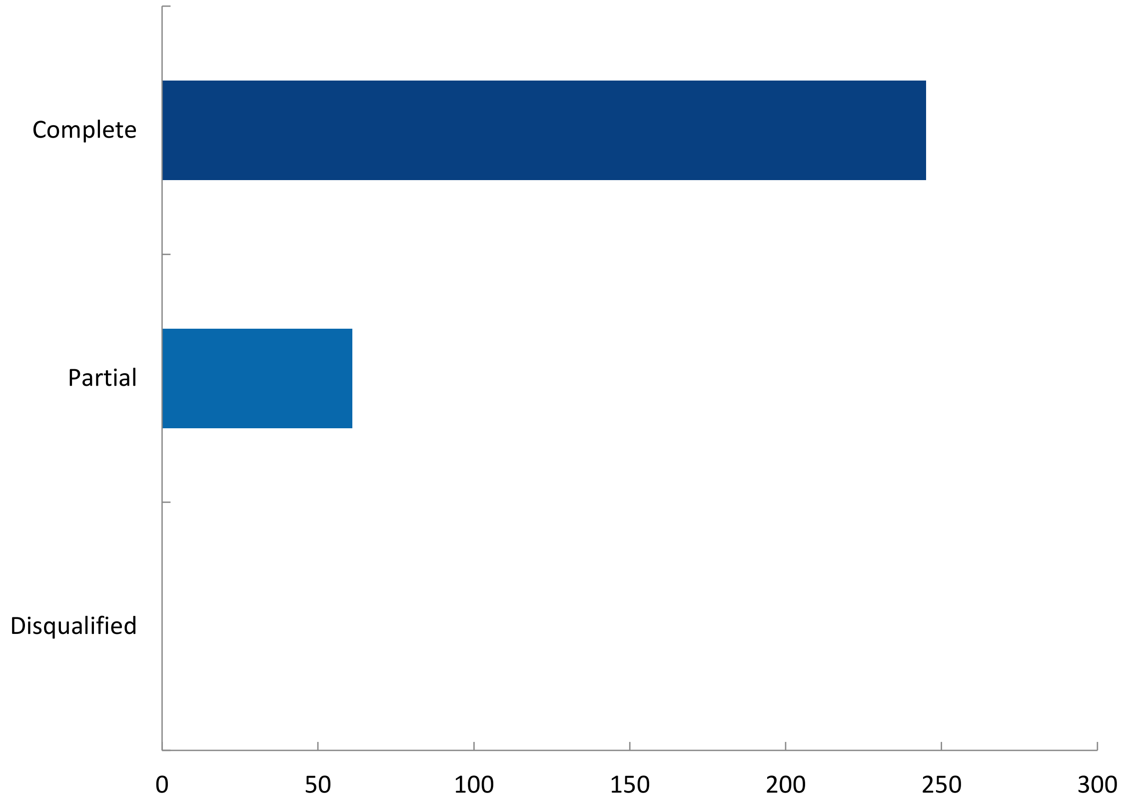
Significance
Low: minimal potential impact
Medium**:** moderate potential impact
High: widespread potential impact

Hazard	Low	Medium	High	2016 Rank	2023 Rank
Dam Failure				Medium	
Drought				Low	
Earthquake				Medium-High	
Floods: 100/500 Year				Medium	
Flood: Localized Stormwater/Flash Flooding				High	
Landslides (includes Rockfall)				Medium	
Severe Weather: High Winds				Low	
Severe Weather: Lightning				Medium	
Severe Weather: Thunderstorms (Hail/Monsoon)				Medium	
Severe Weather: Winter Storm and Extreme Cold				Low	
Wildfire				High	
Volcanoes				Low	

Report for 2022 Los Alamos County, NM: Disaster Preparedness and Mitigation Questionnaire

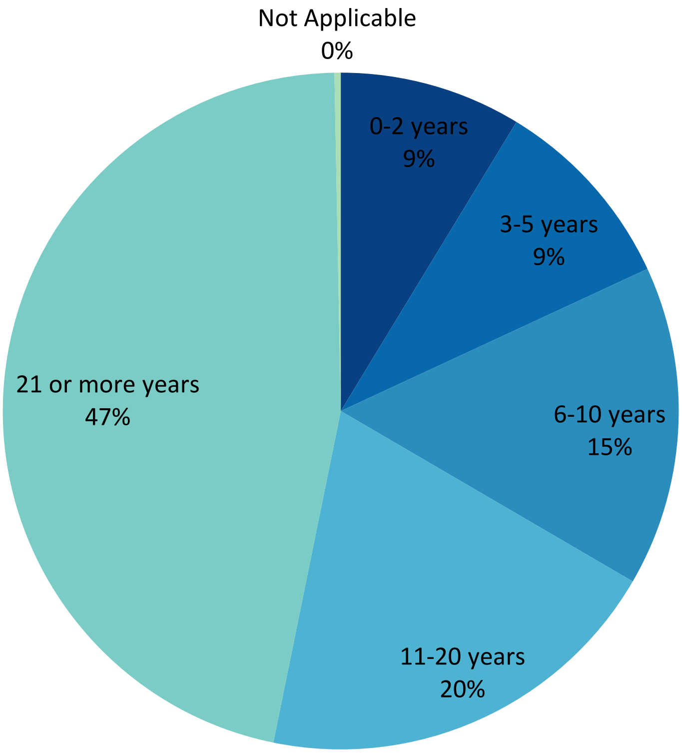
2022 Los Alamos County, NM: Disaster Preparedness and Mitigation Questionnaire

Response Statistics



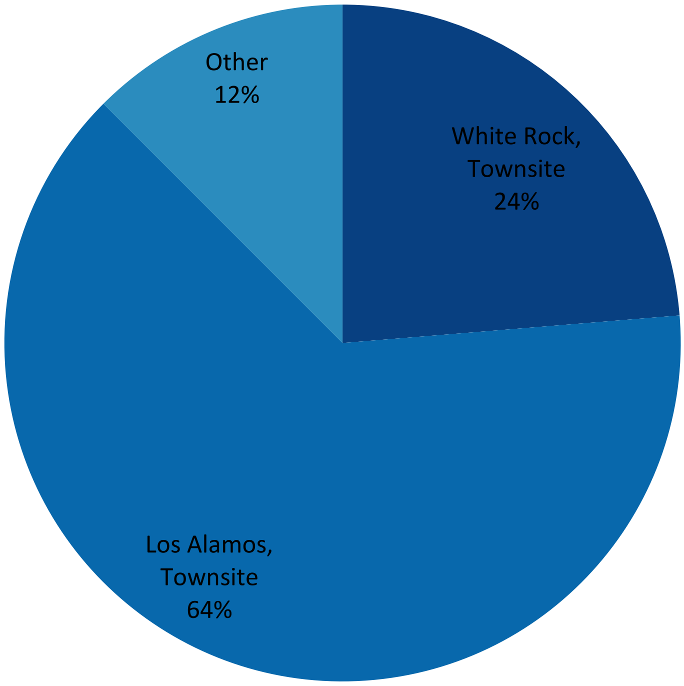
	Count	Percent
Complete	245	80.1
Partial	61	19.9
Disqualified	0	0
Total	306	

1.Approximately how many years have you lived or worked (if you are not a resident) in Los Alamos County, New Mexico?



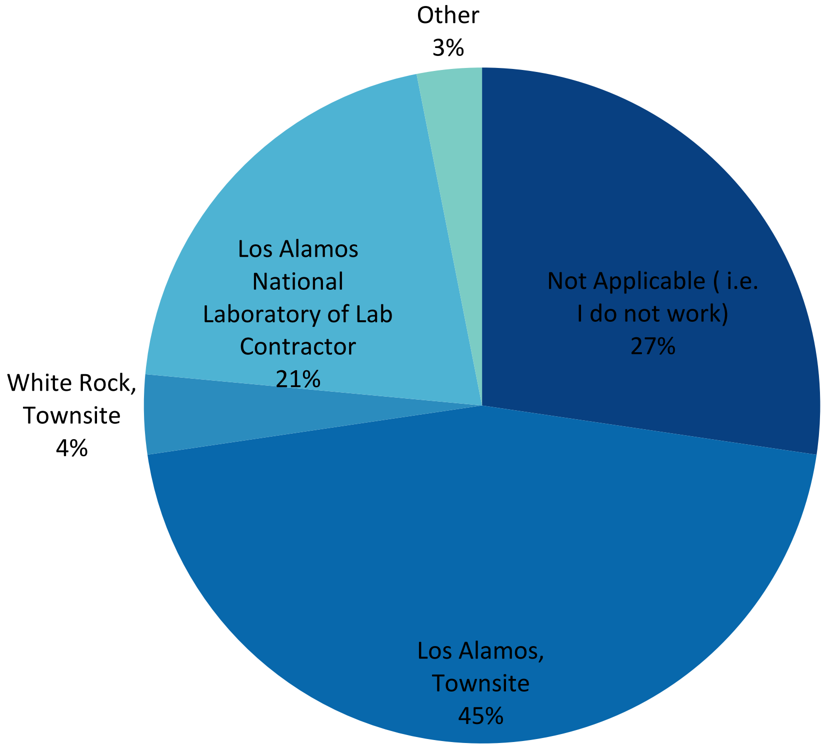
Value	Percent	Count
0-2 years	8.7%	25
3-5 years	9.4%	27
6-10 years	15.3%	44
11-20 years	19.8%	57
21 or more years	46.5%	134
Not Applicable	0.3%	1
	Total	288

2.Please indicate the jurisdiction that best represents the location of your home address/place of residence.



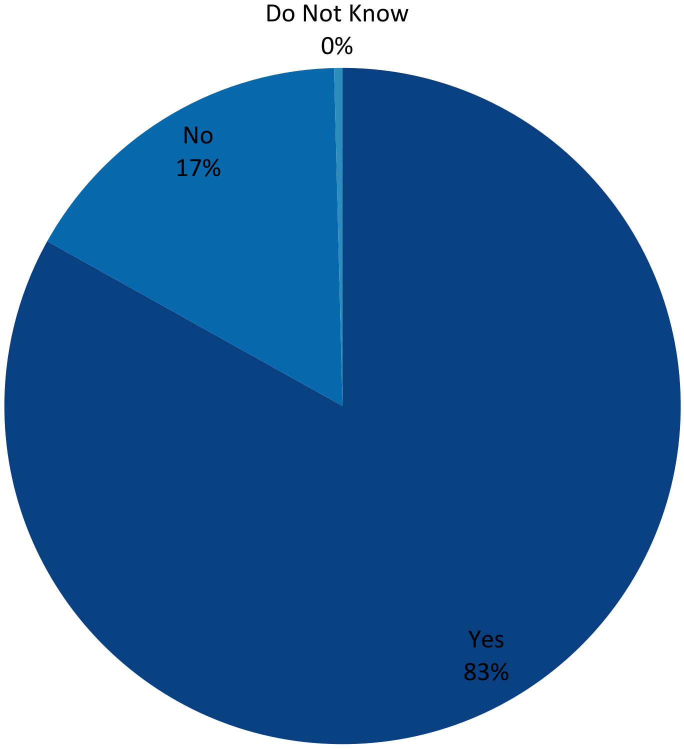
Value	Percent	Count
White Rock, Townsite	23.7%	68
Los Alamos, Townsite	63.8%	183
Other	12.5%	36
	Total	287

3.Please indicate the jurisdiction that best represents the location where you work (i.e. place of business).



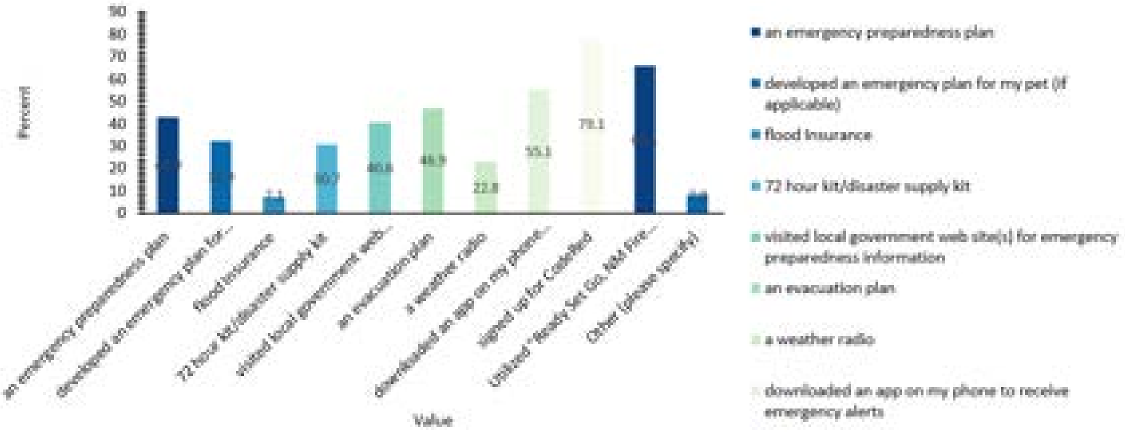
Value	Percent	Count
Not Applicable (i.e. I do not work)	27.3%	79
Los Alamos, Townsite	45.3%	131
White Rock, Townsite	3.8%	11
Los Alamos National Laboratory of Lab Contractor	20.4%	59
Other	3.1%	9
	Total	289

4.Do you have consistent, and stable internet access?



Value	Percent	Count
Yes	83.1%	217
No	16.5%	43
Do Not Know	0.4%	1
	Total	261

5.Please indicate those activities you have done to prepare for emergencies and disa

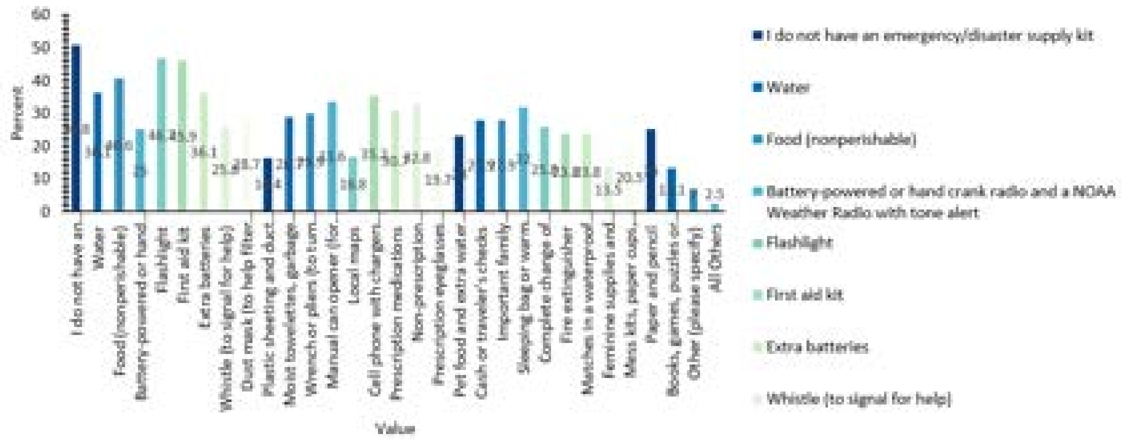


sters. Please select ALL that apply. I have…

Value	Percent	Count
an emergency preparedness plan	42.9%	109
developed an emergency plan for my pet (if applicable)	31.9%	81
flood Insurance	7.1%	18
72 hour kit/disaster supply kit	30.7%	78
visited local government web site(s) for emergency preparedness information	40.6%	103
an evacuation plan	46.9%	119
a weather radio	22.8%	58
downloaded an app on my phone to receive emergency alerts	55.1%	140
signed up for CodeRed	79.1%	201

Utilized "Ready Set Go, NM Fire Prevention Programs"	66.1%	168
Other (please specify)	7.9%	20

6.If you have an emergency supply kit, what items do you have in your kit? Please select ALL that apply.

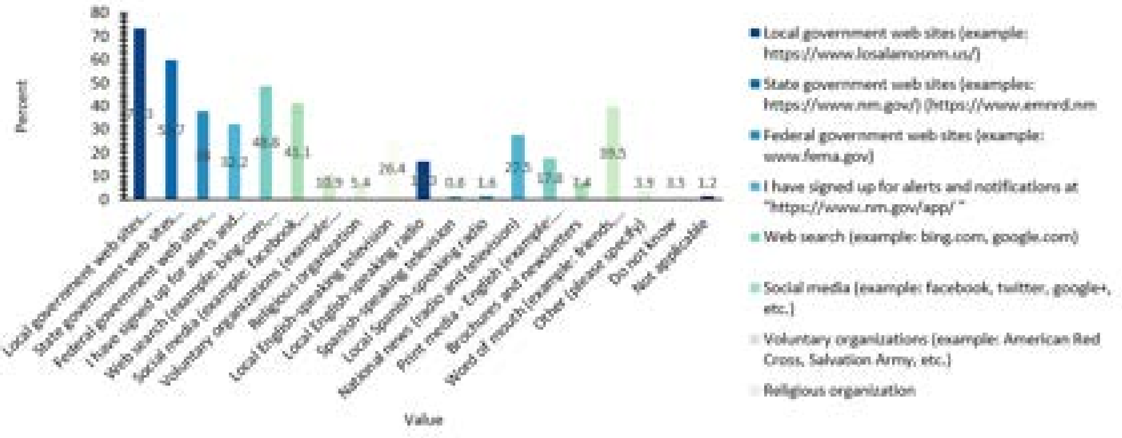


Value	Percent	Count
I do not have an emergency/disaster supply kit	50.8%	124
Water	36.1%	88
Food (nonperishable)	40.6%	99
Battery-powered or hand crank radio and a NOAA Weather Radio with tone alert	25.0%	61
Flashlight	46.7%	114
First aid kit	45.9%	112
Extra batteries	36.1%	88
Whistle (to signal for help)	25.8%	63
Dust mask (to help filter contaminated air)	28.7%	70
Plastic sheeting and duct tape (to shelter in place)	16.4%	40

Moist towelettes, garbage bags and plastic ties (for personal sanitation)	28.7%	70
Wrench or pliers (to turn off utilities)	29.9%	73
Manual can opener (for food)	33.6%	82
Local maps	16.8%	41
Cell phone with chargers and a backup battery	35.2%	86
Prescription medications	30.7%	75
Non-prescription medications such as pain relievers, anti-diarrhea medication, antacids or laxatives	32.8%	80
Prescription eyeglasses and contact lens solution	19.7%	48
Infant formula, bottles, diapers, wipes and diaper rash cream	2.5%	6
Pet food and extra water for your pet	23.0%	56
Cash or traveler's checks	27.9%	68
Important family documents such as copies of insurance policies, identification and bank account records saved electronically or in a waterproof, portable container	27.9%	68
Sleeping bag or warm blanket for each person	32.0%	78
Complete change of clothing appropriate for your climate and sturdy shoes	25.8%	63
Fire extinguisher	23.8%	58

Matches in a waterproof container	23.8%	58
Feminine supplies and personal hygiene items	13.5%	33
Mess kits, paper cups, plates, paper towels and plastic utensils	20.5%	50
Paper and pencil	25.0%	61
Books, games, puzzles or other activities for children	13.1%	32
Other (please specify)	7.0%	17

7.Please indicate where you go to obtain emergency and disaster related information? Please select ALL that apply.



Value	Percent	Count
Local government web sites (example: https://www.losalamosnm.us/)	73.3%	189
State government web sites (examples: https://www.nm.gov/) (https://www.emnrd.nm.gov/sfd/fire-prevention-programs/ready-set-go-new-mexico/) (https://nmfireinfo.com/)	59.7%	154
Federal government web sites (example: www.fema.gov)	38.0%	98
I have signed up for alerts and notifications at "https://www.nm.gov/app/ "	32.2%	83
Web search (example: bing.com, google.com)	48.8%	126
Social media (example: facebook, twitter, google+, etc.)	41.1%	106
Voluntary organizations (example: American Red Cross, Salvation Army, etc.)	10.9%	28

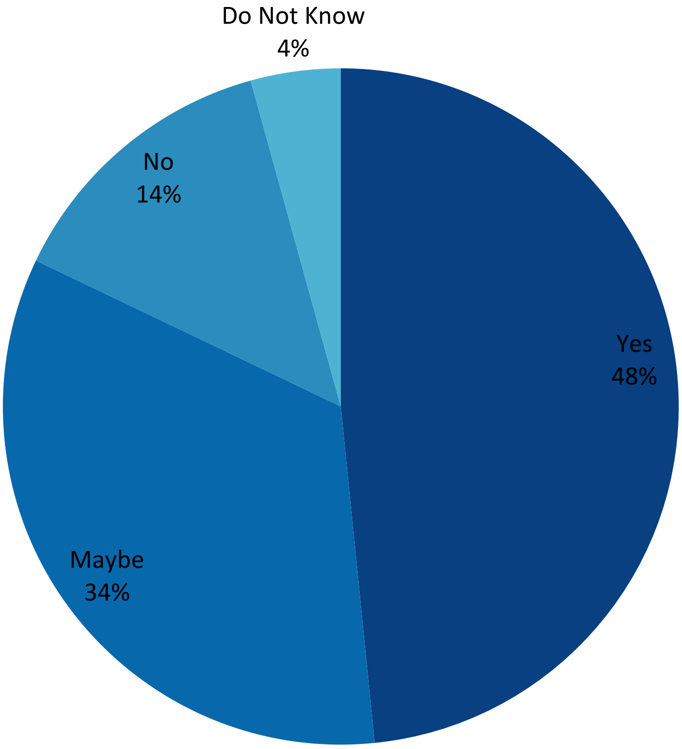
Religious organization	5.4%	14
Local English-speaking television	26.4%	68
Local English-speaking radio	16.3%	42
Spanish-speaking television	0.8%	2
Local Spanish-speaking radio	1.6%	4
National news (radio and television)	27.5%	71
Print media - English (example: newspapers)	17.8%	46
Brochures and newsletters	7.4%	19
Word of mouth (example: friends, family, co-workers)	39.5%	102
Other (please specify)	3.9%	10
Do not know	3.5%	9
Not applicable	1.2%	3

8.Would you agree or disagree with the following statements?

	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Do Not Know		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Los Alamos County is providing the services necessary to prepare me for a disaster.	25	9.6%	105	40.4%	72	27.7%	24	9.2%	9	3.5%	25	9.6%	260
I am familiar with Los Alamos County's web site (https://www.losalamosnm.us/) and can easily obtain information about emergencies and disasters.	46	17.8%	115	44.4%	51	19.7%	29	11.2%	7	2.7%	11	4.2%	259
During times of emergency, information is provided in a format I can understand.	48	18.6%	132	51.2%	46	17.8%	17	6.6%	4	1.6%	11	4.3%	258
I can easily obtain emergency information in times of crisis.	41	15.9%	123	47.7%	52	20.2%	26	10.1%	3	1.2%	13	5.0%	258

9.Please indicate how Los Alamos County can better assist you in preparing for emergencies and disasters (example: provide preparedness materials in my language).

10.If a disaster (i.e. snow storm) impacted Los Alamos County, knocking out electricity and running water, would your household be able to manage on its own for at least three (3) days?



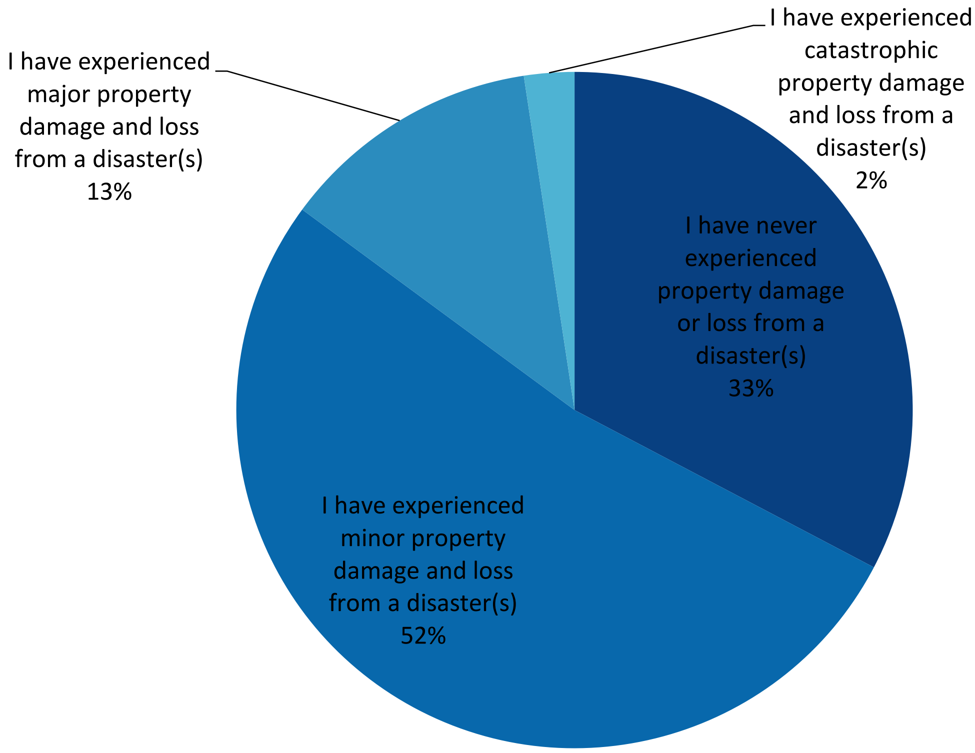
Value	Percent	Count
Yes	48.4%	125
Maybe	33.7%	87
No	13.6%	35
Do Not Know	4.3%	11
	Total	258

11.Do you believe that your household and/or place of business might ever be threatened by the following hazards? Please rate what hazards present the greatest risk.Low Risk = Low impact on threat to life and property damage Medium Risk = Medium impact on threat to life and property damage High Risk = High impact on threat to life and property damage

	Low Risk		Medium Risk		High Risk		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Dam Failure	156	64.5 %	11	4.5%	6	2.5%	69	28.5 %	242
Drought	36	14.9 %	79	32.6 %	119	49.2 %	8	3.3%	242
Earthquake	136	56.0 %	81	33.3 %	18	7.4%	8	3.3%	243
Floods: 100/500 Year	153	62.7 %	53	21.7 %	15	6.1%	23	9.4%	244
Floods: Localized Stormwater/Flash Flooding	111	45.9 %	85	35.1 %	36	14.9 %	10	4.1%	242
Landslides (includes Rockfall)	137	56.4 %	73	30.0 %	21	8.6%	12	4.9%	243
Severe Weather: High Winds (includes Straight Line Winds and Microbursts)	15	6.1%	110	44.9 %	118	48.2 %	2	0.8%	245
Severe Weather: Lightning	19	7.8%	109	44.5 %	115	46.9 %	2	0.8%	245
Severe Weather: Thunderstorms (includes Hail and Monsoon)	15	6.1%	96	39.2 %	133	54.3 %	1	0.4%	245

Severe Weather Winter Storm and Extreme Cold	19	7.7%	106	43.1 %	120	48.8 %	1	0.4%	246
Wildfire	8	3.3%	52	21.1 %	184	74.8 %	2	0.8%	246
Volcanoes	184	75.7 %	21	8.6%	9	3.7%	29	11.9 %	243

12.Please select the answer that best describes your experience.



Value	Percent	Count
I have never experienced property damage or loss from a disaster(s)	32.7%	81
I have experienced minor property damage and loss from a disaster(s)	52.4%	130
I have experienced major property damage and loss from a disaster(s)	12.5%	31
I have experienced catastrophic property damage and loss from a disaster(s)	2.4%	6
	Total	248

13.If you have experienced any damage(s) or injury(ies) from a disaster, please list the hazard(s) that caused the damages/losses and/or injuries (Example: flooding, wind, winter storm)

14.If you have experienced any damage(s) or injury(ies) from a disaster, please indicate where this occurred (Example: my home, on a roadway or intersection, at work, on vacation, etc.)

15.If you have experienced any damage(s) or injury(ies) from a disaster, please describe the damages and/or injuries. (Example: basement flooded, roof was damaged, vehicle was damaged, broken bones, lacerations, etc.)

16. Based on YOUR PERCEPTION of your jurisdiction's hazards, to what degree of emphasis would you expect your jurisdiction to mitigate the following hazards? Mitigation definition: The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. No Mitigation Needed = No mitigation on this hazard is expected or needed Low Priority = This hazard should be mitigated, but is not a high priority compared to other hazards Medium Priority = It is important to mitigate this hazard High Priority = It is a high priority to emphasize mitigation for this hazard

	No Mitigation Needed		Low Priority		Medium Priority		High Priority		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Dam Failure	133	55.4%	71	29.6%	24	10.0%	12	5.0%	240
Drought	21	8.7%	47	19.5%	81	33.6%	92	38.2%	241
Earthquake	71	29.8%	129	54.2%	33	13.9%	5	2.1%	238
Floods: 100/500 Year	71	29.8%	105	44.1%	52	21.8%	10	4.2%	238
Floods: Localized Stormwater/Flash Flooding	35	14.5%	63	26.1%	93	38.6%	50	20.7%	241
Landslides (including Rockfall)	34	14.0%	85	35.1%	80	33.1%	43	17.8%	242
Severe Weather: High Winds (includes Straight Line Winds and Microbursts)	15	6.1%	46	18.9%	93	38.1%	90	36.9%	244

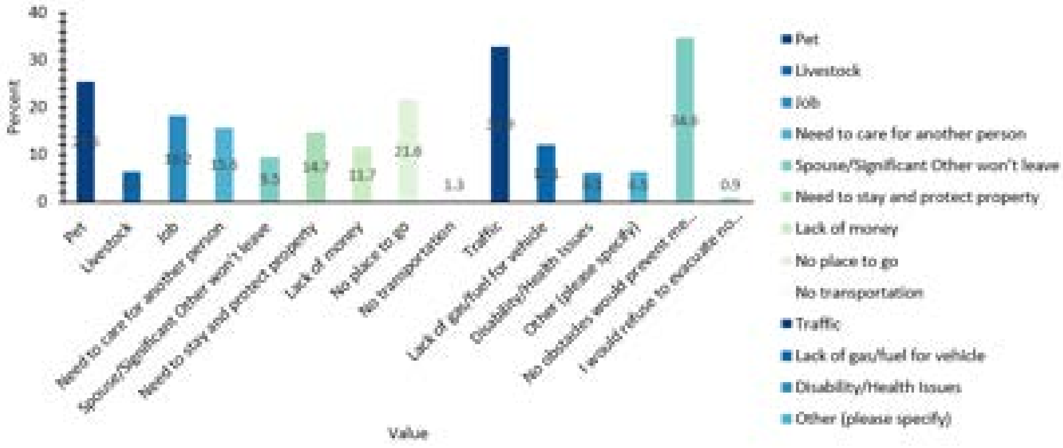
Severe Weather: Lightning	24	9.8%	64	26.2 %	88	36.1 %	68	27.9 %	244
Severe Weather: Thunderstorms (includes Hail and Monsoon)	22	9.1%	56	23.1 %	83	34.3 %	81	33.5 %	242
Severe Weather: Winter Storm and Extreme Cold	12	4.9%	45	18.4 %	99	40.6 %	88	36.1 %	244
Wildfire	3	1.2%	12	4.9%	34	14.0 %	194	79.8 %	243
Volcanoes	143	59.8 %	81	33.9 %	7	2.9%	8	3.3%	239

17.If an evacuation was ordered for your area, please indicate how likely you would be to do the following.

	Very Likely		Somewhat Likely		Not Very Likely		Not Likely at All		Do Not Know		Not Applicable		Responses
	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count	Row %	Count
Immediately evacuate as instructed.	141	58.5 %	51	21.2 %	27	11.2 %	16	6.6 %	4	1.7 %	2	0.8 %	241
I would first consult with family and friends outside my household before making a decision to evacuate.	59	25.3 %	73	31.3 %	40	17.2 %	51	21.9 %	2	0.9 %	8	3.4 %	233
Wait and see how bad the situation is going to be before deciding to evacuate.	43	18.5 %	54	23.3 %	59	25.4 %	66	28.4 %	4	1.7 %	6	2.6 %	232

Refuse to evacuate no matter what.	3	1.3 %	10	4.3 %	32	13.9 %	172	74.8 %	3	1.3 %	10	4.3 %	230

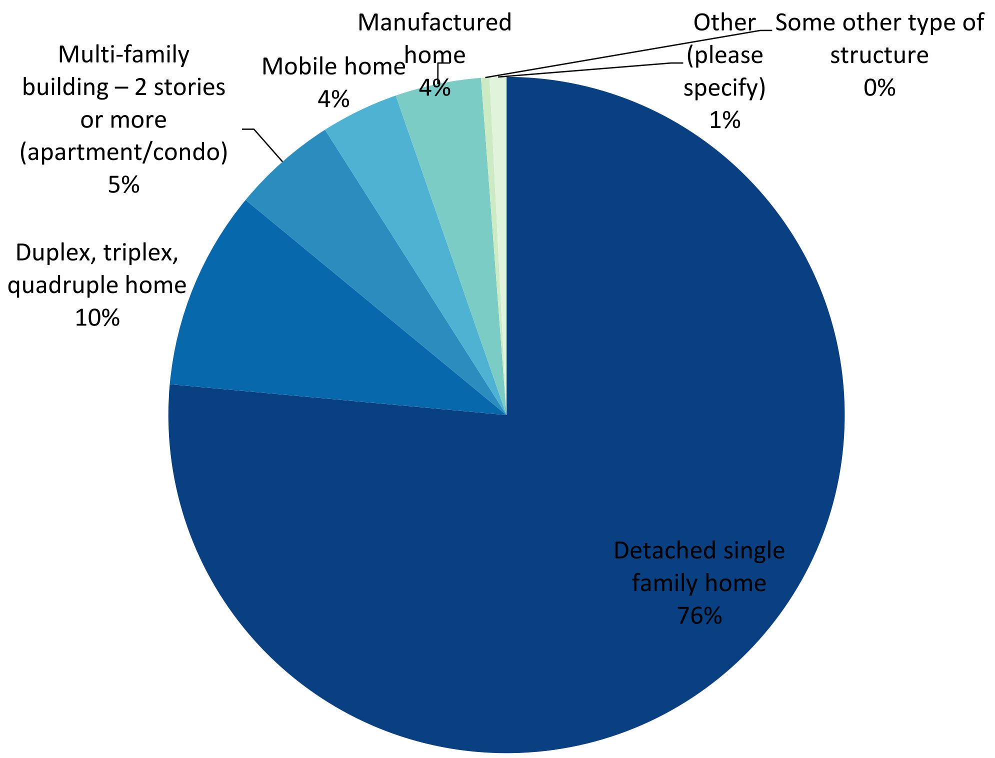
18.What might prevent you from leaving your place of residence if there was an evacuation order? Please select ALL that apply.



Value	Percent	Count
Pet	25.5%	59
Livestock	6.5%	15
Job	18.2%	42
Need to care for another person	15.6%	36
Spouse/Significant Other won't leave	9.5%	22
Need to stay and protect property	14.7%	34
Lack of money	11.7%	27
No place to go	21.6%	50
No transportation	1.3%	3
Traffic	32.9%	76
Lack of gas/fuel for vehicle	12.1%	28

Disability/Health Issues	6.1%	14
Other (please specify)	6.5%	15
No obstacles would prevent me from evacuating	34.6%	80
I would refuse to evacuate no matter what	0.9%	2

19.What type of structure do you live in?

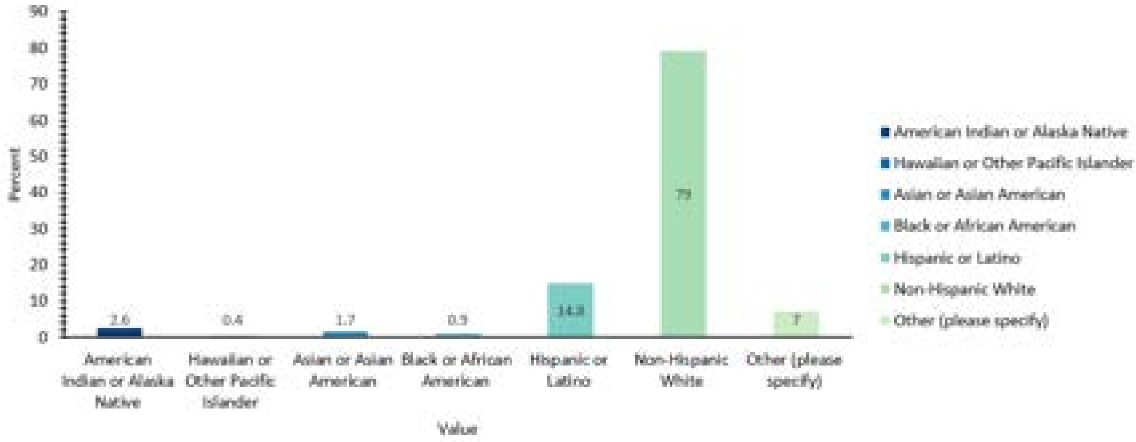


Value	Percent	Count
Detached single family home	76.3%	184
Duplex, triplex, quadruple home	9.5%	23
Multi-family building – 2 stories or more (apartment/condo)	5.0%	12
Mobile home	3.7%	9
Manufactured home	4.1%	10
Some other type of structure	0.4%	1
Other (please specify)	0.8%	2
	Total	241

20.How many persons, including yourself, are currently living in your household?

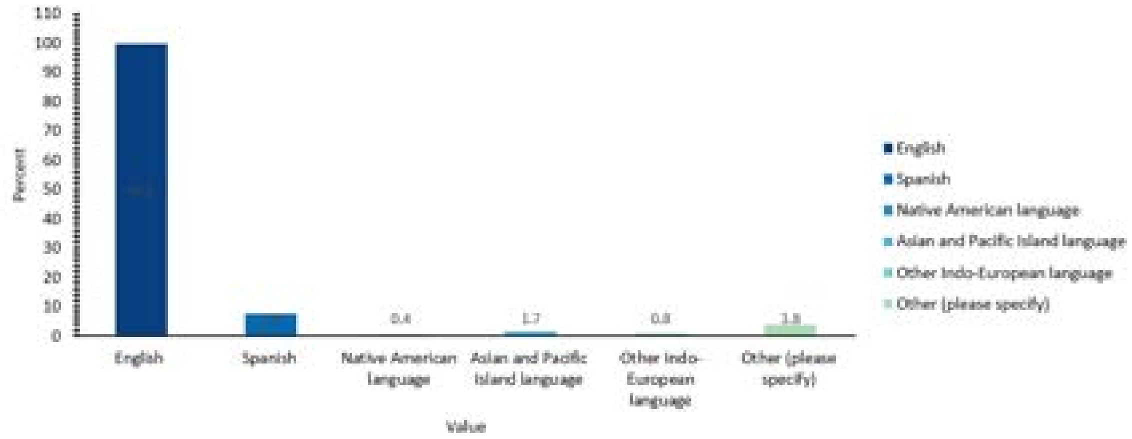
	Number of people in household		Responses
	Row %	Count	
Under age 5:	100.0%	97	97
Ages 6-10:	100.0%	97	97
Ages 11-19:	100.0%	105	105
Ages 20-44:	100.0%	134	134
Ages 45-64:	100.0%	160	160
Ages 65-79:	100.0%	125	125
Ages 80+	100.0%	91	91

21.Which of the following best describes your race/ethnicity? Please select ALL that apply.



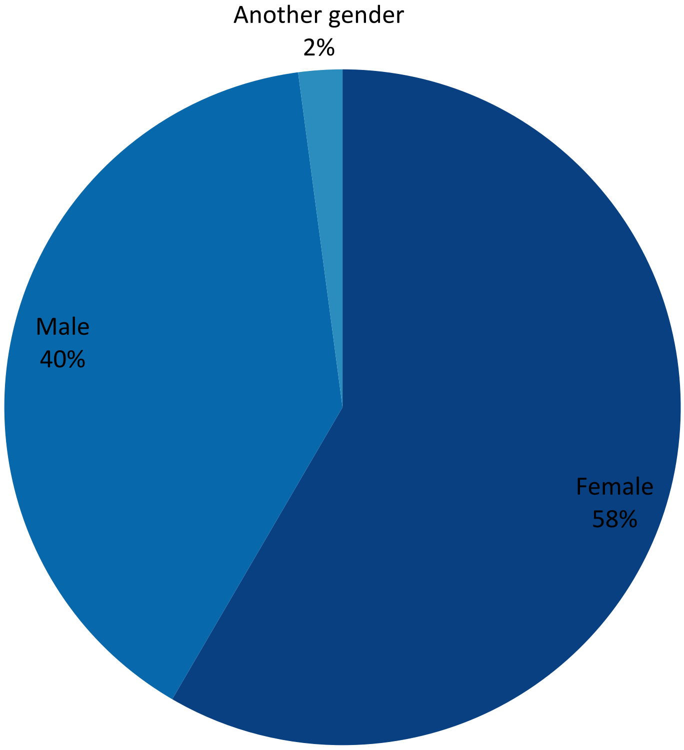
Value	Percent	Count
American Indian or Alaska Native	2.6%	6
Hawaiian or Other Pacific Islander	0.4%	1
Asian or Asian American	1.7%	4
Black or African American	0.9%	2
Hispanic or Latino	14.8%	34
Non-Hispanic White	79.0%	181
Other (please specify)	7.0%	16

22.Please indicate the language(s) spoken in your household. Please select ALL that apply.



Value	Percent	Count
English	99.6%	237
Spanish	7.6%	18
Native American language	0.4%	1
Asian and Pacific Island language	1.7%	4
Other Indo-European language	0.8%	2
Other (please specify)	3.8%	9

23.Please indicate your gender.



Value	Percent	Count
Female	58.4%	136
Male	39.5%	92
Another gender	2.1%	5
	Total	233

24.(OPTIONAL): If you would like someone to contact you regarding emergency preparedness in Los Alamos County, please leave your contact information below, and a representative will contact you. We will ensure your information is kept confidential.

Appendix B REFERENCES

Bohannan Huston for Los Alamos County (6 July, 2012) *Master Plan Drainage Report for Tract A-19-a White Rock, New Mexico.* Web. https://www.losalamosnm.us/projects/cdd/Documents/A-19-a%20Drainage%20Report.pdf

Federal Emergency Management Agency, Department of Homeland Security (March, 2013) *Local Mitigation Planning Handbook*. Web. http://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf

Federal Emergency Management Agency, Department of Homeland Security (August, 2001) *Understanding Your Risks—Identifying Hazards and Estimating Losses.* Web. http://www.fema.gov/media-library-data/20130726-1521-20490-4917/howto2.pdf

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Los Alamos County (November, 2004) *Los Alamos County Multi-Hazard Mitigation Plan.* Web. https://www.losalamosnm.us/emo/HazardousMitigationPlan/HAZMIT2004.pdf

Los Alamos County (24 July, 2015) *Parcel A-19-A Master Plan Study*. Web. https://www.losalamosnm.us/projects/cdd/Pages/A-19aMasterPlan.aspx

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Los Alamos County (Fiscal Year 2015) *Los Alamos County Snow and Ice Control Plan.* Web. https://www.losalamosnm.us/projects/publicworks/Documents/FY15%20Snow%20and%20Ice%20Control%20Plan.pdf

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Los Alamos National Laboratory (October, 2014) *Los Alamos National Laboratory Forest Management Plan.*

National Park Service (Spring, 2013) *Bandelier National Monument Fire Management Plan*. Web. http://parkplanning.nps.gov/projectHome.cfm?projectID=46051

State of New Mexico, Los Alamos County (2022) *Community Wildfire Protection Plan.*

State of New Mexico, Los Alamos County (July 18, 2011) *Flood Insurance Study.*

State of New Mexico (September, 2018) *New Mexico State Hazard Mitigation Plan.* Web. NM-HMP-Approved-Body-9-13-18-V2-low-res.pdf (nmdhsem.org)

URS Corporation for Los Alamos National Laboratory (25 May, 2007) *Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory – Update.*

URS Corporation for Los Alamos National Laboratory (4 December, 2009) *Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory – Update.*

LOS ALAMOS
where discoveries are made

Appendix C ADOPTION RESOLUTION

A model resolution is provided below:

Resolution # ______

Adopting the Los Alamos County Local Hazard Mitigation Plan

Whereas, Los Alamos County recognizes the threat that natural 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, Los Alamos County fully participated in the FEMA-prescribed mitigation planning process to prepare this local 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 Los Alamos County Local Hazard Mitigation Plan and approved it contingent upon this official adoption of the participating governing body;

Whereas, Los Alamos County desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the Los Alamos County Local Hazard Mitigation Plan;

Whereas, adoption by the Los Alamos County Council demonstrates the County's commitment to fulfilling the mitigation goals and objectives outlined in this Local 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 Council adopts the Los Alamos County Local Hazard Mitigation Plan as an official plan; and

Be it further resolved, Los Alamos 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)

____
Certifying Official