DOE-EA-1329

Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory, Los Alamos, New Mexico

Final Document

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ACRONYMS AND TERMS

ac	acres
AEI	area of environmental interest
BNM	Bandelier National Monument
C	Celsius
CFR	Code of Federal Regulations
cm	centimeters
dbh	diameter breast height
DOE	(U.S.) Department of Energy
DOI	(U.S.) Department of Interior
DU	depleted uranium
EA	environmental assessment
EIS	environmental impact statement
ER	Environmental Restoration (Project)
F	Fahrenheit
FR	Federal Register
ft	feet
ft^2	square feet
FY	fiscal year
GIS	geographical information system
h	hour
ha	hectares
HE	high explosives
HMP	Habitat Management Plan
in.	inches
IWMT	Interagency Wildfire Management Team
kg	kilograms
km	kilometers
km^2	square kilometers
kmph	kilometers per hour
LANL	Los Alamos National Laboratory
LCFs	latent cancer fatalities
m	meters
M	million
m^2	square meters
m^3	cubic meters
MAP	mitigation action plan
mi	miles
mi^2	square miles
mph	miles per hour
mrem	millirem
NEPA	*National Environmental Policy Act*
NHPA	*National Historic Preservation Act*
NMAC	New Mexico Administrative Code 2.60
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PM	particulate matter
PM-10	particulate matter smaller than 10 microns in diameter
PRSs	potential release sites
RCRA	*Resource Conservation and Recovery Act*
ROC	region of concern
SASEM	Simple Approach Smoke Estimation Model
SFNF	Santa Fe National Forest
SWEIS	Site-Wide Environmental Impact Statement
SWPP	Storm Water Pollution Prevention (Plan)
t	metric ton
TA	technical area (at LANL)
TCPs	traditional cultural properties
ton	short ton
UC	University of California
$\mu g/m^3$	micrograms per cubic meter
U.S.	United States
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
yr	year

EXPONENTIAL NOTATION: Many values in the text and tables of this document are expressed in exponential notation. An exponent is the power to which the expression, or number, is raised. This form of notation is used to conserve space and to focus attention on comparisons of the order of magnitude of the numbers (see examples):

1×10^{4}	=	10,000
1×10^{2}	=	100
1×10^{0}	=	1
1×10^{-2}	=	0.01
1×10^{-4}	=	0.0001

Metric Conversions Used in this Document

Multiply	By	To Obtain
Length		
inch (in.)	2.50	centimeters (cm)
feet (ft)	0.30	meters (m)
yards (yd)	0.91	meters (m)
miles (mi)	1.61	kilometers (km)
Area		
acres (ac)	0.40	hectares (ha)
square feet (ft^2)	0.09	square meters (m^2)
square yards (yd^2)	0.84	square meters (m^2)
square miles (mi^2)	2.59	square kilometers (km^2)
Volume		
gallons (gal.)	3.79	liters (L)
cubic feet (ft^3)	0.03	cubic meters (m^3)
cubic yards (yd^3)	0.76	cubic meters (m^3)
Weight		
ounces (oz)	29.60	milliliters (ml)
pounds (lb)	0.45	kilograms (kg)
short ton (ton)	0.91	metric ton (t)

EXECUTIVE SUMMARY

Five major wildfires have ignited within the local area outside the boundaries of Los Alamos National Laboratory (LANL) over the past 50 years. In 1954, a wind-driven wildfire known as the Water Canyon Fire, burned about 3,000 acres (ac) (1,200 hectares [ha]) adjacent to the western boundary of LANL and raged over a period of several days. In the 1977 La Mesa Fire, about 15,300 ac (6,120 ha) of forest burned, including about 2,500 ac (1,000 ha) within LANL located near high explosive bunkers and other key facilities. Flame lengths exceeding 200 feet (ft) (60 meters [m]) and rates of spread over 2,300 ft per hour (690 m per hour) were observed in that wildfire, which was finally contained on the fifth day. In 1996, the Dome Fire exploded and grew from 300 ac (120 ha) consumed in the first day to over 6,000 ac (2,400 ha) on the second day. About 16,000 ac (6,400 ha) of forests near LANL were burned before this wildfire was finally contained. In 1998, the Oso Fire burned about 5,300 ac (2,120 ha) to the north of LANL and the Los Alamos townsite. In May 2000, the Cerro Grande Fire burned approximately 43,000 ac (17,200 ha) of land, of which approximately 7,500 ac (3,000 ha) were located within the LANL boundaries (BAER 2000). This fire burned acreage in Bandelier National Monument (BNM), Santa Fe National Forest (SFNF), Los Alamos County, San Ildefonso and Santa Clara Pueblos, the Baca Ranch, and other small private holdings, causing the evacuation of over 20,000 people and the loss of over 230 private residences.

In general, most buildings, structures, and utilities at LANL are susceptible to wildfire damage because of the extreme density of the existing tree stands; the type of trees that grow in the forests; the continuity of surface vegetation such as grasses, herbs, and shrubs; the abundance of downed, dead trees; the proximity of the forest to the various buildings and structures where operations and employees are housed; the occurrence of unfavorable climatic conditions (including the high incidence of lightning strikes) at least once a year; and the proximity of forests at LANL to both SFNF lands and BNM lands where public recreation, including camping and campfires, is usually allowed except under extreme conditions (and even then can occur).

As stated in the *Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory*, the potential for regional and local wildfires poses a substantial risk to the current operational capabilities that ensure mission requirements are met at LANL (DOE 1999a). Furthermore, as a federal government agency and steward of the natural resources that are included within the boundaries of LANL, the United States Department of Energy has a statutory obligation to protect and contribute to the sustainable and ecologically healthy condition of these resources. Consequently, there is a defined need to (1) reduce the risk of damage and injury to property, human life and health, and biological resources at LANL from high-intensity wildfires and (2) enhance forest health at LANL.

The Proposed Action (the No Burn Alternative) would consist of implementing a Wildfire Hazard Reduction and Forest Health Improvement Program at LANL that would not use fire as a treatment measure. This ecosystem-based management program would initially be composed of a series of individual, small-scale projects using mechanical and manual thinning methods that would be conducted over about 10 years with ongoing, long-term maintenance projects conducted thereafter. These carefully planned initial projects would be conducted to bring the forests at LANL to the desired end-state for wildfire risk followed by an on-going maintenance program to maintain the forests in this desired state with enhancements to improve overall forest health. An estimated 35 percent, approximately 10,000 ac (4,000 ha), of LANL would be treated

under this program using forest thinning and the construction of access roads and fuel breaks as treatment measures. Wood materials generated by the treatment measures would be either donated or salvaged; waste wood materials (slash[1]) would primarily be disposed of through chipping and used as mulch on-site. Wood contaminated by depleted uranium could be disposed of at Technical Area 54, Area G.

The Limited Burn Alternative (Forest Waste Only)would be similar to the Proposed Action in terms of planning, implementation, and the spectrum of available treatment measures. This alternative would allow limited burning for slash pile disposal with burns conducted only under controlled weather conditions and with strict on-site suppression resources (fire trucks, personnel, etc.).

The Burn Alternative (Both Treatment and Forest Waste) would be similar to the Proposed Action but initial treatment measures and long-term maintenance treatment measures would be expanded to include the use of carefully controlled burns to reduce ground fuels, and would include the burning of slash waste piles produced by tree thinning treatments. Ten thousand ac (4,000 ha) would be treated under this alternative. Under this alternative, controlled burning would primarily be used as a maintenance tool to remove forest litter (such as leaves and pine needles) and seeding tree growth. Controlled burning involves the use of fire under both controlled and selected conditions. Only where site conditions are favorable would controlled burning be used as a primary treatment measure.

Under the No Action Alternative, the fuels inventory would continue to increase unless and until it was consumed in a wildfire or decayed in place. There would be very limited mechanical and manual tree cutting (only within a 100-ft [30-m] area next to structures, roads, and parking facilities as required by general "good housekeeping" practices) with minimal associated slash disposal by chipping.

Various additional alternative methods of achieving fuel load reduction were considered for implementation but dismissed as being unreasonable within the context of the *National Environmental Policy Act of 1969*. Reasonable alternatives address the purpose and need for action and include those that are practicable or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant (46 Federal Register [FR] 18026, March 23, 1981, as amended, 51 FR 15618, April 25, 1986).

No long-term adverse effects are expected to occur from implementing the Proposed Action, the Limited Burn, or Burn Alternatives. The Proposed Action and the alternatives are not expected to have short- or long-term adverse effects on air quality, visual resources, water quality, soil erosion, cultural resources, waste management, human health, socioeconomics, or utilities and infrastructure at LANL. Only biological resources may be affected by the Proposed Action or the Limited Burn and Burn Alternatives. These alternatives would have a long-term beneficial effect on a variety of resources at LANL. Correspondingly, there would be long-term beneficial contributions to any cumulative effects on resources resulting from actions at LANL or by surrounding land managers. The No Action Alternative would not reduce the risk of catastrophic wildfire that could have a serious adverse local or cumulative effect on resources at or in the vicinity of LANL.

[1] Slash is defined here to include small limbs, branches, and miscellaneous pieces of wood.

1.0 PURPOSE AND NEED

1.1 Introduction

The *National Environmental Policy Act of 1969* (NEPA) requires federal agency officials to consider the environmental consequences of their proposed actions before decisions are made. In complying with NEPA, the United States (U.S.) Department of Energy (DOE) follows the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] 1500-1508) and DOE's own NEPA implementing procedures (10 CFR 1021). The purpose of an environmental assessment (EA) is to provide federal decision makers with sufficient evidence and analysis to determine whether to prepare an environmental impact statement (EIS) or issue a Finding of No Significant Impact. This EA has been prepared to assess environmental consequences resulting from the implementation of a selected forest practices program within the boundaries of Los Alamos National Laboratory (LANL) (Figure 1). LANL is a federal facility comprised of 43 square miles (mi^2) (111 square kilometers [km^2]) administered by DOE. This selected forest practices program, depending upon the alternative action implemented, could embrace several different forest management elements including mechanical thinning of trees, use of controlled burns, and the construction of new access roads and fuel breaks.

The objectives of this EA are to (1) describe the underlying purpose and need for DOE action; (2) describe the Proposed Action and identify and describe any reasonable alternatives that satisfy the purpose and need for Agency Action; (3) describe baseline environmental conditions at LANL; (4) analyze the potential indirect, direct, and cumulative effects to the existing environment from implementation of the Proposed Action, and (5) compare the effects of the Proposed Action with the No Action Alternative and other reasonable alternatives. Reasonable alternatives are those that meet DOE's purpose and need for action by virtue of timeliness, appropriate technology, and applicability to LANL. In addition, the EA process provides DOE with environmental information that can be used in developing mitigative actions, if necessary, to minimize or avoid adverse effects to the quality of the human environment and natural ecosystems should DOE decide to proceed with implementing the elements of the selected forest practices program. Ultimately, the goal of NEPA and this EA is to aid DOE officials in making decisions based on an understanding of environmental consequences and taking actions that protect, restore, and enhance the environment.

1.2 Background

LANL is located in north-central New Mexico (Figure 1) in a region characterized by forested areas with mountains, canyons, and valleys, as well as diverse cultures and ecosystems. It is located on the Pajarito Plateau, a volcanic shelf on the eastern slope of the Jemez Mountains at an approximate elevation of 7,000 ft (2,100 m). The Pajarito Plateau is dissected by 13 steeply sloped and deeply eroded canyons that have formed isolated finger-like mesas oriented in a west to east direction.

LANL was originally established in 1943 as "Project Y" of the Manhattan Project with a single-focused national defense mission. Before World War II, the Los Alamos area consisted of small ranches and farms interspersed among extensive forest and meadow areas that covered the eastern flanks of the Pajarito Plateau. Fewer than 200 people populated the LANL area. During

FIGURE 1—*Location of Los Alamos National Laboratory (LANL).*

World War II, nearly 3,000 people, including civilian and military personnel, worked at the Project Y Facility and many resided in the Los Alamos townsite.

After World War II ended, the Project Y Facility was designated a permanent research and development laboratory (known first as the Los Alamos Scientific Laboratory, it acquired the LANL name in the 1980s) and its mission was expanded to incorporate a wide variety of new mission assignments in support of the federal government. The federal government agency with administrative responsibility for LANL has evolved from the post-World War II Atomic Energy Commission, to the Energy Research and Development Administration, and finally to the DOE.

About 1,850 buildings and a variety of other structures have been constructed within LANL and are now operated in support of DOE's diverse missions. These buildings and structures are worth billions of dollars and are occupied by about 12,000 employees (both of the University of California [UC], which is the current LANL Management and Operating Contractor, and of various sub-contractors to UC). The majority of buildings and structures are concentrated in the general vicinity of Technical Area (TA) 3 together with about one-half of the site's employees. However, there are 49 TAs within LANL boundaries (Figure 2). Much of LANL is restricted to public access and the majority of total acreage is relatively undeveloped land covered with native vegetation. This undeveloped land typically provides security and safety buffer areas for operations at LANL.

Six major vegetation zones are present over the Pajarito Plateau in the region of LANL: montane grasslands (above 9,500 ft [2,850 m]), spruce-fir[2] forest (above 9,500 ft [2,850 m]), conifer forest mixed with aspen forest (between 9,500 and 7,500 ft [2,850 and 2,250 m]), ponderosa pine forest (between 7,500 and 6,900 ft [2,250 and 2,070 m]), piñon-juniper woodland (between 6,900 and 6,200 ft [2,070 and 1,860 m]), and juniper savannah (between 6,200 and 5,200 ft [1,860 and 1,560 m]). In addition, there are grasslands at lower elevations. Of these six vegetation zones, most of LANL is covered by ponderosa pine forest and piñon-juniper woodland which, respectively, trend from the west to the east across the facility (Figure 3). Land to the west of LANL is administered by the U.S. Department of Agriculture, Forest Service, Santa Fe National Forest (SFNF) and is covered mostly by spruce-fir forest and mixed conifer forest. Land to the south is administered by the U.S. Department of the Interior (DOI), National Park Service, Bandelier National Monument (BNM) and is covered mostly by piñon-juniper woodland and ponderosa pine forest. Most of the land to the east of LANL is administered by BNM, DOI (in trust for San Ildefonso Pueblo), and SFNF, and is covered mostly by piñon-juniper woodland and juniper savannah habitat. The small communities of White Rock and Pajarito Acres, which are home to about 8,000 people, are sandwiched in between the eastern end of LANL and the Rio Grande. Land to the north of LANL is occupied by the Los Alamos townsite, which is home to about 10,000 people and, beyond the townsite, lies more of SFNF.

Most of the land in the Jemez Mountains is administered by the federal government and has been and is currently managed for its forest products, livestock grazing, public outdoor recreation, and cultural resources preservation. Overgrazing practices were employed across the Jemez Mountains in the 19th century, including the LANL area, such that by 1893 widespread fire occurrence in the area had ceased (USFS 1998). The generally high-frequency, low-intensity

[2] Scientific names of each plant species are presented in the Appendix of this document.

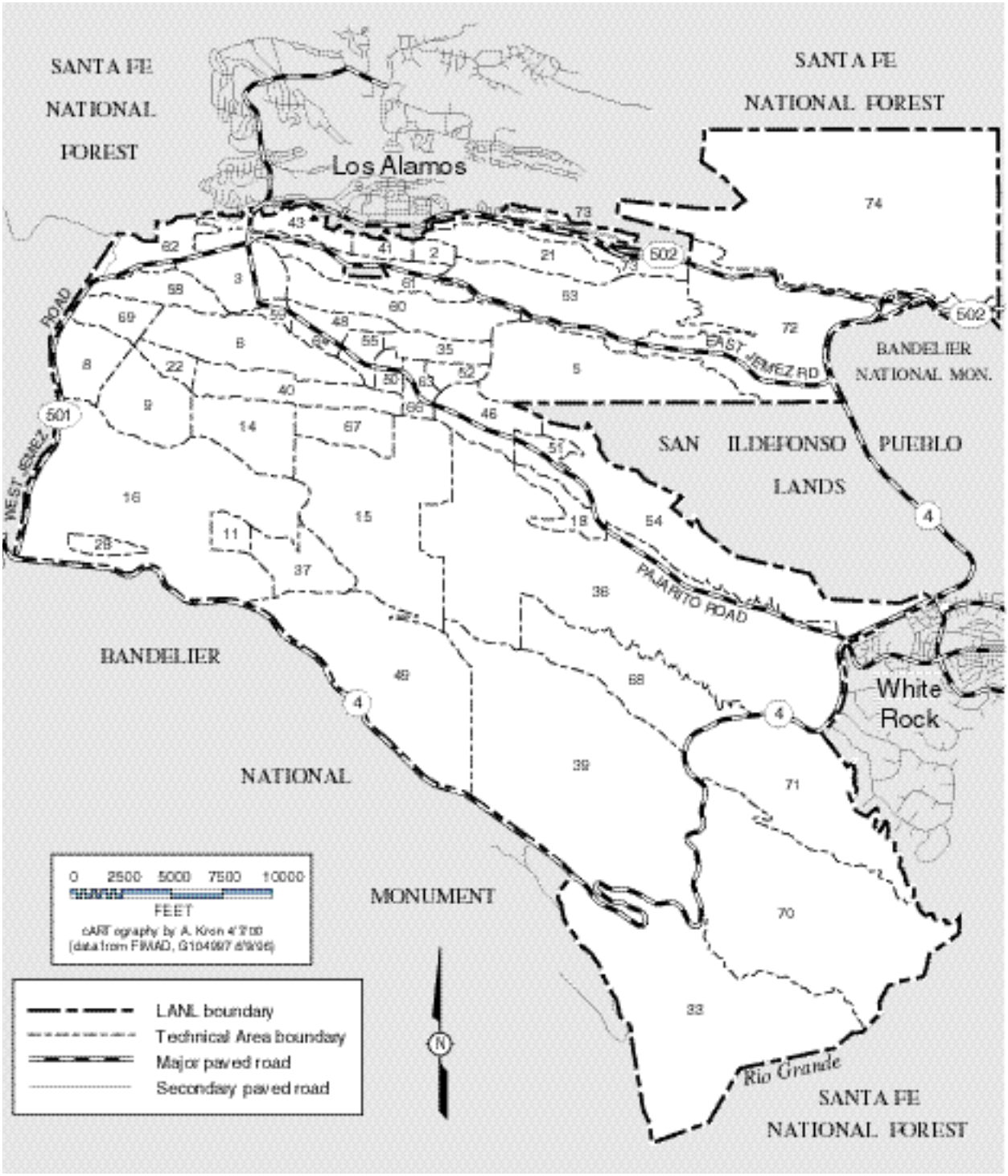

FIGURE 2—*Los Alamos National Laboratory Technical Areas.*

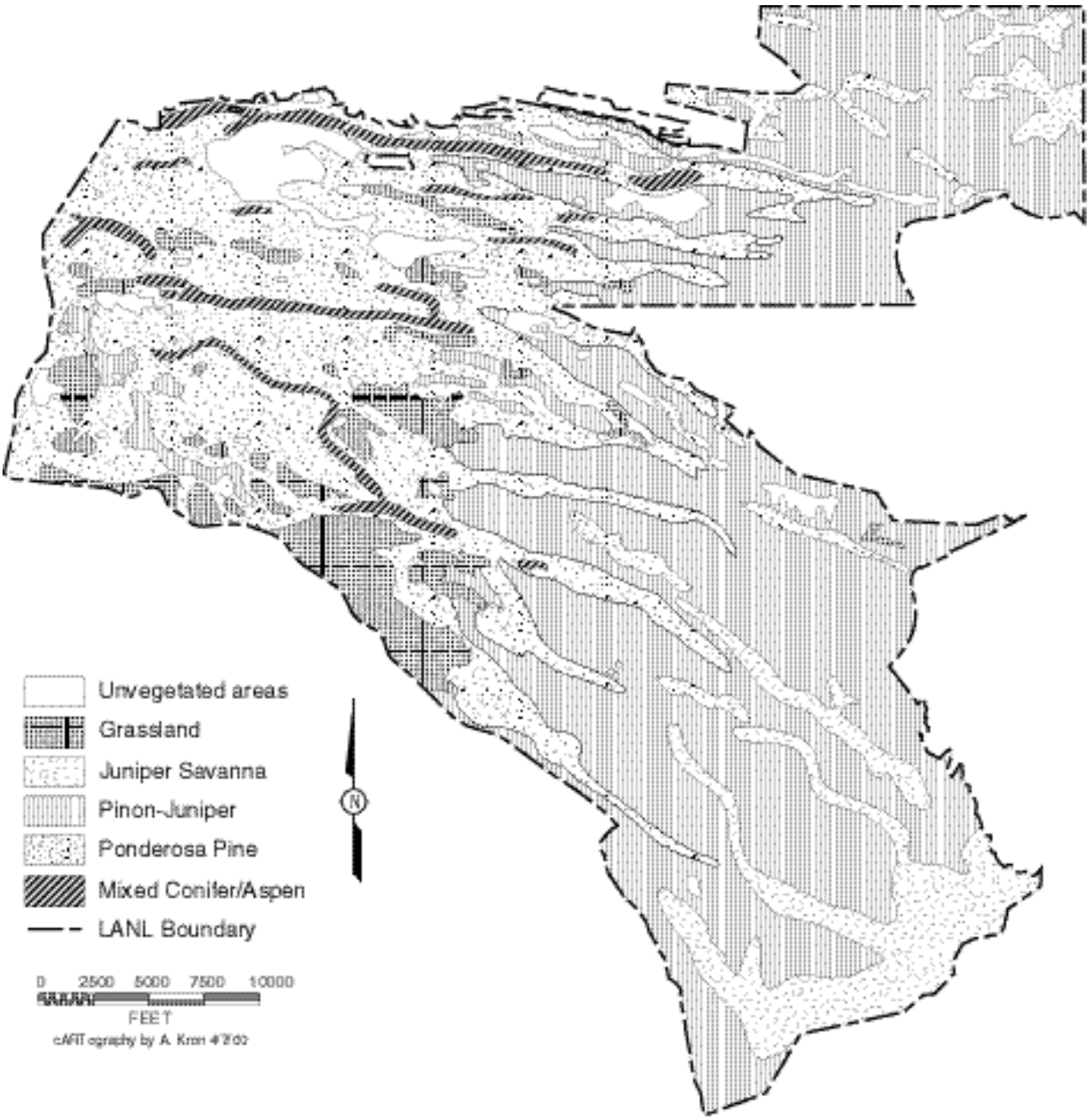

FIGURE 3—*Dominant Vegetation Zones at LANL.*

surface wildfires[3] common to the area previously were likely suppressed as a function of the reduction of the continuity and the quantity of herbaceous fine fuels (such as grasses and broadleaf plants) (USFS 1998). Before the 1890s, surface fires in the ponderosa pine forests covering the middle and upper portions of the Pajarito Plateau were a part of the natural environment with a fire return interval of between 5 and 15 years (Allen 1989). Mixed conifer forest areas had a fire return interval of about 10 years, while patches of aspen within the mixed forests experienced crown fires[4] at various return frequencies before the 1900s (USFS 1998). Spruce-fir forests probably experienced high-intensity fires at mean intervals of over 150 years (Allen 1989). Frequent surface fires favor a grassy understory. They also keep the tree density down and surface fuel accumulation in check (USFS 1998). Clearing by homesteaders around the LANL area further reduced area vegetation. Commercial logging in the Jemez Mountains began in 1897 and continued until 1980. The majority of the cutting at and around LANL selectively removed the larger, and incidentally, more fire resistant trees. At the same time this practice encouraged the establishment of shade-tolerant and fire-intolerant (such as mixed conifers) species of trees (USFS 1998).

Land management practices employed by the various land stewards in the vicinity of LANL along the eastern flank of the Pajarito Plateau during the last half of the 20th century have created heavily forested areas. These densely forested areas are much different from the vegetation common to the region in earlier times. The overall land management practices near LANL during the last half of the 20th century were characterized by severe reductions in cattle grazing and timber cutting in the area, and by artificial (institutionalized) fire suppression. These practices were encouraged in part by the sudden sharp increase in the human population of the area and the presence of extremely valuable buildings and structures at LANL. Today a total of about 23,000 people work and live in Los Alamos County.

In addition to land management changes from the 19th through the 20th centuries in the LANL area, climate variations have also affected vegetation cover. Usual precipitation along the Pajarito Plateau ranges from about 12 inches (in.) (30 centimeters [cm]) to about 36 in. (90 cm). A dry spell with high fire danger usually occurs from late April through the end of June. About 35 percent of the annual precipitation falls during the months of July and August at LANL. An average of 62 thunderstorm days occur between June and September of each year. The Jemez Mountains experience one of the higher levels of lightning activity in the western U.S. resulting in a high frequency of lightning-initiated fires.

Tree ring studies combined with climatological information of the Jemez Mountains area have indicated that a large inter-annual precipitation variability has existed over the past several thousand years. This variability is related to periodic El Niño events bringing wetter springs and summers to the southwestern United States about every 3 to 5 years. Clusters of drought years during the 20th century were from 1932 to 1938; 1942 to 1943; and extreme drought from 1950 to 1951 and 1953 through 1956. The last 20 years have been wetter than any time since 136 B.C.

[3] A surface fire spreads across the forest floor, burning grasses and debris, only occasionally igniting an individual tree. Surface fires, while hot, generally do not burn deeply into the soil and are more easily suppressed than other more consumptive fires.

[4] A crown fire is a catastrophic fire that spreads quickly through the crowns of trees in dense forests. Crown fires are very hot, burn deeply into the soil, and are very dangerous and expensive to suppress.

in the Jemez Mountains, including the Los Alamos area (USFS 1998). However, the most recent years have been characterized by very dry winter and spring seasons.

The most obvious effects of area land management practices and climate on LANL area forests have been an increase in overall tree stand densities, continuity, and fuel loading on the ground with a decrease in the understory cover that now characterize the vegetation present at the start of the 21st century. Today's heavily forested areas within and surrounding LANL are generally overgrown with dense stands of unhealthy trees and excessive amounts of standing and fallen dead tree material. Forested areas with these conditions, coupled with the joint probability of unfavorable weather conditions, present an extreme hazard to nearby communities and properties as the danger of high-intensity wildfires is greatly enhanced. Given the terrain of the Pajarito Plateau, namely numerous narrow, finger-like mesas separated by deep west-to-east oriented canyons, institutionalized fire suppression of high-intensity wildfires is very difficult, particularly within the canyon reaches. Additionally, these same conditions have limited the number of roadways that could be used by the area population as escape routes, which enhances the potential for increased harm to property and human life under extreme conditions.

Five major wildfires and innumerable smaller wildfires have ignited within the local area outside the boundaries of LANL over the past 50 years (Figure 4). In 1954, a wind-driven wildfire known as the Water Canyon Fire, burned about 3,000 ac (1,200 ha) adjacent to the western boundary of LANL and raged over a period of several days. In the 1977 La Mesa Fire, about 15,300 ac (6,120 ha) of forest burned, including about 2,500 ac (1,000 ha) within LANL located near high explosives (HE) bunkers and other key facilities. Flame lengths exceeding 200 ft (60 m) and rates of spread over 2,300 ft per hour (690 m per hour) were observed in that wildfire, which was finally contained on the fifth day. In 1996, the Dome Fire exploded and grew from 300 ac (120 ha) consumed in the first day to over 6,000 ac (2,400 ha) on the second day. About 16,000 ac (6,400 ha) of forests near LANL were burned before this wildfire was finally contained. In 1998, the Oso Fire burned about 5,300 ac (2,120 ha) to the north of LANL and the Los Alamos townsite. In May 2000, the Cerro Grande Fire burned approximately 43,000 ac (17,200 ha) of land, of which about 7,500 ac (3,000 ha) were located within the boundaries of LANL (Figure 5). The remainder of burned land was located within BNM, the SFNF, Los Alamos County, San Ildefonso and Santa Clara Pueblos, the Baca Ranch, and other small private holdings (BAER 2000). Over 230 private residences were burned in the Los Alamos townsite; over 20,000 people evacuated their homes in the Los Alamos townsite, White Rock community, Santa Clara Pueblo, and the nearby town of Española. In each of these five fires the weather changed to permit the fire to be controlled; no major damage to LANL structures and operations resulted from any of these five fires, although some 20 to 30 portable units, small sheds, and vehicles were burned within the boundaries of LANL, and UC has experienced over two months of lost productivity as a result of the Cerro Grande Fire and subsequent recovery actions. These wildfires, especially the Cerro Grande Fire, made it apparent that a wildfire could wreak catastrophic damage upon everything in its path.

Recovery and rehabilitation efforts conducted by DOE at LANL on an emergency basis as a result of the Cerro Grande Fire from May through November 2000 focus only on the removal of trees cut during the undertaking of fire suppression measures that were not consumed in the fire; the cutting and removal of individual damaged or dead trees around buildings, structures, trails, drainages, roads, and other places where they might present a human health or property hazard;

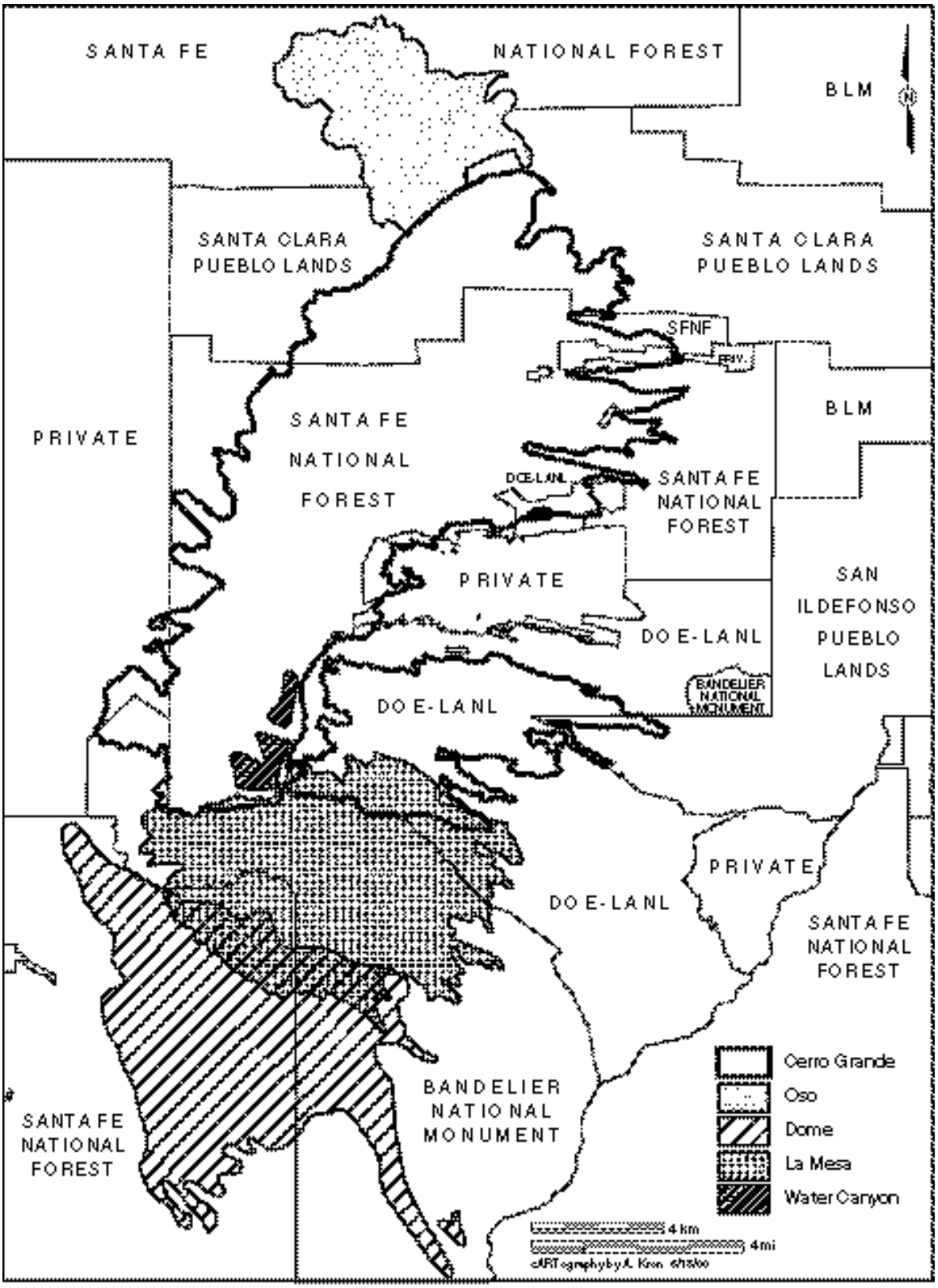

FIGURE 4—*Locations of Five Major Wildfires in the Los Alamos National Laboratory Region in the Past 50 Years (locations and areas of fires on this map are approximate).*

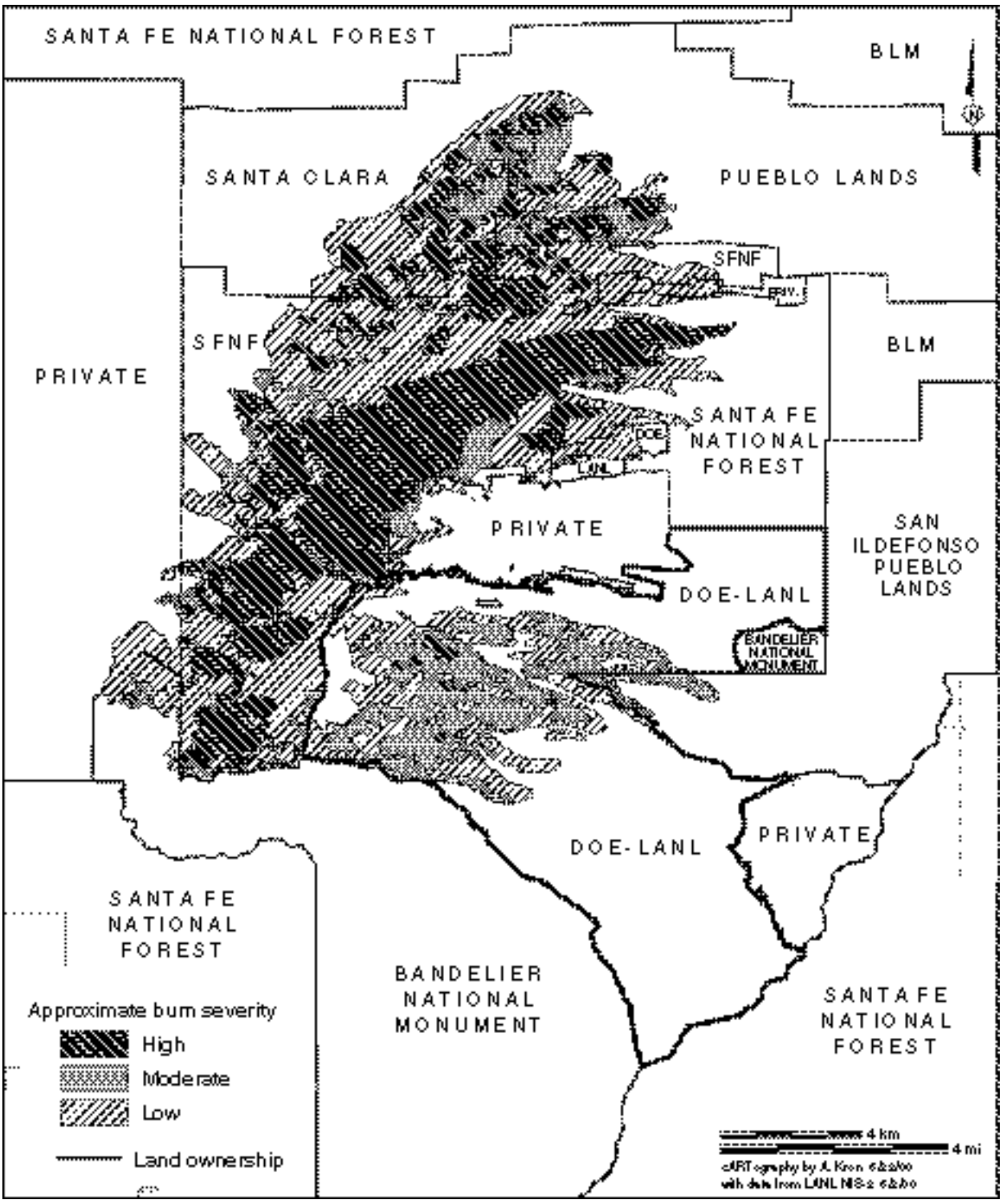

FIGURE 5—*The Cerro Grande Fire Burn Severity.*

the cutting of damaged or dead trees for use on slopes for erosion and flood controls; and the cutting and removal of trees as needed for the installation of flood hazard controls (such as storm water retention structures and weirs). These actions will not significantly reduce the amount of forest fuels present over LANL.

Although the Cerro Grande Fire burned over almost 7,500 ac (3,000 ha) of forest within the boundaries of LANL, the forest burned in a mosaic pattern (BAER 2000) (additional detail about the current environmental setting at LANL is presented later in Chapter 3 of this EA). Most acreage at LANL burned with a low burn severity, with only small areas of high burn severity and moderate burn severity. The majority of buildings, structures, and utilities are still susceptible to wildfire damage because of the extreme density of the tree stands at LANL; the species of trees that grow in the forests at LANL; the remaining and projected return of continuity of surface vegetation such as grasses, herbs, and shrubs; the increased abundance of standing and downed, dead trees; the proximity of the forest to the various buildings and structures where operations and employees are housed; the occurrence of unfavorable climatic conditions (including the high incidence of lightning strikes) at least once a year; and the proximity of forests at LANL to both SFNF lands and BNM lands where public recreation, including camping and campfires, are usually allowed (except under extreme conditions, and even then can occur).

In 1996, the regional Interagency Wildfire Management Team (IWMT) was formed by DOE for the purpose of providing fire control advice and an exchange of expertise and information among the land stewards in the East Jemez region. The IWMT efforts have fostered consultations between agencies and resulted in the development of information for evaluating the nature of the wildfire problem and for proposing optimal mitigation strategies. During the past several years, DOE, in coordination with the IWMT, has evaluated forest conditions within LANL and has identified several projects to consider for the reduction of fire hazard surrounding key operations and buildings and to increase wildfire response and suppression capabilities.

In conducting the analyses for the LANL *Site-Wide Environmental Impact Statement* (SWEIS) (DOE 1999a), DOE evaluated an accident scenario from a hypothetical catastrophic wildfire that was initiated on land adjacent to LANL and spread into LANL. The analysis, which closely mirrored the actual Cerro Grande Fire, concluded that a catastrophic wildfire engulfing buildings and materials used to perform operations was credible and likely to occur. The calculated probability for this scenario is in the order of 1 in every 10 years (0.1 per year); the conditions for occurrence exist at least once every year. While the Cerro Grande Fire and subsequent forest rehabilitation and flood control efforts have slightly reduced the probability of catastrophic wildlife at LANL over the next year or two, the amount of standing and downed fuel within the LANL boundaries has only slightly been decreased. With the return of next season's vegetation growth the probability of such a repeat fire event will rise again. (See BAER 2000, and the DOE Federal Register Notice (DOE 2000a) of Emergency Activities Conducted at LANL (65 FR 120) for information regarding actions being undertaken by the DOE in response to the Cerro Grande Fire and subsequent enhanced flooding risks, as well as the DOE's alternative arrangements for compliance with NEPA pursuant to the Council on Environmental Quality's NEPA implementing regulations (40 CFR 1506.11).) Therefore, the current and future risks of catastrophic wildfires at LANL can only be lessened through purposeful environmental

intervention and active changes to land management practices at LANL. The development of a comprehensive plan for the active management of forest resources is addressed in the LANL SWEIS Record of Decision and subsequent mitigation action plan (MAP). The SWEIS MAP discusses the need for mitigation actions such as wildfire management principally through the reduction of forest fuels.

Additionally, the SWEIS MAP recognizes the concept of integrated natural resource management that has become an increasingly important factor in planning and implementing the DOE mission at LANL and the need for further planning to achieve such comprehensive management. In 1994, the Secretary of Energy issued a Departmental policy designed to strengthen and formalize DOE's role in the stewardship of DOE lands (O'Leary 1994). DOE's Land and Facility Use Planning Policy states:

> "It is the Department of Energy's Policy to manage all of its lands and facilities as valuable national resources. Our stewardship will be based on the principles of ecosystem management and sustainable development. This policy will result in land and facility uses which support the Department's critical missions, stimulate the economy, and protect the environment."

The development and implementation of a comprehensive natural resources management plan at LANL will directly support DOE's policy to manage all of its land and facilities as valuable national resources. Through the implementation of such a plan, DOE will improve the agency's role as a steward of natural resources by integrating its mission and operations with biological, water, and air resources, using a comprehensive process that will guide land and facility use decisions. One of the goals of natural resource management at LANL is to determine conditions and to recommend management measures that will restore, sustain, and enhance the biological quality and ecosystem integrity at LANL within the regional context of the Pajarito Plateau ecosystem. This process will consider the site's larger regional context and be developed in consultation with regional land managing agencies and owners (particularly BNM, SFNF, and Native American Pueblos), State agencies, and the U.S. Fish and Wildlife Service (USFWS). This cooperative effort will ensure a consistent, integrated, and sustainable approach to regional natural resources management. Management planning on this scale will incorporate and enhance DOE's need pursuant to the *Endangered Species Act* to adequately protect potential habitat and known occupied habitat for federally-protected threatened and endangered species present at LANL that are currently managed through the LANL *Threatened and Endangered Species Habitat Management Plan* (HMP) (LANL 1998a).

Water resources are also an integral part of DOE's natural resource management planning process. In support of the Clean Water Act, DOE and UC personnel are coordinating with regional land management agencies to develop a Pajarito Plateau Watershed Management Plan. The focus of the Integrated Watershed Management Plan is primarily on water quality.

The SWEIS MAP also recognizes the need for further management planning with regards to DOE's need to comply with the *National Historic Preservation Act* (NHPA), federal regulations, Executive Orders, standards, and other laws that mandate consideration of the effects of federal actions on prehistoric and historic properties. Approximately 54 percent of LANL has been surveyed for archaeological sites and approximately 1,600 sites have been identified in this

process. Recently, attention has been given to historic buildings and structures dating back to the Manhattan Project period, although earlier cabin ruins and homestead sites around LANL are well known and documented.

1.3 Purpose and Need for Agency Action

As stated in the LANL SWEIS, the potential for regional and local wildfires poses a substantial risk to the operational capabilities that enable DOE to meet its assigned mission needs at LANL. These missions include national security, energy resources, environmental quality, and science. Furthermore, as a federal governmental agency and steward of the natural resources that are present within the boundaries of LANL, DOE has a statutory obligation to protect and contribute to the sustainable and ecologically healthy condition of forest resources. Consequently, there is a defined need to (1) reduce the risk of damage and injury to property, human life and health, and biological resources at LANL from high-intensity wildfires and (2) enhance forest health at LANL.

1.4 Scope of This EA

A sliding-scale approach (DOE 1993) is the basis for the analysis of potential environmental and socioeconomic effects in this EA. That is, certain aspects of the Proposed Action have a greater potential for creating environmental effects than others; therefore, they are discussed in greater detail in this EA than those aspects of the action that have little potential for effect. For example, implementation of the Proposed Action would affect biological resources in the LANL area. This EA, therefore, presents in-depth descriptive information on these resources to the fullest extent necessary for effects analysis. On the other hand, implementation of the Proposed Action would cause only a temporary and minor effect on socioeconomics at LANL. Thus, a minimal description of socioeconomic effects is presented.

When details about a Proposed Action are incomplete, as a few are for the Proposed Action evaluated in this EA (for example, the exact location of each proposed roadway), a bounding analysis is used to assess potential effects. When this approach is used, reasonable maximum assumptions are made regarding potential emissions, effluents, waste streams, and project activities (see Sections 2.0 and 4.0). This type of analysis usually provides an overestimation of potential effects. In addition, any proposed future action(s) that exceeds the assumptions (the bounds of this effects analysis) would not be allowed until an additional NEPA review could be performed. A decision to proceed or not with the action(s) would then be made.

1.5 Public Involvement

DOE notified the State of New Mexico, the four Accord Pueblos (San Ildefonso, Santa Clara, Jemez, and Cochiti), the Mescalero Apache Tribe, and over 30 stakeholders of its intention to prepare an EA in December 1999. The draft EA was issued for a 21-day comment period on July 6, 2000. Where appropriate and to the extent practicable, concerns and comments were addressed in the final EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ASSOCIATED ALTERNATIVES

This section describes the Proposed Action (the No Burn Alternative), the Limited Burn Alternative, the Burn Alternative, and the No Action Alternative, together with other alternatives that were considered but not analyzed in detail because they were not reasonable within the context of NEPA. The No Action Alternative serves as a baseline with which to compare the consequences of the Proposed Action, the Limited Burn Alternative, and the Burn Alternative.

2.1 Proposed Action (No Burn Alternative)

The Proposed Action would consist of implementing a Wildfire Hazard Reduction and Forest Health Improvement Program at LANL that would not use fire as a treatment measure. Only mechanical and manual thinning methods would be used to reduce forest fuel loads at LANL.

The focus of this ecosystem-based management program would be to (1) reduce the risk of damage and injury to property, human life and health, and biological resources from high-intensity wildfires at LANL and (2) enhance forest health at LANL. This program would initially be composed of a series of individual, small-scale projects that would be conducted over about 10 years with ongoing, long-term maintenance projects conducted thereafter. These initial projects would be conducted to bring the forests at LANL to the desired end-state for wildfire risk followed by an on-going maintenance program to maintain the forests in this desired state with enhancements to improve overall forest health. An estimated 35 percent, approximately 10,000 ac (4,000 ha), of LANL would be treated under this program, including portions of LANL burned during the Cerro Grande Fire. Roughly about 1,200 ac (480 ha) or less would be treated in any given year, contingent on funding. Individual initial and maintenance projects would be separately tailored to the specific needs and conditions of each forested area and would be composed of any or all of several different measures. Individual projects would employ mechanical or manual thinning methods. No use of fire as a treatment measure would be employed. Each project would incorporate all of the below listed planning measures, along with the implementation of any or all of several different environmental protection measures, forest treatment measures, wood products and waste disposal methods, and long-term maintenance measures for the identified project area. Additionally, each project may also include one or more of the post-treatment assessment measures. As deemed appropriate, the different project forest treatment measures, environmental protection measures, and long-term maintenance measures may be employed either individually or in series for any given area at different time periods.

All program projects and their related activities would be conducted in compliance with LANL site permit requirements and all applicable local, state, and national laws and regulations. The planning and implementation of individual projects would be coordinated with adjacent land managers and owners to maximize consistency of forest resource end-state conditions across the Pajarito Plateau.

As stated, the proposed Wildfire Hazard Reduction and Forest Health Improvement Program's individual projects would include the following planning measures, each constituent of which is discussed in greater detail in Section 2.1.1.

- **Individual Project Planning Measures**
  - Facility and Forest Fire Hazard Assessment
  - Identification of Resource Issues
  - Coordination with Neighboring Land Management Agencies and Land Owners
  - Development of End-State Conditions
  - Formulation of Treatment and Environmental Protection Measures

After planning is completed, the implementation of each project would include one or all of the following components of the treatment measures, environmental protection measures (with the exception of worker protection and health and safety measures, which would always be included for each project), and removal of generated wood materials and disposal of waste listed below and discussed in greater detail in Sections 2.1.2, 2.1.3, and 2.1.4.

- **Treatment Measures**
  - Equipment and Job Performance
  - Types of Treatment Measures
    - forest thinning
    - construction of access roads and fire breaks
- **Environmental Protection Measures**
  - Worker Protection and Health and Safety Measures
  - Cultural Resources Protection Measures
  - Air Quality Protection Measures
  - Water Quality Protection Measures
  - Threatened and Endangered Species Protection Measures
  - Other Resources Protection Measures
- **Removal of Generated Wood Materials and Disposal of Waste**
  - Donation of Materials
  - Salvage of Timber
  - Disposal On-site or Off-site

Following the implementation of the treatment measures, each individual project may also include one or more of the following post-treatment assessment measures and, at a minimum, would include post-treatment assessment of the desired end-state conditions achieved by project implementation (discussed in detail in Section 2.1.5).

- **End-State Conditions and Post-Treatment Assessment**
  - End-State Conditions Assessment
  - Forest Fuel Load Inventories
  - Ecological Field Studies
  - Watershed Assessment and Monitoring
  - Data Analysis and Modeling

Long-term maintenance projects would follow each initial program implementation project to maintain the desired end-state condition of the subject forest area. Long-term maintenance measures would be planned according to the previously stated planning measures when it is determined that maintenance is necessary. Project areas would be reviewed about every 5 years. In addition to measures utilized to initially treat an area, periodic mowing and grading of access

roads would also be employed as treatments during the long-term maintenance of some project areas. Maintenance measures would include the implementation of environmental protection measures and forest product and waste disposal measures in a similar manner as employed by the initial project.

As outlined in the previous discussions, a hypothetical wildfire treatment project at a specific location might, for example, consist of all listed planning measures; implementation of forest thinning treatment measures; implementation of measures for protection of workers, and cultural resources, post-treatment end-state assessment, and ecological field studies; and implementation of periodic mowing maintenance measures. Similarly, a hypothetical forest health thinning project at a specific location might, for example, consist of all listed planning measures; implementation of thinning treatment measures for a specific tree species density and health status within the forested area identified for the project; implementation of measures for protection of workers, water quality, and cultural resources, timber sales, and on-site waste disposal measures; post-treatment end-state conditions assessment; and periodic thinning activities as a long-term maintenance measure.

2.1.1 Individual Project Planning Measures

The first step in the implementation of each project would be to formulate a plan of action that would identify and assess potential risks and environmental concerns. The second step would be to formulate a reasoned treatment plan. The planning process would consist of several elements that are discussed as follows:

Facility and Forest Fire Hazard Assessment. This assessment process would identify and prioritize facilities or groups of facilities within LANL requiring fire protection based on the importance of the operations housed there to the DOE mission, the environmental and health risks posed by high-intensity wildfires to these facilities, and the wildfire hazard posed by surrounding plant communities. A wildfire hazard condition assessment would be based on the live and dead fuel load present and would be determined by utilizing various field-derived data and other professional techniques, including computer modeling. The higher the fuel loading, the higher the expected burn intensity. A high fuel hazard rating would be greater than 15 tons (metric ton) per ac (5.4 t/ha); a moderate hazard rating would be 7 to 14 tons per ac (2.6 to 5.1 t/ha); and a low hazard rating would be 0 to 6 tons per ac (0 to 2.2 t/ha). A typical high fire hazard tree stand at LANL is shown in Figure 6. Facilities or groups of facilities with higher hazard ratings would be acted upon first. Treatment of these areas would likely result in measures being conducted for fuel load reduction in ponderosa pine vegetation first with facilities in piñon-juniper vegetation receiving treatment later.

FIGURE 6—*High Fire Hazard Ponderosa Pine Stand.*

Identification of Resource Issues. Integral to the development of a wildfire treatment plan is the identification of resource issues that would assist in the design of the treatment plan. These resource issues or conditions can include the presence of buildings and other facilities; the presence of soils and vegetation contaminated with radioactive, organic, or HE products; the presence of threatened and endangered species and associated habitat; the presence of cultural resources, including traditional cultural properties (TCPs); the presence of soil erosion concerns; the presence of health and safety issues; the presence of wetlands; and the presence of water and air quality issues. Many of these issues are discussed in existing documents or in documents under preparation or modification. Management plans prepared for individual resources would be prime information and guidance documents. For example, the HMP for LANL (currently being modified to incorporate habitat changes as a result of the Cerro Grande Fire) is used to direct proposed activities away from areas of potential use by threatened and endangered species or to sufficiently impose mitigation measures on such activities so as to render them non-adverse in effect to the species or their potential habitat areas. Additional consultation with the USFWS may be conducted for projects planned within potential or occupied sensitive habitat core areas. Additional resource management plans for LANL are in development and will be completed over about the next 5 years.

Coordination with Neighboring Land Management Agencies and Land Owners. Integral to the planning process would be coordination with neighboring agencies and landowners. Currently, coordination of wildfire issues is accomplished through the IWMT, which is composed of regional governmental agencies and land owners who manage for fire protection and forest health. This coordination would serve to maximize forest planning and end-state conditions and could result in cooperative participation in the implementation of certain treatment measures.

Development of End-State Conditions. The ultimate forest conditions that are desired as the end-state of the projects initiated and maintained under the Wildfire Hazard Reduction and Forest Health Improvement Program would be a key planning objective. At most locations at LANL, the desired forest end-state condition would be a diverse forest structure (as regards tree sizes, age classes, and densities) present in a mosaic pattern with a herbaceous and grass understory that is resistant to high-intensity wildfires and can be perpetuated in a healthy condition with selective cutting and underburning. This condition would more closely emulate conditions that would exist under a natural fire regime in which higher-frequency, low-intensity surface fires kept the fuel load and tree density low. The treated areas would appear more park-like with an increase in the diversity of shrubs, herbs, and grasses in the understory. The desired end-state forest conditions for most locations would fall within the following parameters:

- Individual tree crowns would be separated by a distance of about 10 to 25 ft (3 to 7.5 m).
- The crowns from a group of trees would be separated by a distance of about 40 ft (12 m) from each other.
- Tree density would be about 50 to 150 trees per ac (20 to 60 trees per ha).
- Canopy cover would be between 40 percent to 60 percent of the project area.
- “Ladder” fuels that would allow fire to move from the ground into the tree crowns would be removed.
- Ground fuels would not exceed 4 tons per ac (1.5 t/ha).

- The majority of trees to be removed would be approximately 9 in. (22.5 cm) in diameter breast height[5] (dbh) or less.
- Some trees 12 to 16 in. (30 to 40 cm) dbh may be removed to achieve the desired spacings.
- Fuel breaks would be developed in about a 200-ft (60-m) radius around buildings using a tree crown spacing of about 20 ft (6 m).
- Diseased, malformed, or weakened trees would be preferentially removed during thinning treatments.

The appropriate desired end-state forest condition would be determined for each individual project area. Planning the exact end-state conditions desired for a project site would be accomplished through careful consideration of site and surrounding area conditions. End-state forest conditions would be evaluated during post-treatment assessments. A typical low fire hazard tree stand at LANL is shown in Figure 7.

FIGURE 7—*Low Fire Hazard Ponderosa Pine Stand.*

Formulation of Treatment and Environmental Protection Measures. Recognizing the planning considerations addressed above, plans for specific forest treatment, together with specific environmental protective measures, would be developed for each site-specific project. Primary wildfire treatment measures could be those that reduce the high forest fuel loads that are present throughout LANL; primary forest treatment measures may be those that focus on selected tree removals to achieve specific results with regards to improving overall forest health, such as the removal of diseased trees. No broad-scale use of insecticide, herbicide, or fungicide applications would be undertaken as treatment measures under the Wildfire Hazard Reduction and Forest Health Improvement Program (should the use of such products on a large treatment-measure scale be proposed at a later time, additional NEPA compliance review would then be necessary). Commensurate with the formulation of treatment measures would be the identification and inclusion of environmental protection measures that would be taken to protect the quality of identified resource concerns. These measures are presented under the discussion of Environmental Protection Measures (Section 2.1.3). This plan of action would be reflected in any contract requirements.

[5] Diameter breast height – is a forest practice term that refers to tree measurements taken at 4.5 ft (1.4 m) above ground level.

2.1.2 Treatment Measures

Initial and maintenance treatment measures would be identified for each project based on individual site conditions and the desired end-state results. Common to all projects would be the equipment, the use of qualified personnel, and the job performance involved.

Equipment and Job Performance

Equipment and Personnel Involved. A typical individual project would utilize from 6 to 20 qualified personnel, axes, chainsaws, chipping machines, one or two front-end loaders, one watering truck, one or two dump trucks, and possibly a small farm tractor. One or two logging trucks per project may also be required. Areas with greater than 30 percent slopes would not be treated using vehicular equipment, but hand-held equipment could be used to cut tree limbs or small diameter trees on areas with slopes as great as 40 percent.

Job Performance. Treatment measures would likely be accomplished by UC personnel or their subcontractor's personnel. An additional possibility is that the treatment measures could be accomplished by other government agency personnel through an interagency agreement(s).

Types of Treatment Measures

Forest Thinning. Thinning would consist of mechanically and manually reducing the density of understory vegetation and trees by selective cutting. Understory thinning removes select woody vegetation, fallen trees and limbs, and low-growing tree limbs that could act as so called "ladder fuel" to carry a surface fire upwards into the tree crowns. Tree thinning removes select trees to interrupt the continuity of the forest canopy and, consequently, the potential for a crown fire to spread. Trees selected for thinning would be marked at least 6 in. (15 cm) above the ground and on the side away from trails or potential public viewing areas. Remaining tree stumps would be 6 in. (15 cm) or less tall. Large, fire-resistant species of trees, e.g., ponderosa pines, would be retained to increase the fire resistance of the forest.

Chain saws would be the primary tool used to cut the more numerous saplings and poles, select midsize trees, and occasional large-diameter trees (as stated, most trees that would be removed would be less than 9 in. [22.5 cm] dbh with some in the 12- to 16-in. [30- to 40-cm] dbh range). Diseased, infected, malformed, and damaged trees would also be cut. Forest thinning would promote tree stands that have a significant component of large, healthy trees with younger age classes that can be perpetuated through time.

Construction or Reclamation of Access (Fire) Roads and Fire Breaks. New access roads may have to be constructed as part of treatment measures and for improved access to facilitate fire suppression efforts in the event of a wildfire (as in the case of the recent Cerro Grande Fire). If required, these roads would be constructed by blading an approximately 16-ft- (4.8-m-) wide swath. Bar ditches and turnouts would be integral to road construction as needed. Existing access roads may require improvement by such measures as grading and ditching. The planning process may demonstrate that some existing access roads as well as firebreaks are no longer necessary. In this case these existing access roads would be disced and revegetated with native plant species.

2.1.3 Environmental Protection Measures

Integral to treatment measures would be complementary measures to protect public health and welfare and to protect and enhance cultural and natural resources. The various environmental protection measures are discussed in detail in the following sections. For any single project it would be unlikely that all the measures would be employed at the same time, but a single project may well use multiple protective measures to complement the chosen treatment measure(s). All projects would include worker health and safety measures.

Worker Protection and Health and Safety Measures. Environmental protection measures that would be employed for the health and safety of involved workers, nearby employees, and the general public include the following:

- Workers would wear personal protective equipment appropriate to the project area site conditions.
- Workers would be appropriately trained when working in or near hazardous waste potential release sites (PRSs), radiological areas, and other hazardous areas.
- Areas potentially contaminated with HE materials or radioactive materials would be identified and no contaminated wood materials would be removed from LANL.
- Workers would be required to wear dosimeters, as appropriate.
- Access to treatment areas would be restricted to involved personnel.
- Treatment would take place at a safe distance from occupied buildings.
- Additional specific health and safety measures would be developed specific to site conditions as necessary.

Cultural Resources Protection Measures. The planning process would include the identification of cultural resources present within each site-specific project area. This identification process would include consultation with the four Accord Pueblos regarding the potential presence of TCPs. Protective measures that would be taken for thinning treatments and road construction include the following:

- Thinning. Cultural resources would be avoided to the maximum extent practicable. The perimeter of identified features would be marked with flagging tape, or pin flags, or both. These sites would be field checked by trained archeologists with the tree thinning crews before thinning activities. If thinning was necessary within an identified cultural resource feature, tree thinning crews would be limited to cutting and removing branches by hand. No tree cutting, piling, or dragging of materials across the surface of a cultural site would be permitted.
- Road Construction. Road alignments and ancillary drainage features would be planned to avoid cultural resources, including any TCPs. Cultural resources located near road alignments would be identified with flagging tape, or pin flags, or both, to avoid inadvertent damage by equipment, personnel, etc. These resources may also be fenced. Identification and protection measures would be removed following treatment activities to prevent the identification of the cultural resource and potential for vandalism.

Air Quality Protection Measures. Environmental protection measures for maintaining air quality would include the following:

- Unpaved access roads would be treated to minimize dust generation during the treatment period by the use of standard dust suppression measures such as the use of water spray.
- Non-sparking equipment would be used when fuels were very dry to prevent accidental fires from occurring.

Water Quality Protection Measures. Environmental protection measures for avoiding potential adverse consequences on water quality are as follows:

- Pursuant to National Pollutant Discharge Elimination System (NPDES) permit requirements, a Storm Water Pollution Prevention (SWPP) Plan would be developed for and implemented at each of the project sites.
- Areas severely disturbed or denuded would be revegetated.
- Water control structures would be constructed as needed.
- Channel stabilization measures would be employed as needed.
- Areas with slopes of greater than 30 percent would not be treated using vehicular equipment because of their high erosion potential; areas with slopes of less than about 40 percent may be treated using hand-held equipment.
- Machinery would not be used during saturated soil conditions.
- New fire roads would be constructed on grades of less than 10 percent with bar ditches and turnouts, as appropriate.

Threatened and Endangered Species Protection Measures. The presence of threatened and endangered species and their habitat would have prime planning considerations. There are three listed species that currently utilize the area at LANL as habitat – the bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), and the southwestern willow flycatcher *(Empidonax traillii extimus*). All features of planned actions would be developed and implemented in accordance with guidance and restrictions contained in the LANL HMP (LANL 1998a) or developed during further consultation with the USFWS. Detailed treatment features for these species are described as follows:

- Bald Eagle. The identified bald eagle area of environmental interest (AEI)[6] is located primarily in piñon-juniper habitat. Wildfires are not as much of a threat in piñon-juniper habitat and, therefore, to this AEI because trees are sparse. Trees that are located in this AEI, primarily along the Rio Grande and at the mouths of certain drainages, provide roosting and perching habitat for bald eagles. Consequently, no treatment involving the cutting of live or dead trees would be utilized within core and buffer areas. An exception to this provision is the treatment by thinning of ponderosa pines growing within 100 ft (30 m) of structures. Juniper and piñon trees and associated understory in the AEI buffer zone may be treated. Screening vegetation would be maintained at the edge of core areas.

  For health and safety reasons, any trees growing within 100 ft (30 m) of buildings but outside of a developed area would be thinned to achieve a 25-ft (7.5-m) spacing between tree crowns. The HMP does not restrict habitat alteration, including thinning, in

[6] Areas of environmental interest (AEIs) are areas at LANL that are managed or protected because of their importance to biological resources including habitats of threatened or endangered species.

developed areas. Nevertheless, live and dead trees along canyon rims would be retained if the rim were in a developed area. Any tree over 9 in. (22.5 cm) dbh that is within

1,250 ft (380 m) of an explosives testing firing site or a waste treatment area permitted under the *Resource Conservation and Recovery Act* (RCRA) or New Mexico Administrative Code 2.60 (NMAC) for burning explosives wastes would be delimbed to a height of 6 ft (1.8 m).

- Mexican Spotted Owl. The identified Mexican spotted owl AEIs are located primarily in ponderosa pine and mixed conifer forests. Wildfires can pose a serious threat to these forest types. USFWS's recovery plan for the Mexican spotted owl (USFWS 1995) lists high-intensity wildfires as a primary threat to spotted owl habitat and encourages land managers to reduce fuel levels and abate fire risks in ways compatible with spotted owl presence on the landscape (USFWS 1995). Several of the Mexican spotted owl AEIs at LANL burned with low to moderate intensity fires during the Cerro Grande Fire. All LANL AEIs are under revision to determine the effects of the fire on the quality and condition of the habitat areas. This information and other specific site conditions will be factured into project plans for treatments within AEIs. Within undeveloped core areas, on slopes greater than 40 percent, in the bottoms of steep canyons, and within 100 ft (30 m) of a canyon rim, thinning of trees less than 9 in. (22.5 cm) dbh and removal of fuels could be allowed. Exceptions allowing trees greater than 9 in. (22.5 cm) dbh to be thinned within 100 ft (30 m) of buildings would be made to protect facilities (see below). Large logs (12 in. [greater than 30 cm] midpoint diameter) at a minimum rate of 50 per acre and snags (large standing trees that are dead or diseased) should be retained at a minimum rate of 50 per acre. Thinning within core areas not meeting the characteristics listed above and in buffer areas may include trees of any size to achieve a 25-ft (7.5-m) spacing between tree crowns.

  For human health and safety reasons, any trees growing within 100 ft (30 m) of buildings but outside of a developed area may be thinned to achieve a 25-ft (7.5-m) spacing between crowns. Habitat alterations including thinning would not be restricted in developed areas. However, trees and snags along canyon rims would be retained if the rim is in a developed area. Because of the extreme fire danger associated with firing sites and the potential effect of a fire on Mexican spotted owl habitat (as in the Cerro Grande Fire), explosives testing and firing sites and waste treatment areas would be treated separately for the purpose of fuels management. Trees within 1,250 ft (380 m) of firing sites and burn areas in both core and buffer AEI areas may be thinned to a 50-ft (15-m) spacing between trees everywhere except on slopes greater than 40 percent or in the bottoms of steep canyons. Any tree over 9 in. (22.5 cm) dbh within 1,250 ft (380 m) of a firing site may have its lower limbs removed up to a height of 6 ft (1.8 m) above the ground to help prevent crown fires.

  In historically occupied core areas, fuels treatments may not exceed 10 percent of the undeveloped core area and would not be allowed within 1,335 ft (400 m) of previously occupied nesting areas. In recently occupied core areas, forest management activities must occur during the nonbreeding season, which is from September 1st to the end of February (USFWS 1995).

- Southwestern Willow Flycatcher. The identified southwestern willow flycatcher AEI is located primarily in drainage areas with willows and cottonwoods. Wildfires can pose a moderate to high threat to these habitat types. Thinning within undeveloped buffer areas may include cutting trees of any size to achieve a 25-ft (7.5-m) spacing between tree crowns. No fuel management practices would be allowed in core areas. Habitat alterations including tree thinning would not be restricted in developed areas.

Other Biological Resources Protection Measures. General protection measures that may be employed would consist of various industry protective measures and other similar actions. Actions would be developed for each specific project area based on the site conditions and may include the following:

- Undesignated parking or equipment and materials storage areas, off-road travel, and crossing of water courses would be avoided.
- Erosion control measures would be implemented where necessary and would then be maintained as appropriate.
- Revegetation measures would utilize native species appropriate for the associated plant community.

2.1.4 Removal of Generated Wood Materials and Disposal of Waste

Slash[7] would result from thinning activities. Some of this material could be donated or salvaged for use by the surrounding communities. However, some of the smaller logs, branches, and brush would require disposal as waste. Proposed methods of removal of wood materials and waste disposal are described in the following paragraphs. One, all, or a combination of measures may be utilized.

Donation of Materials. Thinned wood materials that are free from contamination would be made available to the public and governmental agencies, including nearby pueblos, for use as mulch, fuel wood, latillas, vigas, ceremonial purposes, handicrafts, and other similar purposes. The extent of availability of material would depend on practical site issues such as accessibility, environmental protection, security, and associated costs.

Salvage of Timber. Commercial size timber (typically at least 9 in. [22.5 cm] in diameter) that is free of contamination may be salvaged to offset the costs of treatment operations or, similarly, provided to the party(ies) contracted with to accomplish treatment operations to again offset costs. Logs would be removed from the place where they were cut by truck either directly to off-site facilities owned or operated by contracted parties or to on-site temporary storage locations within the project area. Logs stored on-site would then be donated or salvaged and removed by third parties.

Waste Disposal On-site or Off-site. Slash and other wood wastes could be disposed of on-site as waste by in situ methods (such as chipping and use as mulch), at a permitted on-site disposal facility, or at a permitted off-site disposal facility. The presence or absence of contamination and type of contamination within the waste would dictate the method(s) of disposal.

[7] Slash is defined here to include small limbs, branches, and miscellaneous pieces of wood.

Contaminant-Free Wastes. These materials could be mechanically reduced (chipped). Wood chips produced during cleanup activities from slash could be used as mulch in selected areas at LANL to foster soil stability and establishment of grasses and shrubs. The depth of wood chip mulch would not exceed 2 in. (5 cm). If slash were used for erosion control at LANL in an unchipped state it would not exceed 6 in. (15 cm) in depth and would be used in such a manner so as not to pose a fire hazard.

Potentially Contaminated Wood Materials. Wood materials produced in an identified PRS or other suspect site such as canyon focus areas[8] would be chipped and retained, or removed, managed, and disposed of at LANL's TA-54, Area G, which is a radioactive waste disposal facility, if the waste acceptance criteria for that site were met. If contaminated materials contain HE or depleted uranium (DU) or both, they could be burned at any of the RCRA- or NMAC-permitted burning facilities within LANL's TAs 14, 15, 36, 39, and 40. Currently, contaminated combustible wastes are disposed of in this manner. HE contamination is consumed during burning and DU does not aerosolize at typical wood burning temperatures. Generally, the quantities of wastes disposed of in this manner are small. Wood contaminated with DU could also be disposed of at Area G.

2.1.5 End-State Conditions and Post-Treatment Assessment

A key element of the wildfire management program would be post-treatment assessments. Field assessments would be conducted to monitor the effectiveness of treatment measures in achieving the desired goals, the need to modify the treatment measures used, and to help develop future management strategies. The majority of post-treatment assessments would be conducted in the field. At a minimum, all projects would incorporate an end-state condition assessment. The following activities would compose the post-treatment assessments:

- End-State Conditions Assessment
- Forest Fuel Load Inventories
- Ecological Field Studies
- Watershed Assessment and Monitoring
- Data Analysis and Modeling

End-State Conditions Assessment. The successful implementation of a Wildfire Hazard Reduction and Forest Health Improvement Program at LANL would be determined by assessing the achievement of resource goals and objectives listed in Section 2.1. This program would be deemed successful when fuel loads are reduced to a moderate or low hazard rating, the forest canopy at most project sites is less continuous with small patchy openings, and forest stands are maintained at tree densities of about 50 to 150 trees per acre (20 to 60 trees per hectare). In effect, the potential risk and damage from an uncontrolled and catastrophic wildfire within the boundaries of LANL would be drastically reduced or eliminated if the end-state conditions planned for a particular project area have successfully been met.

Forest Fuel Load Inventories. Preliminary studies have been initiated to survey the wildfire fuels in forests and woodlands at LANL and for the surrounding region. These studies are being performed by DOE in cooperation and collaboration with SFNF, BNM, and Los

[8] "focus area" is a term used to describe a potentially contaminated area at LANL that is not designated as a PRS.

Alamos County. The results of these studies would provide pre-treatment knowledge of the forest fuels. Study areas would be resampled after the application of program-treatment actions and the post-treatment results would be compared to the pre-treatment conditions to determine if the goals and objectives of the wildfire treatment measures had been met.

Ecological Field Studies. Ecological studies are important tools for assessing the effects of forestry treatments on local fauna and flora. Based on need and funding, post treatment studies may be initiated for threatened and endangered species and their habitat, large and small mammals, arthropods, amphibians, bio-contaminant availability, contaminant movement, and vegetation changes.

Field surveys for topographic and vegetational characteristics of forests and woodlands are currently being conducted in the Los Alamos region. The results of these quantitative surveys are being used to develop plant community classifications and to relate these classes to their respective environmental and topographic conditions. The classification provides an analytical framework for comparing and contrasting the effects of treatment measures and for determining changes in plant community structures.

Watershed Assessment and Monitoring. Projects such as the Proposed Action require the development of a SWPP Plan per NPDES permit requirements. The SWPP Plan would list best management practices for monitoring and protecting watersheds. Part of the monitoring program would be linked to the existing water-sediment discharge sampling station network located throughout the major drainages at LANL. Routine monitoring of this network would be done to evaluate the effects of the forest treatments.

Data Analysis and Modeling. A geographical information system (GIS) and other site-specific data bases are used extensively by LANL for analyzing ecological information. Examples of models that are used include topographic-vegetation models for determining suitable threatened and endangered species habitat, soil loss models for determining soil movement, watershed-hydrology models for determining water runoff, and a fire behavior model that is used to predict fire intensities and growth.

Data pertaining to the topographic characteristics and fuel levels at selected sample sites in forests and woodlands of the Los Alamos region are being summarized and analyzed for changes in the fuel levels that result from the application of regional wildfire treatment measures. In particular, these data are being evaluated to determine if the wildfire treatment measures achieved the desired end-state conditions.

Site-specific data may be used to estimate the average fuel levels of plant community types at various topographic conditions. The data may also be used to predict the fuel levels in unsampled areas throughout the Los Alamos region and as inputs to wildfire behavior models that assess wildfire hazards to LANL facilities and residential areas.

All post-treatment assessment activities would be reviewed for potential environmental, safety, and health issues and applicable requirements would be addressed as part of the Wildfire Hazard Reduction and Forest Health Improvement Program before beginning the post-treatment assessment activities.

2.1.6 Implementation of Maintenance Measures

Once an area has been treated, routine maintenance projects would be performed at least once every 5 years (or as necessary) to maintain the desired end-state conditions. In addition to the use of the previously discussed treatment measures that may be utilized to initially treat an area and later to maintain it, periodic mowing and maintenance of access roads would be employed. Also, project planning and environmental protection measures would be included in the formulation and implementation of maintenance projects as applicable.

2.2 Limited Burn Alternative (Forest Waste Only)

This alternative would be similar to the previously discussed (Section 2.1) Proposed Action (the No Burn Alternative) in terms of planning, implementation, and the spectrum of available treatment measures except that the use of carefully controlled burning could be included for general waste disposal of slash piles. Under this alternative, slash piles would be burned in selected areas throughout LANL, including areas that were burned during the Cerro Grande Fire within a ten-year time period (from 2000 to 2010). The optimal controlled burn site weather conditions recommended in the *Handbook of Fire Ecology* (Wright and Bailey 1982) for maintenance and pile burning would be followed. These are:

- 20 to 50 percent relative humidity
- 50° to 70° Fahrenheit (F) (16° to 21° Celsius [C]) air temperature
- wind direction of north, west, or southwest
- 0 to 10 miles (mi)/hour (h) (0 to 16 kilometers [km]/h) wind speed
- 10 hour dead fuel moisture 6 to 15 percent

These weather conditions typically occur in Los Alamos County during the fall, winter, and early spring seasons; however, burning may occur whenever the optimal fire conditions are met. Burning during these optimal weather conditions results in low to moderate fire behavior. The main advantage of piling and burning slash is improved efficiency and the ability to burn during wetter periods of the year therefore reducing the potential for a fire to escape containment. Before slash piles were ignited, adequate suppression resources would be available on-site and personnel would be standing by. A typical slash burn project under this alternative would be confined to less than 50 ac (20 ha) per day to enable maximum control of burning of the piles and to limit the amount of smoke produced. In order to maintain control of any burn project a minimum of six personnel and two fire engines would need to be present on-site before any ignition. Emergency fire fighter personnel at the Los Alamos Fire Department would also have to be notified and placed on standby in the event of an escape. Slash pile burns would only utilize hand-held ignition sources (drip torch, flares) because of the small land areas involved.

If actual weather conditions exceed the range of any maximum value given above during a controlled burn, all ignitions would stop and active suppression would begin until the fire is out or all weather conditions return to within acceptable ranges. In addition, no slash pile burning would be allowed when the fire danger rating is “very high or extreme.” When weather conditions are not conducive for burning, the use of a wood chipper could be utilized for slash disposal.

Slash piles could be located throughout the treatment area(s). Each pile would be about 10 by 10 by 4 ft (3 by 3 by 1.2 m) in area. About a quarter-acre of slash would be burned per acre treated. About 12.5 ac (5 ha) of slash piles would be burned each day for every 50 ac (20 ha) of mechanically or manually treated forest lands. Slash piles would be placed in areas accessible to fire trucks and personnel for enhanced ability to carefully control the burning of these sites.

Under the Limited Burn Alternative, wood contaminated with HE could be chipped and left on-site as mulch to decay; wood containing DU shrapnel could be left on the ground or disposed of at Area G, or the trees could be left standing. Wood materials contaminated with HE or DU could also be burned at RCRA- or NMAC-permitted LANL burning facilities, which is the current practice. Before burning, meteorological conditions would be modeled using SASEM,[9] which is the New Mexico Environment Department's (NMED) preferred model to determine the range of humidity, temperature, and wind speed and direction that is necessary to ensure that the air quality standard for particulate emissions (150 $\mu g/m^3$) is not exceeded during the burning of slash piles.

In addition to the environmental protection measures discussed in Section 2.1.3, additional protection measures for cultural resources, air quality, and threatened and endangered species would be required for this Limited Burn Alternative.

Cultural Resources Protection Measures. As stated under the Proposed Action, the planning process would include the identification of cultural resources present within each site-specific project area, including the potential presence of TCPs. Protective measures that would be taken for slash pile burning include the following:

- Fuel loads would be determined on and adjacent to cultural resources, including any identified TCPs. Fuels may be removed from the surface of an archaeological site and from contiguous areas by hand or mechanical means. Sites may be sprayed with water, or biodegradable foam may be placed around the site perimeter before the planned burn. Foam could also be applied directly to standing wood structures, or protective fire-resistant fabric may be placed around architectural elements.

Air Quality Protection Measures. Additional environmental protection measures for maintaining air quality under this alternative would include the following:

- Slash pile burns would be initiated in late morning to allow upper air dispersion of smoke.
- Slash pile burns would be performed under fair to excellent smoke dispersal conditions as forecast by the National Weather Service.
- Smoke production and wind direction would be monitored and burns curtailed if smoke production could have adverse health and environmental consequences to nearby populations.
- Worker exposure to smoke would be limited according to the parameters established in the health and safety plan.
- Burning on weekends and holidays would be avoided as practicable.

[9] SASEM - Simple Approach Smoke Estimation Model

- Precautionary signs would be posted on highways in vicinity of slash pile burns to alert drivers of smoke danger.
- Surrounding communities would be notified of planned slash pile burns via news media.

Threatened and Endangered Species Protection Measures. The presence of threatened and endangered species and their habitat would require prime planning considerations. Additional treatment features for these species are described as follows:

- Bald Eagle. Slash pile burning may occur in juniper and piñon trees and associated understory in the AEI buffer zone.
- Mexican Spotted Owl. Slash pile burning would be allowed within undeveloped core areas, in the bottoms of steep canyons, and within 100 ft (30 m) of a canyon rim.

2.3 Burn Alternative (Both Treatment and Forest Waste)

This alternative would be similar to the Proposed Action, but initial treatment measures and long-term maintenance treatment measures would be expanded to include the use of carefully controlled burns to reduce ground fuels and would include the burning of non-contaminated wastes produced by tree thinning treatment measures. Controlled burning is the use of fire under both controlled and selected conditions. A total of 10,000 ac (4,000 ha) would be treated under this alternative. Areas requiring treatment would be managed in accordance with the planning and environmental protection measures, wood disposal, end-state conditions, and maintenance measures described under the Proposed Action. Controlled burns would occur and all slash and debris would be chipped or disposed of in manners that could include burning. Wood contaminated with HE could be chipped and left on-site as mulch to decay; wood containing DU shrapnel could be left on the ground or disposed of at Area G, or the trees could be left standing. Wood materials contaminated with HE or DU could also be burned at RCRA- or NMAC-permitted LANL burning facilities, which is the current practice. Routine mechanical maintenance would occur on a less frequent basis than for the Proposed Action. This alternative would be less expensive and labor intensive than the Proposed Action to achieve the objectives of the DOE's stated Purpose and Need for action.

Under the Burn Alternative, controlled burning would primarily be used as a maintenance tool to remove forest litter (such as slash, leaves, and pine needles) and seedling tree growth that has developed since the initial treatment was performed on a project area. Only where site conditions are favorable would controlled burning be used as a primary treatment measure, namely where trees are already widely spaced and ground fuel is light. Controlled burning would not be used where heavy fuel loads are present. Where heavy fuel loads are present, controlled burning would generally be preceded with mechanical thinning measures to reduce the fuel loading.

The maximum area that would be treated by controlled burning at any given time would be limited to less than 100 ac (40 ha) per day to maintain control of the burn and to limit the amount of smoke produced. Before a control burn was ignited, adequate suppression resources would be available on-site and personnel would be standing by. Controlled burning would utilize ignition by hand-held sources (such as drip torches) because of the relatively small areas involved. Consistent with the goals of fuel reduction, critical determinants that would be employed in the

development of a controlled burn include fuel characterization (including type, density/volume, and moisture content), wind direction and speed, ground slope, ambient air temperature and humidity, precipitation, and shading. A burn plan would be prepared before each burn and a burn permit from NMED would be acquired. Controlled burns would be implemented when the ambient conditions were as follows:

- relative humidity of 20 percent to 50 percent
- 50 to 70°F (16 to 21°C) air temperature
- wind direction of north, west, or southwest
- wind speed of 0 to 10 mph (0 to 16 kilometers per hour [kmph])
- 10 hour dead fuel moisture of 6 to 15 percent

If actual weather conditions exceed the range of any maximum value given above during a controlled burn, all ignitions would stop and active suppression would begin until the fire is out or all weather conditions return to within acceptable ranges. In addition, no controlled burning would be allowed when the U.S. Forest Service National Fire Danger rating system indicates that fire danger rating is "very high or extreme." When weather conditions are not conducive for burning, the use of a wood chipper could be utilized for slash disposal, and tractor mowers could be used to perform initial treatment or long-term maintenance measures. Waste disposal of contaminant-free debris could include burning. Waste slash would be piled and burned under the same carefully controlled conditions and employed for treatment measures.

In addition to the environmental protection measures discussed in Section 2.1.3, additional protection measures for cultural resources, air quality, and threatened and endangered species would be required for this burn alternative.

Cultural Resources Protection Measures. As stated under the Proposed Action, the planning process would include the identification of cultural resources present within each site-specific project area, including the potential presence of TCPs. Protective measures that would be taken for controlled burn treatments include the following:

- Fuel loads would be determined on and adjacent to cultural resources, including any identified TCPs. Fuels may be removed from the surface of an archaeological site and from contiguous areas by hand or mechanical means. Sites may be sprayed with water, or biodegradable foam may be placed around the site perimeter before the planned burn. Foam could also be applied directly to standing wood structures, or protective fire-resistant fabric may be placed around architectural elements. Back burns could also be conducted to direct the controlled burn away from cultural resources.

Air Quality Protection Measures. Additional environmental protection measures for maintaining air quality under this alternative would include the following:

- Burns would be initiated in late morning to allow upper air dispersion of smoke.
- Fuel loads would be reduced through wood material and slash (dead limbs, branches, and other similar wastes) removal where appropriate.
- Burns would be performed under fair to excellent smoke dispersal conditions as forecast by the National Weather Service.
- Smaller trees may be thinned to moderate controlled burns.

- Smoldering logs and stumps would be extinguished after approximately 24 hours by field crews using water sprays.
- Smoke production and wind direction would be monitored and burns curtailed if smoke production could have adverse health and environmental consequences to nearby populations.
- Worker exposure to smoke would be limited according to the parameters established in the health and safety plan.
- Burning on weekends and holidays would be avoided as practicable.
- Precautionary signs would be posted on highways in vicinity of controlled burns to alert drivers of smoke danger.
- Surrounding communities would be notified of planned burns via news media.

Threatened and Endangered Species Protection Measures. The presence of threatened and endangered species and their habitat would require prime planning considerations. Additional treatment features for these species are described as follows:

- Bald Eagle. Juniper and piñon trees and associated understory in the AEI buffer zone may be treated by either mechanical thinning or controlled burning.
- Mexican Spotted Owl. Within undeveloped core areas, on slopes greater than 40 percent, in the bottoms of steep canyons, and within 100 ft (30 m) of a canyon rim, thinning of trees less than 9 in. (22.5 cm) dbh and treatment of fuels would be allowed.

2.4 No Action Alternative

The No Action Alternative describes existing conditions and serves as a baseline for comparing the potential environmental effects of the Proposed Action. It must be considered even if DOE is under a court order or legislative command to act (10 CFR 1021.32[c]). Under this alternative, the fuels inventory would continue to increase for both the areas at LANL that were burned by the Cerro Grande Fire and areas that were not burned. There would be very limited tree cutting only within a 100-ft (30-m) area next to structures, roads, and parking facilities as required by general "good housekeeping" practices. Burning of HE- or DU-contaminated wood material would continue to be practiced at the LANL RCRA- or NMAC-permitted burning facilities, and minimal waste disposal activities would occur under this alternative. DOE and UC representatives would continue to participate on the IWMT and support the other agencies' efforts to the extent possible with a minimal reduction in fuels. The risk of wildfire at LANL would remain high. The majority of operations, infrastructure, and buildings at LANL would continue to be at risk from high-intensity wildfires, regional risks would remain to area communities and properties, and forest health conditions would continue to deteriorate.

2.5 Alternatives Considered but Dismissed

Two additional alternative methods of achieving fuel load reduction were considered for implementation. Generally, alternatives are not considered to be reasonable for analysis under NEPA if they do not satisfy the purpose and need in a timely manner, do not employ feasible technology, are not practicable from an economic standpoint, or if they are not applicable to a particular location.

2.5.1 Use Clear Cutting as a Preferred Treatment

This alternative would preferentially apply clear cutting treatments to sites that require reduction in fuel loads. While clear cutting would drastically reduce fuel loads, clear cutting increases soil erosion and the potential for historical soil contaminants to migrate off-site. Severe adverse environmental effects on local wildlife and their habitats would also occur. DOE could not adequately perform its function as a good steward of the environment as forest health would not be improved by clearcutting treatments. DOE's purpose and need for action would not be met, therefore, this alternative is not considered further in this EA.

2.5.2 Use Chemical Herbicides as a Preferred Treatment

This alternative would use commercially available chemical herbicides to kill trees and other vegetation over large areas. Large-scale application (such as those accomplished by using aircraft) would be difficult to accomplish for small, selectively controlled treatment areas. Small-scale application (accomplished by hand-held or similarly scaled appliances) would require a specially trained and certified workforce. Either application method would carry a high risk of exposing workers and local residents to the herbicide employed. An unexpected rainfall event or windstorm could carry the herbicide away from the treatment site and potentially kill vegetation off-site. Fuel loads would remain high under this alternative. Fuels would not be removed and would be much more likely to burn after they died. Forest health could decline. DOE's purpose and need for action could not be accomplished without unnecessary risk of harm to workers, nearby residents, and the environment. Therefore, this alternative is not considered further in this EA.

3.0 AFFECTED ENVIRONMENT

3.1 Regional Setting

The Proposed Action and each of the alternatives are encompassed within Los Alamos and Santa Fe Counties and are within LANL contiguous TAs. LANL is a government-owned, contractor-operated (by UC), multidisciplinary research facility that is located on 43 mi^2 (111 km^2) of land in north-central New Mexico approximately 60 mi (96.6 km) north of Albuquerque. LANL is situated on the Pajarito Plateau along the eastern flank of the Jemez Mountains. The Pajarito Plateau slopes downward towards the Rio Grande along the eastern edge of LANL and contains several finger-like mesa tops separated by relatively narrow and deep canyons. The area surrounding LANL that would be most influenced by the Proposed Action, the Limited Burn Alternative, Burn Alternative, and the No Action Alternative is DOE's region of concern (ROC). This general area comprising the ROC is shown in Figure 8.

Commercial and residential development in Los Alamos County is confined primarily to several mesa tops lying north of the core LANL facility, in the case of the Los Alamos Townsite, or southeast, in the case of the communities of White Rock and Pajarito Acres. The lands surrounding Los Alamos County are largely undeveloped wooded areas administered by the SFNF, BNM, and the U.S. DOI (in trust for San Ildefonso Pueblo).

Detailed descriptions of natural resources, cultural resources, socioeconomics, waste management, regulatory compliance, and general operations at LANL are presented in the LANL SWEIS (DOE 1999a) and the *Environmental Surveillance and Compliance at Los Alamos*

During 1998 report (LANL 1999a). These documents may be found in the library at LANL and are available on the world wide web at http://nepa.eh.doe.gov/eis/eis0238/eis0238.html and at http://lib-www.lanl.gov/la-pubs/la-13633.pdf, respectively.

3.2 Potential Environmental Issues

Potential environmental issues were identified based on their likelihood to be affected by the Proposed Action and the other alternatives analyzed in this EA. Table 3.1 identifies the issues of interest and the section in the EA where these potential issues are discussed with regards to the affected environment.

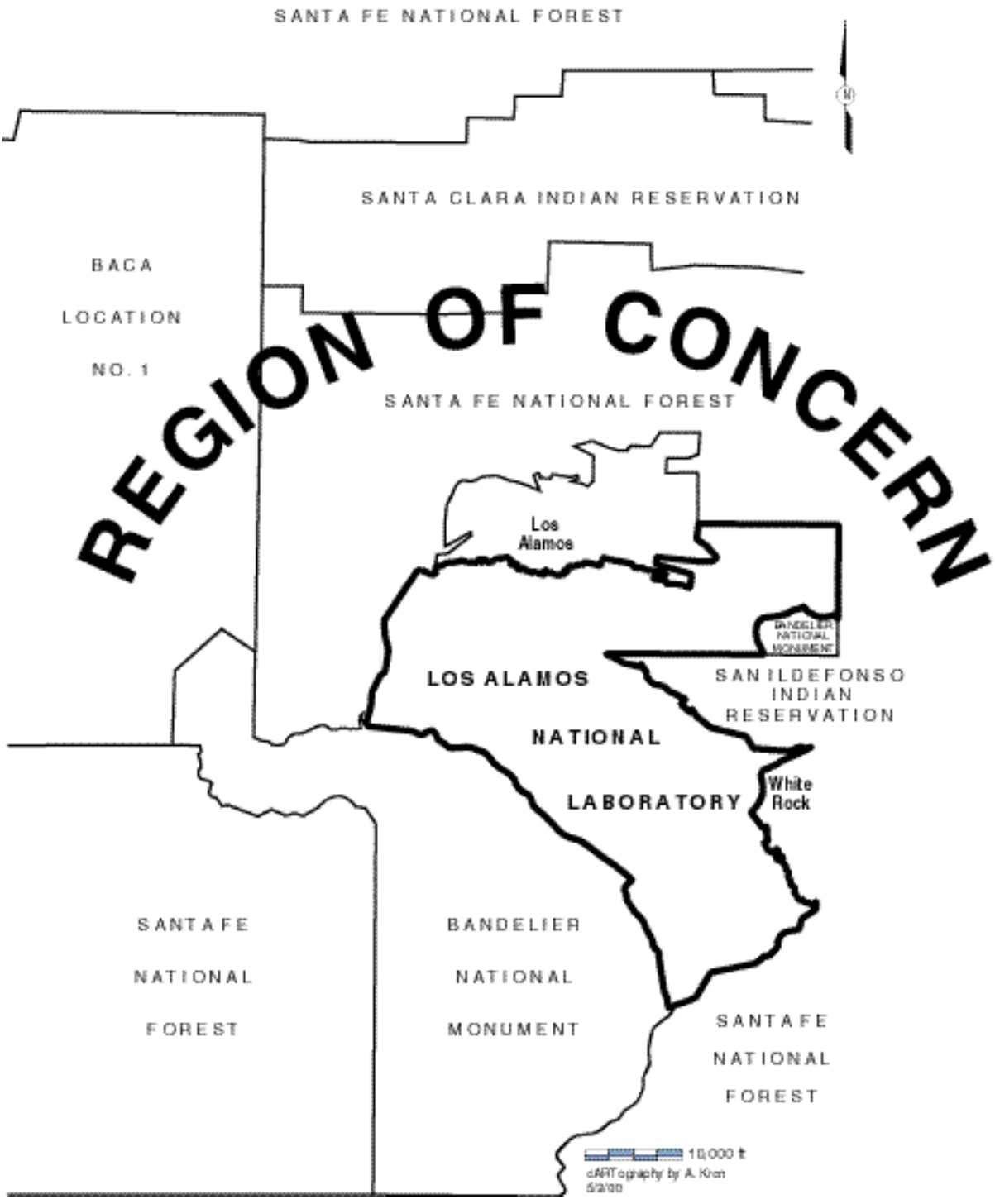

FIGURE 8—*Los Alamos National Laboratory and the Region of Concern*

TABLE 3.1—*Potential Environmental Issues*

Environmental Category	Applicability	Discussed in Section
Biological Resources	Yes	3.3
Air Quality	Yes	3.4
Visual Resources	Yes	3.5
Water Quality and Soil Erosion	Yes	3.6
Cultural Resources	Yes	3.7
Waste Management/Environmental Restoration	Yes	3.8
Human Health	Yes	3.9
Socioeconomics	Yes	3.10
Utilities and Infrastructure	Yes	3.11

Based also on the description of the Proposed Action and alternatives, potential environmental resources that are not likely to be affected were identified using the sliding scale approach as discussed in Section 1.4. Table 3.2 lists those environmental resources that were considered but not analyzed further because the Proposed Action and the alternatives are expected to have either no effect or a negligible effect on these resources.

TABLE 3.2—*Environmental Issues Dismissed from Further Consideration*

Environmental Category	Rationale for Non-Applicability
Noise	Noise associated with certain treatment activities (e.g., mechanical tree trimming and cutting) would be temporary and of short duration and would occur mostly in unoccupied and remote areas at LANL. No prolonged or permanent changes in existing noise levels would be expected to occur.
Environmental Justice	Populations that are subject to environmental justice considerations are present within 50 mi (80 km) of Los Alamos County. However, as none of the treatments associated with the Proposed Action or the alternatives would occur in populated areas, the implementation of the Proposed Action is not expected to result in any disproportionately high and adverse human health or environmental effects on minority and low-income populations.
Land Use	Wildfire treatments at LANL would not change any existing land uses. Forested areas around and between facilities would continue to be used as safety and security buffer zones. Outdoor testing and operational activities would continue to occur in certain treated areas.

3.3 Biological Resources

LANL is located in a region of diverse landform, elevation, and climate—features that contribute to producing diversified plant and animal communities. Plant communities range from urban and suburban areas to grasslands, wetlands, shrublands, woodlands, and mountain forest, and provide habitat for a variety of animal life. Animal life includes herds of elk and deer, bear, mountain lions, coyotes, rodents, bats, reptiles, amphibians, invertebrates, and a myriad of resident, seasonal, and migratory bird life. In addition, threatened and endangered species, of concern, and other sensitive species occur at LANL. Because of restricted access to certain LANL areas, lack of permitted hunting, and management of contiguous BNM and Forest Service lands for natural biological systems, much of the region functions as a de facto refuge for wildlife.

Biological resources include all plants and animals, with special emphasis on federally listed threatened and endangered species protected by *the Endangered Species Act of 1973*, [16 United States Code [USC] 1531 et seq.], floodplains, and wetlands that could be affected by

implementation of either the Proposed Action or any of the alternatives. This section discusses the presence, location, and extent of potentially affected diverse biological resources. Effects on biological resources were evaluated using existing DOE documentation, UC's GIS database, and site-specific field surveys.

The Los Alamos region is biologically diverse. This diversity is due partly to the pronounced 5,000-ft (1,500-m) elevation gradient from the Rio Grande to the Jemez Mountains and partly to the many canyons that dissect the region. Five major vegetational cover types are found within LANL: juniper savannas, piñon-juniper woodlands, ponderosa pine forests, mixed conifer forests, and grasslands. There are small areas covered by spruce-fir forests. In addition, 27 wetlands and several riparian areas enrich the diversity of plant and animal life at LANL. This diversity is illustrated by the presence of over 900 species of vascular plants; 57 species of mammals; 200 species of birds, including 112 species known to breed in Los Alamos County; 28 species of reptiles; 9 species of amphibians; and over 1,200 species of arthropods.

The juniper savanna community type is found along the Rio Grande and extends upward on the south-facing sides of canyons at elevations between 6,200 and 5,200 ft (1,860 to 1,560 m). The piñon-juniper cover type occupies large portions of the mesa surfaces in the 6,900- to 6,200-ft (2,070- to 1,860-m) elevation range, as well as north-facing slopes at lower elevations. The piñon-juniper woodland community type is the dominant vegetation type of both the Pajarito Plateau and the Caja del Rio Plateau. It occupies 46 percent of the total area at LANL. Ponderosa pine forests are found in the western portion of the Pajarito Plateau in the 7,500- to 6,900-ft (2,250- to 2,070-m) elevation range. Ponderosa pine forests occupy approximately 29 percent of the total area at LANL.

Conifer forest mixed with aspen forest, at an elevation of 9,500 to 7,500 ft (2,850 to 2,250 m), intermix with the ponderosa pine forests in the deeper canyons and on north slopes and extend from the higher mesas onto the slopes of the Jemez Mountains. Spruce-fir forest can be found above 9,500 ft (2,850 m) outside LANL boundaries and becomes the predominant vegetation type toward the crest of the mountains. Grasslands occur in the western and central region at LANL, generally in areas that have been previously burned or disturbed.

Wetlands are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. A 1990 survey (based on interpretation of aerial photographs) identified a total of about 39 ac (16 ha) of wetlands within LANL. A 1996 field survey by LANL personnel identified an estimated 50 ac (20 ha) of wetlands within LANL, based on the presence of wetland vegetation (hydrophytes). The survey determined that more than 95 percent of the identified wetlands are located in watersheds of the Sandia, Mortandad, Pajarito, and Water Canyons (DOE 1999a).

Wetlands in the general LANL region provide habitat for reptiles, amphibians, and invertebrates (e.g., insects). Wetlands also provide habitat, food, and water for many common species such as deer, elk, small mammals, and many migratory birds and bats. The majority of the wetlands in the LANL region are associated with canyon stream channels or are present on mountains or mesas as isolated meadows containing ponds or marshes, often in association with springs or seeps. There are also some springs within White Rock Canyon.

The Cerro Grande Fire burned approximately 7,500 ac (3,000 ha) on LANL lands. Preliminary results indicate that about 65 percent of those acres were burned with low severity (i.e., burn severity relates to the fire's impact on soil features), 32 percent with moderate severity, and about 3 percent with high severity. The fire created a habitat mosaic that is dynamic and will offer changing opportunities for plant and animal communities. About 50 ac (20 ha) of the land that was burned within LANL boundaries have been assigned a zero to 10 percent vegetation mortality rate classification; about 6,050 ac (2,420 ha) are classified as having a 10 to 40 percent vegetation mortality rate; about 800 ac (320 ha) are classified as having a 40 to 70 percent vegetation mortality rate; and about 510 ac (204 ha) are classified as having a 70 to 100 percent vegetation mortality rate (BAER 2000).

Depending on the fire intensity (i.e., fire intensity relates to the fire's impact to vegetation), existing vegetation will either be replaced by new species or will recover in a relatively short time period. In areas of moderate to high fire intensity where trees and understory species were destroyed, a recolonization of different species may occur. In areas of low to moderate intensity, the existing species may recover quickly, depending on precipitation and other weather factors. However, these areas will probably look quite different because old dead material and detritus have burned, and because burned materials released nutrients that will stimulate a productive growth spurt. As vegetation proceeds through the natural course of succession in the burned areas, there will also be a corresponding change in the diversity, composition, and numbers of wildlife species utilizing those areas. Much of this vegetation may be high in nutrients and very attractive to foraging species.

Under the *Endangered Species Act of 1973* (16 USC 1531 et seq.), government agencies are required to consider the potential effects of all its activities on federally-listed threatened and endangered species and their critical habitat. Table 3.3 lists four federally-listed species that may be located within LANL boundaries or nearby. The Cerro Grande Fire did not severely burn the threatened and endangered species AEIs on LANL.

TABLE 3.3–*Federal Threatened or Endangered Species Considered under the Proposed Action and Each Alternative*

Common Name	Scientific Name	Status*	Habitat
Mexican spotted owl	*Strix occidentalis lucida*	FT	Ponderosa pine and mixed conifer forests. Uneven-aged, multistoried forests with closed canopies.
Bald eagle	*Haliaeetus leucocephalus*	FT	Roosts in riparian areas near streams and lakes.
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	Nests in riparian areas with willows and cottonwoods.
Whooping crane	*Grus americana*	FE	Sandbars and wetlands. Uses White Rock Canyon during migration.

* FE = Federally listed as Endangered, FT = Federally listed as Threatened

Some federally protected species have historically inhabited areas in the vicinity of LANL but are no longer present. The black-footed ferret (*Mustela nigripes*) has a historical range that includes 12 states (Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming) and the Canadian provinces of Alberta and Saskatchewan. Black-footed ferrets depend almost exclusively on prairie dogs for food and

shelter. Ferret range is coincident with that of prairie dogs (Anderson et al., 1986), with no documentation of black-footed ferrets breeding outside of prairie dog colonies. Only prairie dog colonies with a combined area greater than 80 ac (32 ha) are large enough to support black-footed ferrets. There are no prairie dog colonies of the appropriate size in LANL and black-footed ferrets are therefore not discussed further in this document.

Potential American peregrine falcon (*Falco peregrinus anatum*) habitat exists within LANL boundaries. Recently, the peregrine falcon was removed from the Federal List of Endangered and Threatened Wildlife. DOE is required to track potential effects to de-listed species for five years, thus DOE will continue to track the potential effect to peregrine falcon habitat until the end of 2004.

The State of New Mexico *Wildlife Conservation Act* (NMSA 1978a) states that "it is unlawful for any person to take (harass, hunt, capture, or kill any wildlife or attempt to do so), possess, transport, export, process, sell or offer for sale or ship any species of wildlife appearing on any of the following lists." This provision applies only to species identified as endangered. Both state endangered and threatened species are identified in Table 3.4. There are no known plants on LANL that are listed as endangered plant species in New Mexico (NMSA 1978b). New Mexico prohibits the collection of listed species.

TABLE 3.4–*New Mexico Threatened and Endangered Species Potentially Occurring Within or Near the Project Area*

Scientific Name	Common Name	New Mexico Status*	Habitat	Potential to OccurĀ
Pisidium lilljeborgi	Lilljeborg's pea-clam	NMT	The species is especially characteristic of lakes, occurring at higher latitudes and altitudes in both North America and in Europe. The New Mexico population of the species occurs in cold, alpine Nambe Lake, which is located in a glacial cirque.	Low
Stagnicola caperatus	Wrinkled marsh snail	NME	High-elevation emergent wetlands.	Low
Plethodon neomexicanus	Jemez Mountains salamander	NMT	Shady, wooded, spruce-fir dominated sites at elevations of 7,200 to 9,200 ft (2,190 to 2,800 m).	Moderate
Aegolius funereus	Boreal owl	NMT	Relatively inaccessible mature to old growth spruce-fir forests.	Low
Cynanthus latirostris magicus	Broad-billed hummingbird	NMT	Primarily in riparian woodlands at low to moderate elevations.	Low
Lagopus leucurus altipetens	White-tailed ptarmigan	NME	White-tailed ptarmigan inhabit alpine tundra and timberline habitats, which in New Mexico are mainly above 10,500 ft (3,150 m).	Low
Vireo vicinior	Gray vireo	NMT	Open piñon-juniper and oak woodlands.	Moderate
Ammodramus bairdii	Baird's sparrow	NMT	In New Mexico it has been found in a variety of habitats, ranging from desert grasslands in the south to prairies in the northeast and mountain meadows in the San Juan and Sangre de Cristo mountains—to an elevation of 11,800 ft (3,540 m).	Low

Table 3.4 cont.

Scientific Name	Common Name	New Mexico Status*	Habitat	Potential to OccurÃ
Falco peregrinus anatum	American peregrine falcon	NMT	Uses juniper savannah, piñon/juniper woodland, ponderosa pine forest, and mixed-conifer forests. Requires cliffs for nesting	High
Haliaeetus leucocephalus	Bald eagle	NMT	Roosts in riparian areas near streams and lakes.	High
Grus americana	Whooping crane	NME	Sandbars and wetlands. Uses White Rock Canyon during migration.	Low
Empidonax traillii extimus	Southwestern willow flycatcher	NME	Nests in riparian areas with willows and cottonwoods.	Moderate to High
Euderma maculatum	Spotted bat	NMT	Spotted bats have been recorded in a wide variety of habitats, from riparian and piñon-juniper woodlands to ponderosa pine and spruce-fir forests.	High
Martes americana origenes	American marten	NMT	Late successional spruce-fir forests.	Low
Zapus hudsonius luteus	New Mexican jumping mouse	NMT	In both the Jemez Mountains and the Rio Grande Valley, preferred habitat for the jumping mouse contained permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs.	Moderate

*CODES FOR LEGAL STATUS
NME = New Mexico endangered
NMT = New Mexico threatened

⊗ POTENTIAL TO OCCUR
High = species is known to occur in the area
Moderate = the area has some species habitat components
Low = the area does not have species habitat components

3.4 Air Quality

The general meteorological characteristics of the Los Alamos area are described in the LANL SWEIS (DOE 1999a) and in the *EIS for the Conveyance and Transfer of Certain Land Tracts Administered by the Department of Energy* (DOE 1999b). LANL is an attainment area for criteria pollutants under the *National Ambient Air Quality Standards*. The primary criteria pollutant of interest for this EA is particulate matter (PM), especially, respirable particulates, those smaller than 10 microns in diameter (PM-10). The Environmental Protection Agency air quality standard for PM-10 is 150 micrograms per cubic meter ($\mu g/m^3$). The New Mexico standard for total suspended particulates is also 150 $\mu g/m^3$. BNM, located along the south side of LANL, is considered a *Clean Air Act* Class 1 airshed (for visibility characteristics) at its Dome Wilderness areas.

Table 3.5 compares the annual emissions of criteria air pollutants projected by the LANL SWEIS and actual emissions for 1998, the latest year for which data are available (LANL 1999b). Emissions of criteria air pollutants were well below levels projected in the SWEIS for 1998.

TABLE 3.5—*Comparison of Annual Emissions of Criteria Air Pollutants*

Pollutants	SWEIS (tons/yr)	Actual 1998 (tons/yr)
Particulate matter (PM-10)	11.0	3.9
Carbon monoxide	58.0	23.0
Nitrogen oxides	201.0	85.0
Sulfur oxides	0.98	0.35

Source: LANL 1999b

Airborne particulates are the primary pollutant from wildfires and controlled burns (Wright and Bailey 1982). Hydrocarbons are the second most important combustion product from fires, but few, if any, appear in the combustion of wood products that are important for photochemical reactions in the atmosphere. Carbon monoxide is given off in substantial quantities from burning forest fuels but it oxidizes readily into carbon dioxide. Sulfur is almost absent in woody fuels, and nitrogen oxides are not generally formed by the relatively low temperatures associated with burning wood.

3.5 Visual Resources

A detailed description of the visual environment for LANL is provided in Section 4.1.2 of the LANL SWEIS (DOE 1999a). Areas burned by the Cerro Grande Fire at or in the vicinity of LANL are shown on Figure 4. These burned areas have very limited visual value as a result of the Cerro Grande Fire. The remaining unburned natural settings (mountains, unusual geology, and varied vegetation) present many panoramas and scenic views. LANL's facilities, characterized as "austere and utilitarian" frequently contrast with this natural setting (DOE 1999a). In addition, prescribed burns, conducted by neighboring land management agencies for forest management, have been a common aspect of the visual environment for LANL.

3.6 Water Quality and Soil Erosion

The predominant surface water features within the LANL area are ephemeral and intermittent streams in canyon bottoms and arroyos that provide drainage. These ephemeral and intermittent streams are considered to be Waters of the U.S. under the *Clean Water Act*. Water quality standards for Waters of the U.S. consist of two elements: (1) use classification and (2) criteria that, if not exceeded, will protect the designated use. The ephemeral and intermittent streams within the boundaries of LANL are protected for livestock watering and wildlife habitat. Various water quality criteria (e.g., physical, chemical, and biological characteristics) have been established to ensure that the intended use of the surface waters can be maintained.

Under the *Clean Water Act*, the NPDES program requires the permitting of point source and certain non-point source effluent discharges to Waters of the U.S. (LANL 1996a). Before an effluent can be discharged, it must first meet specific chemical, physical, and biological criteria specified in the NPDES permit. In addition, SWPP Plans defined under the NPDES program are required for certain types of terrain disturbances to prevent the pollution of surface and ground waters.

By the end of 1997, LANL had reduced the number of NPDES-permitted outfalls from the 88 present in 1996 to 20 as of April 2000 (Beers 2000). Water quality samples were found to be in

compliance with permit requirements in greater than 99 percent of all samples collected. These results indicate that the surface water quality at LANL is being adequately maintained to meet permit conditions.

The major factors that influence soil erosion and sediment transport on the Pajarito Plateau are climate, geomorphic setting, soil erodibility, and ground cover (Davenport et al. 1998). The recent Cerro Grande Fire resulted in a very large potential for flash flooding that may scour stream channels, move sediments, damage infrastructure and facilities, and threaten life on LANL lands. Generation of surface water flow is generally limited to snowmelt and summer thunderstorms. Snowmelt is much less likely to generate enough runoff to result in soil erosion. The majority of soil erosion and sediment-related contaminant transport is a result of runoff generated by high-intensity summer thundershowers. Geomorphic setting incorporates factors such as slope gradient and slope length. Areas with steep slopes are more likely to generate runoff than areas of less slope since precipitation has less time to infiltrate into the soil. Soil erodibility is dependent upon many factors including soil texture, porosity, bulk density, hydraulic conductivity, structure, and organic matter and rock fragment content. In general, a medium-textured loamy soil is more susceptible to erosion than either a coarse, sandy soil or a fine, clayey soil (Hawkins 1987). Approximately 95 percent of the soils within the boundaries at LANL are derived from Bandelier Tuff (LASL 1978), which often decomposes to form loamy soils.

The three forest types out of the five vegetation zones present within the LANL boundaries are the conifer mixed with aspen or mixed conifer forest, ponderosa pine forest, and piñon-juniper woodland. The mixed conifer and ponderosa pine forests, in general, have high soil cover values from needles and litter. Soil erosion, in undisturbed soils, is relatively minor in these forest types. The piñon-juniper woodland is more arid and has lower soil cover values and substantially higher erosion rates than the other forest types. Erosion rates of up to 4 tons/ac/year (1.4 t/ha/year) have been recorded in this vegetation type on BNM (Wilcox et al. 1996). Erosion rates as high as 100 times or greater than what they were before the fire have been predicted for certain areas on LANL lands during a 100-year 6-hour duration flood event (BAER 2000).

3.7 Cultural Resources

Cultural resources include prehistoric and historic archaeological sites and TCPs. An archaeological site is defined as any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times. The visible indications of such activity may be identified by structural sites, bedrock mortars, game traps, petroglyphs, steps and roads, water-catching devices, habitation areas, terraces, shrines, and artifact scatters. Lone projectile points, stone tools and debris (lithic flakes), and potsherds obviously derived from the same vessel are considered to be isolated occurrences. Historic resources dating to before 1943 and between the years 1943 to 1956 are also identified during field surveys. TCPs, which are resources of cultural or religious importance to Native Americans and other area community members, are identified by those communities.

Under NHPA (16 USC 470 et seq.), cultural resources undergo an evaluation process that determines if the resource is eligible for listing on the National Register of Historic Places (NRHP). Resources that are already listed, determined eligible for listing, or are undetermined

are afforded a level of consideration under the NHPA Section 106 process. Resources that are not yet identified are considered to have undetermined eligibility; these include subsurface archaeological deposits, unrecorded burials, and unidentified TCPs.

In order to be determined eligible for listing on the NRHP, a resource must meet one or more of the criteria found in 36 CFR Part 60 as follows:

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: Associated with the lives of people significant in our past.
- Criterion C: Embodies the distinctive characteristics of a type, period, or method of construction.
- Criterion D: Yielded or may be likely to yield information important in prehistory or history.

The resource also must retain most, if not all, of seven aspects of integrity: location, design, setting, workmanship, material, feeling, and association.

Over 1,600 archaeological sites and numerous historic properties have been identified at LANL. Some of these sites consist of archeological or prehistoric artifact scatters that reflect the ephemeral remains of ancient hunting campsites, while others include homestead cabin sites and the Manhattan Project buildings where the Atomic Age began. As of 1999, a total of approximately 19,000 ac (7,600 ha) had been inspected for cultural resources. However, only 15,000 ac (6,000 ha) or 54 percent of LANL lands have been intensively surveyed. Sixteen hundred archaeological sites have been recorded, for a site density of about 1 site per 10 ac (4 ha). However, site density decreases as elevation increases. For example, 13 percent of the sites are situated in grasslands, 4 percent in juniper woodlands, 51 percent in piñon/juniper woodlands, 19 percent in ponderosa pine forest, 1 percent in mixed conifer forest, and 12 percent in bare ground and developed areas. There are approximately 100 sites that date to the Homestead Era from the turn-of-the century to the 1940s, and 500 buildings that were constructed during the Manhattan Project or Cold War era (1943–1956). Because of the Cerro Grande Fire, some sites have been affected (burned or damaged) and others may have been newly exposed. Approximately 430 recorded sites are located within the area burned by the Cerro Grande Fire.

LANL is located within the ancestral domain of the Pueblo of San Ildefonso. As such, the pueblo recognizes several of the large prehistoric villages at LANL as ancestral homes. Fourteen native groups, including the Rio Grande Pueblos and the Mescalero Apache and Navajo Tribes, claim traditional use of LANL. The area also has traditional ties to Hispanic communities in the region.

A TCP is an important place or object associated with historical, cultural, or spiritual practices or beliefs of a living community that is rooted in that community's history and is important in maintaining the continuing cultural identity of the community. Federal guidelines identify TCPs to include:

- Natural resources

- Prehistoric and historic archaeological sites
- Traditional-use areas in the cultural landscape that do not reveal evidence of human use
- A rural community whose organization, buildings and structures, or patterns of land use reflect the cultural traditions valued by its long-term residents
- An urban neighborhood that is the traditional home of a particular cultural group and that reflects its beliefs and practices
- A location where a community has traditionally carried out economic, spiritual, artistic, or other cultural practices important in maintaining its historic identity

An area may have TCP significance depending upon a variety of factors such as if the site is remembered in prayers or tribal stories, if the traditional ritual knowledge of the place is passed on to other members of the community, or if traditional customs continue to be practiced by members of a community. TCPs that are considered culturally important by traditional communities may include shrines, natural features, trails, springs, rivers, acequias, plant and mineral gathering areas, traditional hunting areas, ancestral villages and grave sites, and petroglyphs. Within the boundaries of LANL there are ancestral villages, shrines, petroglyphs, sacred springs, trails, and traditional-use areas that could be identified as TCPs.

3.8 Waste Management and Environmental Restoration

UC employs a variety of strategies to manage waste generated at LANL. Sanitary waste is treated on-site at the TA-50 Sanitary Wastewater Systems Consolidation Plant. Solid waste, including construction rubble, goes primarily to the Los Alamos County Landfill; certain classified waste goes to a classified landfill at TA-54. Radioactive liquid waste is treated on-site at TA-50, and the treated effluents are discharged into Mortandad Canyon. Hazardous waste is shipped off-site. Low-level radioactive waste is disposed of at TA-54, Area G, or shipped off-site. Transuranic waste is stored at TA-54 before being shipped to the Waste Isolation Pilot Plant near Carlsbad, New Mexico, if defense related. Mixed waste is stored at TA-54 pending suitable waste disposal alternatives.

DOE established the Environmental Restoration (ER) Project at LANL in 1989 to assess and remediate potentially contaminated sites from past LANL operations. The ER Project is ongoing. Activities include site characterization, sampling and sample analysis, human health and environmental risk screening and analysis, corrective actions, cleanups, and reporting. Altogether, there were over 2,100 PRSs identified through LANL's ER Project. Some have been remediated, others have been determined to need no remediation, while the remainder remain under investigation. The Cerro Grande Fire has affected numerous PRSs at LANL.

UC employees have identified 19 major canyon systems at LANL as focus areas to be characterized and remediated if necessary through the ER Project (LANL 1995). The canyon systems include surface and subsurface soils, sediments and geology, and surface water and ground water systems. Certain canyons received untreated effluents and contaminants from TAs upstream and surrounding them. These contaminants have been widely distributed during the past 55 years. UC employees and subcontractors are continuing their evaluations of the distribution of contaminants and potential risk to human health particularly in response to the potential for increased floods as a result of the Cerro Grande Fire. Generally, contaminants in all but DP Canyon, upper Mortandad Canyon, Acid Canyon, and Los Alamos Canyon at the

confluence with DP Canyon were at or below instrument detection limits and well below levels that may cause a human health concern (Pratt 2000).

3.9 Human Health

Wildfires and wildfire prevention treatment measures, in general, pose a degree of risk to human health. In 1994, wildfires destroyed 324 homes and structures and claimed the lives of 34 firefighters in the U.S. (Phillips 1995). The use of controlled burns as a preventative treatment routinely exposes fire management experts to personal injuries (e.g., burns) and respiratory hazards from smoke inhalation. To date, no wildfire-related fatalities or major injuries occurred to fire management experts working within the boundaries of LANL, including the Cerro Grande Fire. However, losses of LANL structures (approximately 30) occurred and members of the general public suffered the loss of their homes (approximately 230) from the Cerro Grande Fire. Non-fire-related health risks from the cutting of timber and the use of wood-handling equipment, as well as environmental hazards (e.g., falls, animal bites, etc.), are also potential health hazards for workers that implement wildfire prevention treatment measures.

The use of wood products removed from LANL during wildfire treatment activities could pose some health risk to the general public. In 1996, some wood removed from LANL was found to be contaminated with DU. All of this wood was recovered and returned to LANL by DOE and no injuries or adverse health effects were determined to have occurred. Administrative controls have now been changed to preclude this from happening again.

3.10 Socioeconomics

The geographic area most affected by LANL is the region comprised of Los Alamos, Santa Fe, and Rio Arriba Counties. Demographic, social, and economic conditions are summarized here and described in detail in the LANL SWEIS (DOE 1999a). Population data from the most recent 1990 Census shows about 18,000 people in Los Alamos County, about 99,000 people in Santa Fe County, and 34,500 people in Rio Arriba County. The economic base of the tri-county (Los Alamos, Santa Fe, and Rio Arriba) region is described in detail in the LANL SWEIS (DOE 1999a). UC remains the largest employer in the tri-county region. For fiscal year (FY) 1997, the DOE operations funding amount for LANL (actual cost) was $1,105.4 million (M) and included 6,855 full-time equivalent personnel (LANL 1998b). During FY 1997 UC spent a total of $723.0M for external subcontracts and procurements. Of this total, $294.0M was spent on small and disadvantaged businesses. A detailed description of the community infrastructure and social services, which includes (pre-Cerro Grande Fire) data on local government finances, the number of housing units, public schools, health services, police protection, fire protection, and utilities, is included in the LANL SWEIS.

3.11 Utilities and Infrastructure

LANL is situated on approximately 27,800 ac (11,120 ha) of land administered by DOE. With only about 30 percent of this land developable because of topographic, environmental, operational, and buffering constraints, LANL has about 8 million square feet (ft^2) (720,000 m^2) of structural space. Ownership and distribution of utility services is split between DOE and Los Alamos County. Utility systems at LANL include electrical service, natural gas, steam, water, sanitary wastewater, and refuse. Ongoing maintenance of power line corridors includes thinning and clearing of low-lying vegetation and the topping off of tall trees. This type of maintenance

provides easy access and protects the power line from fire danger. Safeguards and security operations are conducted at LANL to provide protection of national security interests, proprietary information, personnel property, and the general public. Vegetation, such as trees, is used at LANL to enhance buffer areas for operational and security purposes. Facility fire protection programs at LANL ensure that personnel and property are adequately protected against facility fire or related incidents. Interagency agreements between Los Alamos County and DOE are in place to share water supplies, equipment, and personnel as required to perform fire protection. Regional and site transportation routes are the primary methods used to transport LANL-affiliated employees, commercial shipments, and hazardous and radioactive material shipments. Bladed (unpaved) fire roads are located in many areas of LANL and are often used as access roads for maintaining utility services. During fire protection maintenance operations some road closures are necessary. The Cerro Grande Fire damaged above-ground utilities and infrastructure at LANL in the areas burned by the Cerro Grande Fire.

4.0 ENVIRONMENTAL CONSEQUENCES

Methodologies for Environmental Effects Analyses

There are a variety of techniques that can be used to assess potential effects that implementation of a Wildfire Hazard Reduction and Forest Health Improvement Program could have on the environment at LANL. These techniques include collecting and analyzing data; using models to predict results and effects; comparing expected or past actual representative outcomes to regulatory standards; or using professional expertise. This EA uses the best available data and analytical methodologies for each potentially affected environmental media. A description of these methodologies follows.

Biological Resources. The assessment of biological resources was both quantitative and qualitative. Methodologies included models that were developed by UC personnel and outside consultants, comparison to government standards, subject-matter expertise, and recommendations by outside agencies.

Federally-listed threatened and endangered species habitat was modeled using a GIS analysis of suitable habitat based on vegetation type and topography and was ground-truthed by numerous field surveys. For the bald eagle, actual and potential roost trees along the Rio Grande were identified (LANL 1996b). The locations of these roost trees then became the center points for the core areas of the AEI. A buffer was placed around the core areas and along the river. A model (1998a) was developed to classify nesting and roosting habitat for Mexican spotted owls in the Jemez Mountains based on topographic characteristics and vegetative diversity. Topographic characteristics were calculated from a 100-ft (30-m) resolution Digital Elevation Model, and vegetative diversity was estimated from Landsat satellite imagery. In cases where previous knowledge indicated that the model incorrectly identified an area as "suitable" (for example, in the La Mesa burn area), ground surveys were conducted to determine the actual cover type. Where suitable habitat was identified, a canyon rim coverage on the GIS was used to draw core areas extending outward 333 ft (100 m) on mesa tops from the canyon rims. Southwestern willow flycatcher core areas were defined by the presence of riparian habitat and suitable wetland vegetation, identified by UC personnel in 1994 during a survey of wetlands at LANL and mapped using a global positioning system. These wetland areas were confirmed by

ground surveys in 1998. Wetlands without stands of dense willows at least 6 ft (1.8 m) tall and 100 ft (30 m) wide were removed from the AEI.

Impact effects assessment methodology used for analysis of threatened and endangered species is documented in the HMP (LANL 1998a). USFWS concurred with DOE's determination that management measures described in the HMP may affect, but would not likely adversely affect listed species. UC personnel collected extensive data and used other data sources including USFWS, Department of Defense, U.S. Air Force, and various universities.

Air Quality. The effects analysis for air resources was both quantitative and comparative. Air emissions under the Proposed Action would result only from mechanical and manual treatment. Effects of the Limited Burn and Burn Alternatives were predicted by using actual data from air quality permits for similar types of burns prepared for NMED in the past and comparing the calculated emissions to legal limits.

Visual Resources. The visual resources analysis made extensive use of existing analyses in the LANL SWEIS and other NEPA documents. The current degraded state of the viewshed as a result of the Cerro Grande Fire was also considered. The analysis relied primarily on a qualitative approach to evaluating the effects of tree thinning and controlled burns under the Proposed Action, the Limited Burn, and Burn Alternatives.

Water Quality and Soil Erosion. Potential effects on water quality and soil erosion were evaluated by considering the effects of the program over the life of the project. The methodologies used to estimate treatment effects on water quality and soils were primarily quantitative. When available, data from published studies with similar treatments in similar vegetation types were used to provide potential ranges of soil erosion and/or water quality responses. Data were available from the *1998 LANL Environmental Surveillance Report* to quantitatively describe baseline water quality (LANL 1999b). Water quality and soil erosion mitigation techniques were adapted from the draft LANL Watershed Management Plan and are a part of the Proposed Action and each alternative.

Cultural Resources. The cultural resources assessment was qualitative. Protective measures and best management practices were evaluated on a treatment-by-treatment basis. The methodology relied primarily on professional expertise of UC personnel and outside agencies. UC personnel compiled cultural data and constructed a GIS data base that included information about the type of site as well as its location; other data sources included reports from BNM and the U.S. Forest Service.

Waste Management and Environmental Restoration. The effects analyses for waste management and ER were qualitative and comparative. Waste management information was provided through the LANL waste management web site at http://wmgt.lanl.gov. Information about the ER Project was provided through various ER Project publications and through personal communication with ER Project workers. A GIS was used to estimate relative proportions of potential treatment areas that may fall within sites that are under investigation by the ER Project.

Human Health. The human health analysis made use of published information pertaining to wildfire management. Information from the LANL SWEIS was also considered (DOE 1999a).

Consideration was also given to the hazard reviews and administrative controls that would be implemented as part of the Proposed Action and each alternative.

Socioeconomics. The socioeconomics analysis was largely quantitative and used 1990 U.S. Census data plus more current employment information for LANL. The EA evaluates the effects of the entire wildfire management program on surrounding communities.

Utilities and Infrastructure. The analysis was qualitative and relied on information from the LANL SWEIS (DOE 1999a). Effects were evaluated on the wildfire management program as a whole.

4.1 Proposed Action Effects (No Burn Alternative)

Implementation of proposed Wildfire Hazard Reduction and Forest Health Improvement Program measures would provide a high level of assurance that severe wildfires, such as the Cerro Grande Fire, would not reoccur within the boundaries of LANL and impair DOE's ability to safely carry out its assigned missions of national security, energy resources, environmental quality, and science at LANL. Lowering the high fuel loads present in area forests would appreciably reduce the potential for future large, high-intensity wildfires that could threaten to seriously interrupt these missions. Correspondingly, the ecosystem-based approach of the Proposed Action would improve the long-term health and stability of the forest, in direct support of DOE's Land and Facility Use Planning Policy (DOE P 430.1) to manage all of its lands and facilities as valuable natural resources. Proposed measures would create forest conditions that are consistent with more natural ecological processes with accompanying improved health and vigor and with increased biological diversity.

The following sections describe the anticipated effects of implementing the Proposed Action at LANL. The anticipated effects were determined based primarily on the methodologies described in Section 4.0.

4.1.1 Biological Resources

The proposed ecosystem-based wildfire management measures would produce an array of biological effects ranging from transient to long-term and from subtle to pronounced. Some of these effects may be considered positive and some negative. In the long term, the major positive effect that the proposed measures would have is to create conditions that are consistent with a more natural historic ecological process with accompanying improved health and vigor and with increased biological diversity. Opening of the forest and decreasing the density of trees and fuel load would decrease the competitive stress among trees, reduce the potential for insect infestations, rejuvenate understory vegetation, and reduce the threat of a severely damaging wildfire. Reducing the risk of a severe wildfire would protect forest biological resources. Reducing the risk of severe wildfire remains important because the majority of forested acres within the LANL boundaries, and in particular the threatened and endangered AEIs, were not severely burned in the Cerro Grande Fire. Therefore, the fuel load available to facilitate a wildfire situation remains high.

Modifying both the forest structure and understory plant diversity would have corresponding transient as well as long-term effects for wildlife. The general disturbance and removal of

vegetation created by treatment measures would displace local wildlife temporarily, for example, deer, elk, birds, and small mammals. This displacement could range from a few days to several weeks, depending on the species involved. However, wildlife presence and use would rapidly return and, with an anticipated general increase in herbaceous and shrubby plant cover, wildlife use and diversity could be expected to increase on a long-term basis. Use of treated areas (for nesting, foraging, and cover) by some bird species may be expected to decline on a local basis while other species would remain unchanged and some would increase. The increased ground cover density and diversity could be expected to increase foraging habitat for deer and elk and there could be an increased use of LANL by these species.

A general improvement in forest health would correspondingly benefit federally-listed threatened and endangered species by producing generally higher quality habitat. Strict adherence to the provisions of the HMP accompanied by environmental protection measures developed during consultation on project plans with USFWS would ensure the continued protection and welfare of these species. These measures include those that would guard against contaminant releases. USFWS's Recovery Plan for the Mexican spotted owl lists high-intensity wildfires as a primary threat to spotted owl habitat and encourages land managers to reduce fuel levels and abate fire risks in ways compatible with the presence of Mexican spotted owls (USFWS 1995). In addition, the Mexican spotted owl was originally listed as threatened partially because of widespread habitat-destroying wildfires. The goal of the Proposed Action to reduce the risk of severe, high-intensity wildfires supports the recovery goals for the Mexican spotted owl. The Proposed Action would correspondingly reduce the risk of habitat loss for the bald eagle and could improve the quality of foraging habitat for this species. The southwestern willow flycatcher would not likely be positively or negatively affected.

New Mexico State threatened or endangered species with a moderate to high probability of occurring at LANL and possibly being affected by the Proposed Action include the Jemez Mountains salamander, gray vireo, spotted bat, and New Mexican jumping mouse. Only the Jemez Mountains salamander and the spotted bat use mature forests like those expected to receive extensive treatment at LANL. Forest thinning should not affect either of these species.

As described, the potential adverse effects of proposed forest treatment measures are expected to be transient and minor. The effects are similar in scale with other naturally occurring forest disturbances such as historical wildfire that resulted in forest stability during past centuries. The disturbances were necessary short-term consequences leading to the vegetative and soil conditions that produced long-term forest features represented by all aged, well-spaced trees with a diverse and vigorous understory that was resistant to catastrophic change.

4.1.2 Air Quality

Effects on air quality would be minimal under this alternative. Emissions of criteria pollutants would come from equipment used to perform mechanical and manual treatments. The total amount of emissions would be minimal from these activities. In addition, no burning as a treatment measure would be conducted under the Proposed Action. Routine low-level emissions from mechanical treatment would occur more often and on more days per year. Emissions from the burning of HE- or DU-contaminated wood material would be the same under this alternative as under the current LANL waste management practices (see the No Action Alternative in Section 2.4). Burn permits administered by NMED would be required; these would limit

allowable emissions relative to National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards. Over the years, extensive modeling, using site-specific data, has been conducted at LANL to assess the effects on air quality from burning wood potentially contaminated with HE and DU. Specific air pollutants considered included criteria pollutants such as carbon monoxide, nitrogen oxides, PM, sulfur oxides, and DU. The emissions from all regulated pollutants were shown to be well below the ambient standards at all affected locations.

4.1.3 Visual Resources

The Proposed Action would have a minimal effect on visual resources at LANL and the surrounding area given the degraded panoramas of the Pajarito Plateau and Jemez Mountains since the Cerro Grande Fire. The primary aspect of the Proposed Action that would affect visual resources is vegetation removal that would occur as a result of selected thinning activities. Trees slated for removal would be marked on the side away from viewing so as not to be an eyesore. There would be stumps shorter than 6 in. (15 cm) resulting after mechanical or manual treatment.

The forest at LANL would become more park-like with an increase in the diversity of shrubs, herbs, and grasses in the understory. Some facilities currently screened from casual view may become visible to viewers at various vantage points. The overall effect of the Proposed Action would be to make the contrast between the background setting and LANL's industrial character more obvious. Tall structures that are already visible from surrounding areas would not be more visible than they are currently. The effects of vegetation removal at LANL would have no adverse effect on the degraded panoramas of the Pajarito Plateau and Jemez Mountains.

4.1.4 Water Quality and Soil Erosion

Thinning activities under the Proposed Action would result in minimal disturbance of the surface forest litter layer and, therefore, no erosion is anticipated. Thinning activities reduce evapotranspiration and increase soil infiltration. This results in greater soil moisture availability for remaining plants and a general increase in ground cover and less soil erosion. Mixed conifer and ponderosa pine forests generally have an extensive surface litter layer that would not be removed in the thinning process. Piñon-juniper sites often have high erosion rates and would benefit from the thinning and slash-mulch or chip-mulch treatments. Road and fire break building activities would be kept to a minimum and would adhere to construction specifications described in the Water Quality Protection Measures (Section 2.1.3).

Floodplains would be treated by cutting. Protection for floodplains includes all of the previously listed environment protective measures. However, wetlands would not be treated. Workers would not stage equipment in wetland areas, nor drive through them to reach treatment areas or allow cut trees to fall into wetlands. When planning a treatment, DOE would consider potential effects to wetlands downslope of the treatment areas and take protective measures. Environmental protection measures would include, but are not be limited to, 1) leaving groundcover vegetation in place, 2) scattering chips and slash on bare spots, 3) constructing berms, 4) driving only on established roads, 5) carrying felled trees rather than dragging them, and 6) using no heavy equipment in areas with slopes steeper than 30 percent.

Implementation of wildfire treatment techniques addressed under the Proposed Action would reduce the potential for adverse flooding effects and sediment transport that could result from a

catastrophic wildfire. The potential for an uncontrolled wildfire to degrade water quality or increase soil erosion would be reduced under this proposal.

4.1.5 Cultural Resources

Adverse effects on cultural resources are not expected to occur under the Proposed Action. As identified in Section 2.1.3, cultural resources would be avoided or protected during thinning, road or fire break construction, maintenance, and wood disposal activities. Cultural resource sites would be clearly marked to avoid disturbance during thinning, road construction, or maintenance activities. When vegetation covering a cultural resource site must be thinned as part of a treatment for a larger area, field crews would be limited to cutting and removing vegetation by hand. Areas used to dispose of wood and other forest debris would not be located in the vicinity of cultural resource sites. Any new access roads or fire breaks would be located and constructed in a manner to avoid cultural resource sites. Maintenance activities would also be monitored to ensure that cultural resource sites are not adversely affected.

Implementation of the wildfire treatment techniques addressed under the Proposed Action would benefit the management and protection program for cultural resources at LANL. The potential for an uncontrolled wildfire to damage or destroy a large number of known cultural sites and remaining historic properties at LANL would be reduced under this proposal.

4.1.6 Waste Management and Environmental Restoration

Effects on waste management and PRSs would be minimal under the Proposed Action. Project planning assessments would identify PRSs and other potential contamination within treatment areas. In terms of acreage, most of the treatment areas are uncontaminated. Trees removed from uncontaminated areas would not become waste. Wood suitable for sawlogs or firewood would be salvaged. Limbs and small trees would be chipped and left in place to control erosion and to recycle the nutrients or moved to other locations at LANL to provide the same benefits.

There are some contaminated areas within the boundaries at LANL that may need to undergo treatment. If the project area contains a PRS, then the trees would be cut but left in place on the PRS (either whole or after chipping), or removed and disposed of at an appropriate permitted disposal facility. If the contaminated area was not a PRS and the contamination was HE and/or DU, the trees could be burned at a RCRA- or NMAC-permitted burning facility at LANL or chipped and left on-site. Burning is the standard and acceptable disposal method for trees contaminated with HE and DU because the HE is consumed during burning yet the DU would not become aerosolized. Ashes produced from burning would be collected and disposed of under standard LANL waste management procedures. Wood contaminated with DU could also be disposed of on-site at Area G.

In certain canyons, there may be very low levels of HE or DU contamination (near or at instrument detection limit) widespread throughout the canyon bottoms with isolated pockets of higher levels of contamination. Most of the trees throughout the canyon would have little or no contamination uptake, but a few may have measurable amounts of contamination. Only wood that was determined safe for public use would be released to the public. Suspect wood would be chipped, left on-site, or burned at an appropriate permitted disposal facility.

Maintenance of treated areas that do not contain PRSs or other potential contamination would not produce hazardous or radioactive waste. Maintenance of a PRS or other potentially contaminated area would produce minimal waste, and it would be disposed of in the same manner as for the original treatment.

Fire roads would be sited to avoid PRSs and potentially contaminated areas. Therefore, there would be no waste generated from the construction of fire roads because trees suitable for firewood or sawlogs would be salvaged and slash would be chipped and scattered on site to control erosion. Restoration of abandoned fire roads would generate very minimal waste including seed packages, seedling containers, and so forth. This waste would be disposed of at an appropriate landfill.

4.1.7 Human Health

Application of wildfire treatment techniques under the Proposed Action should not adversely affect worker or public health. Workers involved in thinning, road or fire break construction, maintenance, and wood disposal activities would be evaluated by medical personnel to determine their physical fitness and formally trained and certified to safely perform these tasks. Experienced wildfire management experts would be used to design and implement treatment programs at LANL. Potential hazards would be identified during the fire hazard assessment phase of each individual treatment operation. Appropriate worker protection measures would be taken to reduce or eliminate hazards that could be expected to occur from routine treatment and maintenance activities. Members of the public would be excluded from areas where treatment activities were occurring and would therefore not be exposed to any potential health risks from such activities. Wood released for public use would be free of contamination and would not pose any health risks to the general public.

4.1.8 Socioeconomics

No substantial changes to either the local or regional populations or economies are expected under the Proposed Action. Potential socioeconomic benefits are associated with timber sales, salvaging, fuel wood permits, and local contracting that may occur as part of the programmatic strategy for uses of timber cleared from treated sites. There could be as much as 1,000 board feet of saw timber and three cords of firewood per acre. Saw timber is valued at about $0.15 per foot, and firewood at about $20.00 per cord based on actual sales at LANL. This would total about $2M over ten years, or about $200 thousand per year. These programmatic strategies are expected to be beneficial to local and regional contractors and the general public.

4.1.9 Utilities and Infrastructure

The Proposed Action would have a beneficial effect on water, gas, and electric utilities at LANL. It would also have a beneficial effect on facilities, use of roadways, and other infrastructure such as communication and security systems. Benefits would include improved access to both utilities and infrastructure from additions of new fire breaks and improved maintenance of existing fire breaks in and around utility lines and facilities. Thinning activities would also improve access to buried water and gas lines as well as electric and communication lines that are located in areas that are currently overgrown with vegetation. These areas are particularly difficult to reach to perform maintenance or, in the event of an emergency, to perform repairs. Forested areas bordering roadways would be thinned, which would in turn improve visibility and

reduce the potential for vehicular accidents from collisions with wildlife and trees and forest debris that could fall on roadways.

The most important benefit would result from the reduced risk of another uncontrolled wildfire destroying large forested areas at LANL including exposed utilities and infrastructure. Key facilities would be less vulnerable to a wildfire and could therefore more reliably support DOE's national security and other important missions at LANL. The potential threat of hazardous and radioactive materials being accidentally released to the environment from a wildfire would be reduced or eliminated. Also, the potential of having to replace expensive utilities and infrastructure that could be damaged or destroyed by wildfire would be greatly reduced.

4.2 Limited Burn Alternative Effects (Forest Waste Only)

The Limited Burn Alternative would be similar to the Proposed Action, but waste disposal elements would be expanded to include the burning of waste slash piles produced by tree thinning treatment measures. Areas requiring treatment would be managed using mechanical thinning methods as described under the Proposed Action. Slash and debris could be chipped or disposed of in a manner that could include burning. Wood contaminated with HE would be chipped and left on-site as mulch to decay or it would be burned at NMAC- or RCRA-permitted LANL burn facilities. Wood containing DU shrapnel could be burned, left on the ground, or disposed of at Area G. The costs of implementing this alternative and long-term upkeep and maintenance would be lower than under the Proposed Action because the work would be less labor intensive.

4.2.1 Biological Resources

Under the Limited Burn Alternative, the effects on biological resources, including all the federal and state listed threatened and endangered species, would be similar to the Proposed Action. Vegetation alterations and tree thinning activities would still occur. Burning releases nutrients more quickly into the soil than decay of slash and chips, thus the Limited Burn Alternative would allow the release of these nutrients more quickly then expected under the Proposed Action. Therefore, the re-growth of understory vegetation may be slightly greater under this alternative.

4.2.2 Air Quality

Effects on air quality would be minimal under the Limited Burn Alternative. Waste pile burning would result in short-term temporary increases in criteria air pollutants from burning waste from tree thinning activities on a maximum of about 50 ac (20 ha) a day. Typical daytime wind patterns for LANL are south, southwest, or southeast. Since the *Clean Air Act* Class I airshed located in BNM is directly upwind from LANL (i.e., BNM lies to the south/southwest of LANL), no smoke effects would occur to this airshed. Avoiding northerly winds during burning operations would prevent any smoke from entering the Bandelier airshed. Before burning, meteorological conditions would be modeled using SASEM, which is NMED's preferred model to determine the range of humidity, temperature, and wind speed and direction that is necessary to ensure that the air quality standard for particulate emissions (150 $\mu g/m^3$) is not exceeded during the burn. Mechanized equipment used for cutting, hauling, and chipping fuels would have about the same daily exhaust emissions associated with a small-scale construction project (such as a project using one loader and two dump trucks).

Burn permits administered by NMED would be required; these would limit allowable emissions relative to National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards. Over the years, extensive modeling, using site-specific data, has been conducted at LANL to assess the effects on air quality from burning wood potentially contaminated with HE and DU. Specific air pollutants considered included criteria pollutants such as carbon monoxide, nitrogen oxides, PM, sulfur oxides, and DU. The emissions from all regulated pollutants were shown to be well below the ambient standards at all affected locations. Emissions from the burning of HE- or DU-contaminated wood material would be the same under this alternative as under the current LANL waste management practices (see the No Action Alternative in Section 2.4).

4.2.3 Visual Resources

The Limited Burn Alternative would have a minimal effect on visual resources. The effects on visual resources under this alternative would be similar to the Proposed Action. The two primary aspects of this alternative that would affect visual resources are vegetation removal and waste pile burning activities. Vegetation removal would occur as a result of selected thinning activities and burning activities would be temporary.

There would be minimal effects on visual resources from smoke under this alternative. Although smoke from burning of slash would temporarily increase concentrations of PM and negatively affect visibility, burning would only be conducted under conditions that would keep particulate concentrations below150 $\mu g/m^3$. The negative effect of smoke on visibility would typically be less than that associated with prescribed burns that frequently occur in the vicinity of Los Alamos County and substantially less than that produced by wildfires. A variety of smoke management measures may be applied to reduce the effects on visibility. These measures are discussed in Section 2.2. Burned slash pile areas would be approximately 0.1 ac (0.04 ha) in size each and the effects from burning would be of a temporary nature until revegetation occurred. The effects of vegetation removal would be the same as for the Proposed Action.

4.2.4 Water Quality and Soil Erosion

The effects on water quality and soil erosion under the Limited Burn Alternative would be minimal. Burning of slash piles under typical controlled conditions is unlikely to create water quality or soil erosion problems. Burning slash piles that are less than one tenth acre (<0.1 ac [0.04 ha]) in size can result in scorched areas that can take several years to stabilize. Because of the small size of these areas, they are unlikely to contribute to water quality degradation or extensive soil erosion. Floodplains would be treated by both cutting and chipping and by slash pile burning. Protection for floodplains includes all of the previously listed environment protective measures. However, wetlands would not be treated.

Implementation of wildfire treatment techniques addressed under this alternative would reduce the potential for adverse flooding effects and sediment transport that could result from a catastrophic wildfire. The potential for an uncontrolled wildfire to degrade water quality or increase soil erosion would be reduced under this alternative.

4.2.5 Cultural Resources

Adverse effects on cultural resource sites would not be expected to occur under this alternative. As planned under the Proposed Action, cultural resource sites would be avoided during thinning, road or fire break construction, maintenance, and wood disposal activities. Where practical, cultural resource sites may be wet down or sprayed with foam to prevent the site from being burned while the surrounding area is treated. This technique would be especially applicable to small sites and to historic properties. Implementation of a wildfire prevention program under this alternative would benefit cultural resources by reducing the potential for adverse effects from an uncontrolled wildfire on cultural resources and historic properties at LANL.

4.2.6 Waste Management and Environmental Restoration

Effects on waste management and PRSs would be minimal under this alternative. As with the Proposed Action, uncontaminated wood would be salvaged or chipped and left in place or moved to another location on-site. In addition, slash and debris could be piled and burned.

Wood from canyon focus areas would not be released to the public. It would be disposed of as waste either by leaving it on-site whole or chipped, or disposed of at an approved or permitted waste disposal facility. If the project area contains a PRS, then the trees would be cut but left in place on the PRS (either whole or after chipping), or removed and disposed of at an appropriate permitted disposal facility. If the contaminated area was not a PRS and the contamination was HE or DU, the trees could be burned at a NMAC- or RCRA-permitted burning facility at LANL or chipped and left on-site. Burning is the standard and acceptable disposal method for trees contaminated with HE and DU because the HE is consumed during burning yet the DU would not become aerosolized. Ashes produced from burning would be collected and disposed of under standard LANL waste management procedures. Wood material contaminated with DU could also be disposed of on-site at Area G.

4.2.7 Human Health

Slash pile burning and the associated smoke would have a minimal effect on worker and public health under this alternative. Although workers could be directly exposed to fire hazards and smoke inhalation, potential worker health effects would be kept to a minimum by burning only small slash piles and through the use of physically fit and specially trained personnel and administrative controls. As planned under the Proposed Action, these administrative controls are established as part of the plan and worker protection phases of each project.

Smoke emissions would be short term and occur only during optimal dispersion conditions in accordance with applicable air permit requirements. The primary regulated components of wood smoke (i.e., particulates, hydrocarbons, and carbon monoxide) would be limited to levels that would not adversely affect human health or welfare. Because of the limited amount of fuel and area to be burned, smoke from this alternative should not affect members of the public; no adverse effects on the health of the general public are expected from limited slash pile burning activities at LANL.

4.2.8 Socioeconomics

Socioeconomic benefits would be essentially the same under this alternative as under the Proposed Action. Timber sales, wood salvaging, and local contracting would still occur. Neither local nor regional socioeconomic changes would be expected under this alternative. Since mechanical and manual thinning treatments would occur under this alternative, the number of workers would remain high but would be slightly less than for the Proposed Action. This slight decrease in the number of workers, along with slightly lower equipment costs, could decrease the overall cost of the Limited Burn Alternative compared to the Proposed Action. Because of funding uncertainties, a decrease in project costs could result in a more effective Wildfire Hazard Reduction and Forest Health Improvement Program at LANL.

4.2.9 Utilities and Infrastructure

Benefits to utilities and infrastructure at LANL would be essentially the same under this alternative as described under the Proposed Action. Activities associated with wildfire treatments would improve access to buried utilities, facilities in forested areas, and improve the visibility and safe use of roadways at LANL. The risk of an uncontrolled wildfire destroying large areas including utilities and infrastructure could be reduced sooner under this alternative than under the Proposed Action because of the slightly reduced time it would require to meet the end-state conditions and maintain them.

4.3 Burn Alternative Effects (Both Treatment and Forest Waste)

The Burn Alternative would be similar to the Proposed Action, but treatment elements would be expanded to include the use of controlled burns and the burning of wastes produced by tree thinning treatment measures. In addition to controlled burns, areas requiring treatment could be managed using mechanical thinning methods as described under the Proposed Action. Slash and debris could be chipped or disposed of in a manner that would include burning. Wood contaminated with HE would be chipped and left on-site as mulch to decay. Wood containing DU shrapnel could be burned, left on the ground, or disposed of on-site at Area G. Controlled burns under carefully planned conditions would be used to reduce ground fuels. The costs of long-term upkeep and maintenance would be lower under this alternative than under the Proposed Action or the Limited Burn Alternative because the work would be much less labor intensive.

4.3.1 Biological Resources

Under the Burn Alternative, the effects on biological resources, including all the federal and state listed threatened and endangered species, would be similar to the Proposed Action. Vegetation alterations and tree thinning activities would still occur. Because there would be controlled burns, there would also be temporary disturbance resulting from burning activities, and a slight temporary decrease in habitat modification and disturbance resulting from chipping and spreading of slash. Burning releases nutrients more quickly into the soil than decay of slash and chips, thus the Burn Alternative would allow the release of these nutrients more quickly then expected under the Proposed Action. Therefore, the growth of understory vegetation would be greater with the Burn Alternative or the Limited Burn Alternative. Burning also improves forest health by destroying some disease organisms and insects that may occupy forest litter during some stages of their life cycle. Some plant species (such as certain trees) have evolved so as to

depend upon fire to aid in the germination of seeds; this alternative would benefit the reproduction of these species. Fire is recognized as being an important feature of natural ecosystems in the Southwest for this and other reasons. Burning would result in a positive effect on the overall forest ecology.

4.3.2 Air Quality

The effects on air quality would increase under the Burn Alternative but would not pose an unacceptable health or environmental hazard. Controlled burning would result in short-term temporary increases in criteria air pollutants from burning up to 100 ac (40 ha) a day. Typical daytime wind patterns for LANL are south, southwest, or southeast. Since the *Clean Air Act* Class I airshed located in BNM is directly upwind from LANL (i.e., BNM lies to the south/southwest of LANL), no smoke effects would occur to this airshed. Avoiding northerly winds during burning operations would prevent any smoke from entering the Bandelier airshed. Before burning, meteorological conditions would be modeled using SASEM, which is NMED's preferred model to determine the range of humidity, temperature, and wind speed and direction that is necessary to ensure that the air quality standard for particulate emissions (150 $\mu g/m^3$) is not exceeded during the burn. Mechanized equipment used for cutting, hauling, and chipping fuels would have about the same daily exhaust emissions associated with a small-scale construction project (such as a project using one loader and two dump trucks). However, the total amount of equipment emissions would be less under this alternative than what would occur under the Proposed Action or the Limited Burn Alternative.

Burn permits administered by NMED would be required; these would limit allowable emissions to National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards. Over the years, extensive modeling, using site-specific data, has been conducted at LANL to assess the effects on air quality from burning wood potentially contaminated with HE and DU. Specific air pollutants considered included criteria pollutants such as carbon monoxide, nitrogen oxides, PM, sulfur oxides, and DU. The emissions from all regulated pollutants were shown to be well below the ambient standards at all affected locations.

4.3.3 Visual Resources

The overall effects on visual resources would be similar under this alternative to the Proposed Action. The two primary aspects of this alternative that would affect visual resources are burning activities and vegetation removal. Burning activities would be temporary and vegetation removal would occur as a result of selected thinning activities.

Although smoke from controlled burns and burning of slash and detritus would temporarily increase concentrations of PM and negatively affect visibility, burning would only be conducted under conditions that would keep particulate concentrations below150 $\mu g/m^3$. Because fuel loads would be reduced by mechanical means before burning in densely vegetated areas, the negative effect of smoke on visibility would typically be less than that associated with prescribed burns conducted on SFNF and substantially less than that produced by the Cerro Grande Fire. A variety of smoke management measures may be applied to reduce the effects on visibility. These measures are discussed in Section 2.3. There would be stumps shorter than 6 in. (15 cm) remaining after mechanical treatment. Burned areas could be visible until revegetation returned. Removal trees would be marked on the side away from viewing so as not to be an eyesore.

The forest would become more park-like with an increase in the diversity of shrubs, herbs, and grasses in the understory. Some LANL facilities currently screened from casual view may become visible to viewers at various vantage points. The overall effect of this alternative would be to make the contrast between the natural setting and LANL's industrial character more obvious. Tall structures that are already visible from surrounding areas would not be more visible than they are currently. The effects of vegetation removal would have minimal effects on the degraded panoramas of the Pajarito Plateau and Jemez Mountains.

4.3.4 Water Quality and Soil Erosion

Minimal effects on water quality and soil erosion would be expected under this alternative. Burning under typical controlled conditions is unlikely to create water quality or soil erosion problems. DeBano et al. (1996) published average sediment transport estimates from light, moderate, and severe burns in southwestern ponderosa pine forests. Estimates from light and moderate burns (comparable to controlled burns) range from a high of approximately 4 lbs/ac/year (yr) (0.72 kilogram [kg]/ha/yr) in the first year following fire to background levels in 4 to 8 years. This is well below the maximum soil loss tolerance level of 5 tons/acre/yr (1.8 t/ha/yr) considered to be representative of the area around LANL (McCormack and Young 1980). Burning slash piles less than one-tenth acre (<0.1 ac [0.04 ha]) in size can result in scorched areas that can take several years to stabilize. Because these areas are small, they are unlikely to contribute to water quality degradation or extensive soil erosion. Floodplains would be treated by cutting or burning. Protection for floodplains includes all of the previously listed environment protective measures. However, wetlands would not be treated.

Implementation of wildfire treatment techniques addressed under this alternative would reduce the potential for adverse flooding effects and sediment transport that could result from a catastrophic wildfire. The potential for an uncontrolled wildfire to degrade water quality or increase soil erosion would be reduced under this alternative.

4.3.5 Cultural Resources

Minimal adverse effects on cultural resources would be expected to occur under this alternative. Known cultural resources would be avoided during all treatments and not burned under this alternative. However, as surface debris and rubble are burned, unknown archaeological sites and TCPs may be uncovered. Actual damage to archaeological sites would be minimal, while the potential damage to TCPs would be dependent on the physical composition of the site. Where practical, cultural resource sites may be wet down or sprayed with foam to prevent the site from being burned while the surrounding area is treated. This technique would be especially applicable to small sites and to historic properties. Back burns could also be conducted to direct the controlled burn away from the cultural resource sites. Cultural resource sites would be avoided during thinning, road or fire break construction, maintenance, and wood disposal activities. Implementation of a wildfire prevention program under this alternative would benefit cultural resources by reducing the potential for adverse effects from an uncontrolled wildfire on cultural resources and remaining historic properties at LANL.

4.3.6 Waste Management and Environmental Restoration

Effects on waste management and PRSs under this alternative would be minimal. As with the Proposed Action, uncontaminated wood would be salvaged or chipped and left in place or moved to other locations at LANL. It could also be piled and burned.

Wood from canyon focus areas would not be released to the public. It would be disposed of as waste either by piling and burning, leaving it on-site whole or chipped, or disposed of at an approved or permitted waste disposal facility. As under the Proposed Action, there would be no hazardous or radioactive waste generated from construction of new fire roads or maintenance of old fire roads.

If the project area was a PRS, then the trees would be cut but left in place on the PRS (either whole or after chipping), or removed and disposed of at an appropriate permitted disposal facility. If the contaminated area was not a PRS and the contamination was HE or DU, the trees could be burned at a NMAC- or RCRA-permitted burning facility at LANL or chipped and left on-site. Burning is the standard and acceptable disposal method for trees contaminated with HE and DU because the HE is consumed during burning yet the DU would not become aerosolized. Ashes produced from burning wood would be collected and disposed of under standard LANL waste management procedures. Wood material contaminated with DU could also be buried on-site at Area G.

4.3.7 Human Health

The effects on human health would be minimal under this alternative. Although health hazards from fire and smoke would occur, exposures to mechanical hazards would decrease as compared to the Proposed Action.

Controlled burns and their associated smoke have the potential to affect worker and public health. Workers could be directly exposed to fire hazards and smoke inhalation. Potential worker health effects would be kept to a minimum through the use of physically fit and specially trained personnel and administrative controls. These administrative controls would be established as part of the plan formulation and worker protection phases of the Proposed Action described in Section 2.1.

The public could be exposed to smoke. Smoke emissions would be short term and occur only during optimal dispersion conditions in accordance with applicable air permit requirements. The primary regulated components of wood smoke (i.e., particulates, hydrocarbons, and carbon monoxide) would be limited to levels that would not adversely affect human health or welfare. However, the smoke could be a temporary irritant to nearby members of the public. Under this alternative, no PRSs would be burnt in controlled fires. Controlled burns operate at a lower ground surface temperature than wildfires. This is one of the factors that minimizes particle suspension forces in controlled burns, which, in turn, would result in less suspension of burned vegetation and soil. No adverse effects on the health of the general public are expected from burning activities at LANL.

4.3.8 Socioeconomics

Socioeconomic benefits would be essentially the same under this alternative as under the Proposed Action. Timber sales, wood salvaging, and local contracting would still occur. Neither local nor regional socioeconomic changes would be expected under this alternative. Since thinning and controlled burn treatments would be allowed under this alternative, a decrease in the number of workers would occur. This decrease in workers, along with reduced equipment costs, would decrease the overall cost of the Burn Alternative compared to the Proposed Action. Because of funding uncertainties, a decrease in project costs would result in a more effective Wildfire Hazard Reduction and Forest Health Improvement Program at LANL.

4.3.9 Utilities and Infrastructure

Benefits to utilities and infrastructure at LANL would be essentially the same under this alternative as described under the Proposed Action. Activities associated with wildfire treatments would improve access to buried utilities, facilities in forested areas, and improve the visibility and safe use of roadways at LANL. The risk of an uncontrolled wildfire destroying large areas including utilities and infrastructure could be reduced sooner under this alternative than under the Proposed Action and the Limited Burn Alternative because of the reduced time required to meet the end-state conditions and maintain them.

4.4 No Action Alternative Effects

The No Action Alternative would be a continuation of existing conditions and ongoing management measures as discussed in Section 2.4. The fuels inventory would continue to increase for both the areas at LANL that were burned by the Cerro Grande Fire and areas that were not burned. There would be very limited tree cutting as required by general "good housekeeping" practices and waste disposal activities would be minimal under this alternative. These "good housekeeping" practices would only be conducted within a 100-ft (30-m) area next to structures, roads, and parking facilities.

4.4.1 Biological Resources

The No Action Alternative would not produce immediate changes to biological species and their habitats. However, long-term habitat quality would not improve as it would under the Proposed Action or alternative scenarios. Under the No Action Alternative, there is a high risk of another catastrophic wildfire at LANL. This type of wildfire would damage or destroy additional habitat and would have dramatic long-term effects on many of the biological resources, including the federal and state listed threatened and endangered species at LANL.

4.4.2 Air Quality

Emissions of criteria pollutants would be substantially less under this alternative than under either the Proposed Action, the Limited Burn, or the Burn Alternative as there would be no controlled burning and the use of machinery and vehicles to reduce vegetation would be limited to the "good housekeeping practices" discussed in Section 4.4. Minimal air emissions from routine maintenance activities would continue to occur under the No Action Alternative. If, however, a wildfire occurred, air emissions would be expected to be much higher than either the Proposed Action or the alternatives. Particulate emissions could not be controlled so as to

maintain concentrations at less than 150 $\mu g/m^3$ and wildfire damage to facilities at LANL could result in uncontrolled releases of hazardous materials.

4.4.3 Visual Resources

Under the No Action Alternative, the high risk of another uncontrolled wildfire at LANL could result in additional changes to the viewshed in and around LANL. In the event of another wildfire, particulate concentrations would likely exceed 150 $\mu g/m^3$ and would affect visibility for long periods of time.

There would be a slight increase in the visibility of LANL facilities from vegetation removal associated with general maintenance activities under this alternative. Because much less vegetation would be removed, the effects would be less than those of the Proposed Action or either of the alternatives. In the event of another wildfire, however, destruction of vegetation would make additional areas of LANL more visible.

4.4.4 Water Quality and Soil Erosion

The No Action Alternative would produce minimal short-term effects on water quality and soil erosion under normal conditions. Maintenance activities would be conducted to maintain existing treated areas. No large new areas would undergo treatment at LANL. However, long-term adverse effects from additional uncontrolled wildfires could occur.

The most serious potential consequence of not conducting wildfire mitigation actions is an increased risk of another catastrophic wildfire. Catastrophic wildfire, such as the Cerro Grande Fire, can result in substantial soil erosion and flooding that can destroy on-site productivity for years and devastate downstream resources. Facilities and natural resources located on floodplains below burned areas are at an increased risk of flood damage. An analysis of flood hazards in Capulin Canyon on BNM following the 1996 Dome Fire revealed an increase in flood magnitude of over 100 times the average annual summer thunderstorm flood (Veenhuis 1999). Erosion rates as high as 20 times what they were before the fire have been predicted for certain areas on LANL lands during a 100-year 6-hour duration flood event (BAER 2000). Wildfire suppression activities that include the use of heavy equipment can result in increased erosion, contaminant transport, and adverse effects on water quality. The risk of soil erosion and contaminant transport associated with catastrophic wildfire is much greater than that associated with wildfire treatment measurements under the Proposed Action or either of the alternatives.

4.4.5 Cultural Resources

Under the No Action Alternative, tree thinning, burning of slash piles, fire break construction, and wood disposal activities would not occur in the vicinity of cultural resource sites. However, facility maintenance activities would continue to occur. No adverse effects to cultural resources from on-going maintenance activities would occur.

The No Action Alternative would allow the fuel load to increase through time, potentially placing cultural resources and TCPs at an increased risk of being exposed to high-intensity fires. This would have a catastrophic effect on historic wood structures and features similar to what occurred during the Cerro Grande Fire. These high-intensity fires would develop intense heat

and therefore cause extensive surface damage to cultural resources and TCPs and increase the potential for soil erosion and additional site damage.

4.4.6 Waste Management and Environmental Restoration

The No Action Alternative would produce minimal waste from the conduct of forest maintenance activities. However, if no forest treatments occur, the potential for another catastrophic wildfire increases. If another wildfire occurs within LANL boundaries, waste volumes could reduce the capacities of landfills currently operating within LANL boundaries and Los Alamos County. Waste items could include trees, structures, and infrastructure. Many of the waste items could potentially contain hazardous and radioactive materials. Waste characterization would be a monumental endeavor, but would be necessary for waste to be disposed at a licensed waste disposal facility. No new fire roads would be constructed, and no old fire roads would be improved or reclaimed. Therefore, there would be no potential for hazardous or radioactive waste generated from fire road construction, improvement, or reclamation. PRSs could be affected by a catastrophic wildfire. PRSs previously characterized may need to be characterized again because the contaminant levels could increase or decrease, depending on the type of PRS and severity of the fire. PRS boundaries may be difficult to recognize after a fire. Releases from PRSs during a fire could produce a health risk to the environment and to human health.

Wood contaminated with HE could be chipped and left on-site as mulch to decay; wood containing DU shrapnel could be left on the ground or disposed of at Area G, or the trees could be left standing. Wood materials contaminated with HE or DU could also be burned at RCRA- or NMAC-permitted LANL burning facilities, which is the current practice.

4.4.7 Human Health

Under the No Action Alternative, there is a minimal potential to affect worker and public health. Routine maintenance activities would continue to pose minimal hazards to workers. Small-scale burns from maintenance activities would provide minimal fire and smoke hazards. The potential for substantial worker and public health hazards from an uncontrolled wildfire would remain high under this alternative. Another catastrophic wildfire could pose substantial hazards to workers and the public from smoke, flames, floods, and potential hazardous material and contaminant releases.

4.4.8 Socioeconomics

Socioeconomic benefits associated with timber sales, salvaging, fuel permits, and local contracting opportunities would not occur under this alternative. In addition, a continued high wildfire danger at LANL could adversely affect Los Alamos County's ability to maintain or attract new residences or businesses to the area.

4.4.9 Utilities and Infrastructure

This alternative would have a minimal benefit to utilities and infrastructure at LANL. Routine facility maintenance activities would continue to be conducted around key facilities and other critical infrastructure sites. However, large portions of existing utility lines and other infrastructure would remain highly vulnerable to wildfire risk. The loss of certain key facilities

or infrastructure could adversely affect DOE's ability to meet its national security and other important missions at LANL. Hazardous and radioactive materials could also be released to the environment if key facilities or other infrastructure were damaged or destroyed by wildfire. Because of the overall high value of utilities and infrastructure at LANL, even a small percent loss could cost millions of dollars to replace.

4.5 Comparison of Effects Among Alternatives

Table 4-1 summarizes and compares the effects of the Proposed Action, the Limited Burn Alternative, and Burn Alternative to the No Action Alternative.

5.0 ACCIDENT ANALYSES AND REVIEW

5.1 Introduction

The purpose of evaluating accident analyses is to weigh accident issues among the alternatives so that DOE can consider this information in deciding which alternative to pursue. The objectives of this chapter are to (1) characterize the overall risk of injury, illness, or death to workers or the public resulting from accidents and (2) realistically qualify and/or quantify the risk among the alternatives. In accordance with DOE NEPA guidance, the level of complexity of this review and analyses is commensurate with the scope of the project and the relative level of this document, (i.e., an EA not an EIS). This "graded approach" also applies to the various accidents considered within the scope of this EA. Some accidents have a greater potential for causing environmental effects than others; therefore, they are discussed in greater detail. For example, the No Action

Alternative (or failure to implement the Proposed Action) carries a relatively high risk of catastrophic wildfire. Therefore, this potential accident is addressed in detail, through incorporation by reference, as the bounding case accident. The LANL SWEIS (DOE 1999a) established the baseline risk from wildfire and the bounding accident analysis. This EA tiers from the SWEIS. In addition, information from the Cerro Grande Fire has been added where appropriate. In general, the human health consequences of the Cerro Grande Fire at LANL have been less severe than estimated in the SWEIS accident analysis.

A limited spectrum of accidents was considered for the Proposed Action and for each alternative. In general, a bounding accident is an implication of consequence only, and consideration of consequence without consideration of frequencies distorts the evaluation. However, the calculation of accident frequencies inherently includes a large margin of uncertainty. Therefore, even when the frequency of a bounding accident is considered in the context of risk, it may add little to the accuracy of the analysis. For this EA, accident risk considers both frequency and consequences.

TABLE 4.1—*Comparison of Alternatives*

Factor	Proposed Action	Limited Burn Alternative	Burn Alternative	No Action Alternative
Biological Resources	Long-term improvement to forest health, increased biodiversity, increased protection of biological resources. Increase in biomass and diversity of understory vegetation. Temporary effects include temporarily displacing local wildlife, some decrease in use of some areas by certain species. Minimal effects on threatened and endangered species.	Very similar to Proposed Action except more disturbance to habitats due to treatment by pile burning. Faster increase of understory biomass and vegetation diversity.	Very similar to Proposed Action except more disturbance to habitats due to treatment by pile and controlled burning and faster increase of understory biomass and vegetation diversity.	No long-term improvements to forest health conditions resulting from this alternative. Fuel loading would continue to increase and biodiversity would decrease. There would be an increased potential for another catastrophic wildfire that may destroy habitat and negatively impact biological resources, including threatened and endangered species.
Air Quality	Minimal effects from mechanical and manual treatments.	Similar to Proposed Action. There would be very limited emissions from burning slash piles, but slightly decreased amounts of emissions from decreased use of mechanical treatments.	Similar to Proposed Action. There would be limited emissions from burning, but decreased amounts of emissions from decreased use of mechanical treatments.	No increases of emissions of criteria pollutants resulting from this alternative. However, if another catastrophic wildfire occurred, air emissions would exceed emissions expected under the Proposed Action and the alternatives and would likely be far in excess of air quality standards.
Visual Resources	Small temporary negative effect on visibility during vegetation thinning. Vegetation removal would increase contrast between buildings and forest at LANL.	Very limited visual effect from smoke emissions. Similar effects from vegetation removal as that of the Proposed Action.	Limited visual effect from smoke emissions. Similar effects from vegetation removal as that of the Proposed Action.	No visual resources effects resulting from this alternative. However, if another wildfire occurred, visual resources could be more severely affected.
Water Quality and Soil Erosion	Long-term increased ground cover and decreased soil erosion. Temporary soil disturbance.	Similar effects as for Proposed Action.	Similar effects as for Proposed Action.	No positive long-term decreased soil erosion. However, if there was another catastrophic wildfire, there could be much erosion and a very large negative impact on surface water quality; flooding hazards would increase.

Table 4.1 cont.

Factor	Proposed Action	Limited Burn Alternative	Burn Alternative	No Action Alternative
Cultural Resources	No adverse effects. Some potential to improve protection of sites because of decreased erosion potential.	Same as the Proposed Action.	Similar to the Proposed Action except that controlled burning has the potential to expose archaeological sites and TCPs. Minimal effects to archaeological sites would be expected while the effects to TCPs would be unknown.	Minimal effects to cultural resources resulting from potential on-going erosion effects. However, another catastrophic wildfire could harm or destroy numerous sites.
Waste Management and Environmental Restoration	Small amount of waste would be generated that would require disposal in a landfill. PRSs would not be disturbed.	Less wastes for disposal at landfills and there would be a decrease in chipping of waste for use as mulch material compared to the Proposed Action.	Less wastes for disposal at landfills and there would be a greater decrease in chipping of waste for use as mulch material compared to the Proposed Action.	Minimal effects from this alternative. However, should a catastrophic wildfire occur, there could be huge amounts of waste generated, including low-level radioactive, hazardous, and mixed wastes. PRSs could be disturbed and some may be difficult or impossible to cleanup after a fire.
Human Health	No exposure to smoke for workers and the public. Some risk from physical hazards.	Minimal exposure to smoke for workers and the public. Minimal risk from physical hazards.	Slightly elevated exposure to smoke for workers and the public. Minimal risk from physical hazards.	Potential effects from physical hazards similar to the Proposed Action but on a much smaller scale. However, another catastrophic wildfire could pose substantial hazards to workers and the public from smoke, flames, flooding, and potential hazardous material and contaminant releases.
Socioeconomics	Minimal increase to local or regional economics and no expected change to populations.	Similar to Proposed Action.	Similar to Proposed Action.	No changes to current socioeconomic conditions from this alternative.
Utilities and Infrastructure	Important beneficial effects to the protection of and enhanced ability to repair utilities, facilities, and infrastructure. Reduced threat of accidental release of contaminants to environment and destruction of utilities and infrastructure.	Similar to Proposed Action.	Similar to Proposed Action.	No changes to infrastructure or utilities under this alternative. Another catastrophic wildfire could devastate structures and utilities and compromise DOE's national security and other missions at LANL.

Several general goals were identified for the accident analyses and review in this chapter:

1. Where possible, a more realistic approach than the conservatism used in typical safety analysis report analyses was taken, e.g., using the most probable meteorological values, using actual radiological inventories, or using actual size distribution of airborne particles.
2. Consistency among accidents with the LANL SWEIS was pursued.
3. Accident likelihood and consequences were considered in the context of risk that may include carrying dose consequences through to a metric of health effect measured as incremental change in latent cancer fatalities (LCFs).
4. The effect of an accident on human health is the most severe consequence to be considered.

5.2 Methods

The general method used was to review appropriate literature and interview wildfire experts in order to accomplish the following:

1. Identify and Screen Accidents

   A spectrum of potential accidents was identified that represents various processes, types of materials at risk, types of accident initiators, and types of consequences that can be anticipated for the alternatives. By definition, accidents are not expected; i.e., have a frequency of occurrence of less than or equal to once per ten years ($\leq 1 \times 10^{-1}$/yr). Health incidences expected to occur at an estimated frequency of greater than or equal to once per year ($\geq 1 \times 10^{0}$/yr) are considered a human health issue. Also, accidents that were identified to be of interest to the public were reviewed.

2. Reduce List of Potential Accidents

   The list of potential accidents was first reduced to those that were considered credible, specifically ones that have an estimated frequency of occurrence of once per ten years to once per one million years (1×10^{-1}/yr – 1×10^{-6}/yr). Potential accidents that were known to be inconsequential (not a threat of serious illness, injury, or death) were dismissed. The remaining accidents were then binned by processes, types of materials at risk, types of accident initiators, and types of consequences.

3. Analyze Consequences

   Consequences in terms of human health dose or threats of serious illness, injury, or death were estimated. Where possible, comparisons of estimated consequences were made to those that might occur to the general population or to forest product industries.

4. Estimate Risk

   The consequence and the likelihood of the consequence occurring was considered for the remaining potential accidents.

5.3 Results

Potential accident initiating events were identified and reduced to a credible list. These credible accident initiators included cutting, chipping, and other mechanical processes (e.g., the use of skidders); burning, maintenance, and waste management/material disposal.

No accidents that are likely to result in a fatality are expected to occur from implementing the Proposed Action or any of the alternatives. Accidents could arise from mechanical processes such as using chain saws to fell trees during the thinning process, chipping tree and branch thinnings, and the use of skidders to move thinnings to a staging or processing area. A wide range of effects could result from these kinds of activities, including minor perturbations such as scrapes, cuts, and bruises as well as more serious injury, illness, and death. The rate of fatal occupational injury in the forestry and logging occupations is about 155 per 100,000 workers per year (NSC 1994). This equates to a fatal accident every 645 years for each worker, which is in the range of once per ten years to once per hundred years (1×10^{-1}/yr – 1×10^{-2}/yr). Specific initiators that can, within reason, result in death in the forestry industry are a tree falling on a worker, contact with high-power lines, falls, exposures to hazardous substances or extreme environments, and transportation. However, because of the rigorous health and safety planning required to perform treatments, it is estimated that the frequency of a fatal occupational injury at LANL from the Proposed Action would be less than once in 100 years (less than 1×10^{-3}/yr).

The potential for accidents to affect workers would be essentially the same under the Limited Burn and Burn Alternatives as it is under the Proposed Action. The risk of accident or injury to workers from exposure to smoke and fire would only be possible under the Limited Burn and Burn Alternatives. However, because a greater amount of manual and mechanical treatment would be required to compensate for the absence of fire under the Proposed Action, the potential for accident or injury from this type of treatment would be expected to decrease under the Limited Burn and Burn Alternatives. Therefore, the overall accident risk would not be expected to change.

The No Action Alternative would continue the limited forestry management practices at LANL without the implementation of a long-term wildfire hazard reduction and forest health implementation program. This alternative includes maintenance actions that have been initiated to reduce wildfire risk to major LANL facilities.

The site-wide wildfire accident scenario postulated and analyzed by the LANL SWEIS as SITE – 04, Site-Wide Wildfire Consuming Combustible Structures and Vegetation (DOE 1999a) is the risk-dominant accident for this type of initiator/consequence combination. This conservative scenario indicates that no LCFs should occur from exposure to radioactive emissions resulting from a wildfire at LANL. This scenario was verified by air monitoring conducted during the Cerro Grande Fire at LANL.

The SWEIS analysis consisted of a thorough consideration of factors involving a potential wildfire initiated to the southwest of LANL, which advances through the LANL site boundary charring both forested areas and buildings within the Laboratory. This scenario matches what actually occurred during the Cerro Grande Fire. In order to establish an upper extreme of potential effects, many additional modeling parameters were conservatively chosen in the LANL SWEIS analysis.

The estimated frequency of occurrence of a fire moving to the edge of LANL was 0.1 per year, or once every 10 years. This frequency was estimated from the joint probability of (1) ignition in an adjacent forest, (2) fire danger, (3) ability to extinguish the fire, (4) wind conditions, (5) humidity, and (6) precipitation. Volume III, Part B, Page G-103, *Wildfire Frequency*, of the

SWEIS should be consulted for additional details on how the frequency of a wildfire at LANL was derived. Because of the Cerro Grande Fire, the actual frequency of another wildfire occurring at LANL or the surrounding area would be less over the short-term, but could be even greater in the long-term due to the stimulation of growth due to the release of nutrients.

The SWEIS wildfire analysis considered two cases: one in which structures with inventories of radioactive or chemical burned and a second in which mitigations (such as tree thinning and brush removal) were undertaken at vulnerable structures and the structures with inventories did not burn. The collective dose from the first wildfire accident scenario was estimated at 675 person-rem, which would be expected to result in 0.34 LCFs. Since 0.34 LCFs are less than one, no radiation induced fatalities are expected. The radiation dose consequences from the second case of 1.0 millirem (mrem) at the source, 0.04 mrem at 333 ft (100 m), and 3,333 ft (1,000 m) from the postulated fire, respectively, were estimated for maximally exposed individuals. The radiation dose from the second case resulted from the burning of vegetation only. Preliminary monitoring results from the Cerro Grande Fire also indicate that no LCFs are expected as a result of the wildfire. For additional details of the health risk analysis, Volume III, Part B, Section G, 5.4.4 of the LANL SWEIS should be consulted (DOE 1999a).

6.0 CUMULATIVE EFFECTS

Cumulative effects on the environment result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes them. These effects can result from individually minor, but collectively significant, actions taking place over a period of time (40 CR 1508.7). This section evaluates the cumulative effects of implementing the Proposed Action, the Limited Burn Alternative, and the Burn Alternative with the effects resulting from common issues of other actions that have, are, and will be taken at LANL or in the ROC as generally shown on Figure 8. The No Action Alternative would not reduce the risk of another catastrophic wildfire that could have a serious adverse cumulative effect on resources at or in the vicinity of LANL.

No long-term adverse cumulative effects are expected to occur from implementing the Proposed Action, the Limited Burn Alternative, or the Burn Alternative. As discussed in Section 4.0, the Proposed Action and each alternative are not expected to have long-term adverse effects on air quality, visual resources, water quality, soil erosion, cultural resources, waste management, human health, socioeconomics, or utilities and infrastructure at LANL. Only biological resources, particularly wildlife habitat, may be affected by the Proposed Action and each alternative. The Proposed Action and each alternative, except the No Action Alternative, would have a long-term beneficial contribution to any cumulative effects on various resources resulting from actions at LANL or by surrounding land managers.

Activities discussed in the LANL SWEIS, two recently approved projects within the boundaries of LANL, and the Cerro Grande Fire are considered here for the cumulative effects assessment. As stated in the LANL SWEIS and Record of Decision, ecological and biological resources would not be adversely affected by ongoing and certain expanded operation at LANL (DOE 1999a). The *EIS for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE 1999b) and its subsequently issued Record of Decision

concluded that habitat could be fragmented, wildlife migration corridors could be disrupted, and that the disposal of land to the identified parties, particularly where it would be conveyed outside of federal government control, could result in less-rigorous environmental review and protection processes. However, most of the land to be conveyed would be preserved or used for recreation; only a small portion is planned for development. According to the EA and Finding of No Significant Impact for the *Electrical Power System Upgrades at Los Alamos National Laboratory* (DOE 2000b and DOE 2000c), less than 25 ac (10 ha) of land would be disturbed by that project. Reseeding and stabilization would be done to restore disturbed areas. The Cerro Grande Fire burned about 43,000 ac (17,200 ha) with 7,500 ac (3,000 ha) of land (including facilities and infrastructure) at LANL. However, the burned areas still require treatment and maintenance. Recovery of the burned areas would be enhanced by actions proposed in this EA. Since the Proposed Action and each alternative would enhance biological resources, no long-term adverse cumulative effects would be expected within the boundaries of LANL.

There were several forest management projects planned for areas surrounding LANL before the Cerro Grande Fire that could have a cumulative effect on biological resources that occur at and in the vicinity of LANL. Most of these projects focused on wildfire fuel reduction. As a consequence of the Cerro Grande Fire, additional prescription burns in the vicinity of LANL are not expected in the near future.

Forested lands adjacent to LANL have been subjected to fire suppression regimes similar to those at LANL during the 20th century. Forest managers at BNM, DOI (for San Ildefonso Pueblo and Santa Clara Pueblo), San Ildefonso Pueblo, County of Los Alamos, and the SFNF could reduce fuel loads (and wildfire risk) on properties under their jurisdiction using mechanical thinning and prescribed burns. Their end-state objectives are similar to those presented in this EA and they, too, must meet the same air quality standards, threatened and endangered species and cultural resource compliance, and watershed protection measures that bound the Proposed Action and alternatives in this EA. Any controlled burns at LANL would be coordinated among the agencies through the IWMT or similar cooperative efforts. These controlled burns would be staggered to preclude cumulative short-term effects that could appreciably degrade environmental quality, especially air quality.

From an ecosystem perspective, the combined forest management efforts at LANL, County of Los Alamos, BNM, San Ildefonso Pueblo, Santa Clara Pueblo, and SFNF would improve forest health and wildlife habitat and would stabilize the watershed. Water quality would be improved and cultural resources would be protected from degradation by erosion. Forest fires and ecosystems do not respect administrative boundaries; should DOE decide to manage forests at LANL in a manner that would complement adjacent forest management practices, administrative boundaries would look continuous and be unnoticeable.

In summary, the Proposed Action, the Limited Burn Alternative, and the Burn Alternative would restore forested lands at LANL to a healthier, more natural state that would be consistent with the fire protection and forest management policies of agencies that manage lands that surround LANL. Wildlife habitat would be correspondingly improved. Under the Proposed Action and each alternative, forests at LANL would blend into the surrounding landscape and would not pose an elevated forest fire risk to the neighboring lands. Therefore, the effects of the Proposed

Action, when combined with those effects of other actions defined in the scope of this chapter, would not result in cumulatively significant impacts.

7.0 CONSULTATION AND COORDINATION WITH OTHER AGENCIES

Federal Agencies

U.S. Department of Interior, U.S. Fish and Wildlife Service (USFWS)

In 1998, DOE issued the Threatened and Endangered Species HMP for LANL. The HMP was submitted to the USFWS for review and consultation consistent with Section 7 consultation requirements of the U.S. Endangered Species Act. On February 12, 1999, USFWS concurred with DOE's determination that implementation of the HMP may affect, but is not likely to adversely affect, threatened and endangered species at LANL. All activities that would be conducted under the Proposed Action or each alternative analyzed in this EA would strictly adhere to the guidelines specified in the HMP or to restrictions developed during consultation with USFWS on project plans. A Biological Resources Management Plan is to be developed for LANL under the Integrated Resources Management Plan required by the MAP for the LANL SWEIS. This plan would address site-wide forest management activities including a detailed fire management strategy. It is anticipated that this plan would be developed in consultation with the USFWS.

U.S. Department of Agriculture, Forest Service, Santa Fe National Forest

U.S. Forest Service staff provided technical expertise and assisted in the preparation of this EA. In addition, U.S. Forest Service staff provided information on planned forest management practices and recovery plans following the Cerro Grande Fire on U.S. Forest Service administered lands in the vicinity of LANL.

Interagency Wildfire Management Team (IWMT)

The IWMT is an informal advisory team that provides advice and shares information on wildfire related issues at or in the vicinity of LANL. The IWMT is composed of representatives from DOE, UC, SFNF, BNM, County of Los Alamos, San Ildefonso, and the New Mexico Forestry Division. The IWMT provided information that was used in the preparation of this EA.

State Agencies

New Mexico Office of Cultural Affairs, Historic Preservation Division

A Programmatic Agreement among the DOE, New Mexico State Historic Preservation Office, and Advisory Council on Historic Preservation concerning the management of cultural resources at LANL was executed in April 2000. All activities under the Proposed Action and each alternative would comply with the provisions of the Programmatic Agreement. Under the agreement, treatment methods would be considered undertakings of no effect to historical sites at LANL through avoidance of the resources. In those instances where sites cannot be avoided and there is a potential for effects, consultation is required in Section 106 of NHPA will be initiated.

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APPENDIX

TABLE A.1—*Scientific Names of Plant and Animal Species Mentioned in the Wildfire EA*

Common Name	Scientific Name
Plants	
Spruce	*Picea engelmannii* Parry ex Engelm., *Picea pungens* Engelm.
Fir	*Abies sp.*
Aspen	*Populus tremuloides* Michx.
Ponderosa pine	*Pinus ponderosa* P&C Lawson
Piñon	*Pinus edulis* Engelm.
Juniper	*Juniperus monosperma* Engelm., *J. scopulorum,* Sarg.
Animals	
Bald eagle	*Haliaeetus leucocephalus*
Mexican spotted owl	*Strix occidentalis lucida*
Southwestern willow flycatcher	*Empidonax traillii extimus*
Elk (Rocky Mountain)	*Cervus elaphus*
Mountain lion	*Felis concolor*
Coyote	*Canis latrans*
Deer (mule)	*Odocoileus hemionus*
Bear (black)	*Ursus americanus*
Whooping crane	*Grus americana*
Peregrine falcon	*Falco peregrinus anatum*
Black-footed ferret	*Mustela nigripes*
Prairie dogs	*Cynomys lucoricianus, C. gunnisoni*
Lilljeborg's pea-clam	*Pisidium lilljeborgi*
Wrinkled marsh snail	*Stagnicola caperatus*
Jemez Mountains salamander	*Plethodon neomexicanus*
Boreal owl	*Aegolius funereus*
Broad-billed hummingbird	*Cynanthus latirostris magicus*
White-tailed ptarmigan	*Lagopus leucurus altipetens*
Gray vireo	*Vireo vicinior*
Baird's sparrow	*Ammodramus bairdii*
Spotted bat	*Euderma maculatum*
American marten	*Martes americana origenes*
New Mexican jumping mouse	*Zapus hudsonius luteus*

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LA-UR-01-2017

Title: Wildfire Hazard Reduction Project Plan

By: ESH-20, Ecology Group

Date: April 2001

Los Alamos
NATIONAL LABORATORY

Contents

Figures

1.0 INTRODUCTION

On August 10, 2000, the Department of Energy (DOE) Los Alamos Area Office Manager issued a Finding of No Significant Impact (FONSI) (DOE 2000a) for the Wildfire Hazard Reduction and Forest Health Improvement Program Environmental Assessment (EA) (DOE 2000b) (both the FONSI and EA are reproduced in full as Appendix B of this plan). As part of this determination, a Wildfire Hazard Reduction Project Plan (WHRPP) was identified as needed for completion. This plan identifies planning areas and projects by priority on a three-phase implementation schedule. This plan has been prepared to provide the basis for directing programmatic and project-specific actions to reduce the risk of catastrophic wildfire at Los Alamos National Laboratory (LANL). It also provides the basis for consultation with the US Fish and Wildlife Service (USFWS) and the New Mexico State Historic Preservation Office as needed. Vegetation treatments have been developed for facility infrastructure protection and for fuel reduction and forest health purposes.

The initial sections of this plan contain background, describe existing conditions, and provide goals and objectives of the project. Then, a detailed implementation section follows and includes individual project planning measures, forest prescriptions, and environmental protection measures. A final section provides maps and project description tables. This plan is a "living document;" as time passes and work is performed, this plan is expected to evolve.

2.0 BACKGROUND

LANL is located in north-central New Mexico (Figure 1) in a region characterized by forested areas with mountains, canyons, and valleys, as well as diverse cultures and ecosystems. It is located on the Pajarito Plateau, a volcanic shelf on the eastern slope of the Jemez Mountains at an approximate elevation of 7,000 ft (2,100 m). Within the boundaries of LANL, the Pajarito Plateau is dissected by more than 13 canyons over the entire Plateau and have formed isolated finger-like mesas oriented in a west-to-east direction.

The long-term effect of area land management practices and climate on LANL area forests has been an increase in overall tree stand densities, lack of frequent low-intensity fires, and the unnatural buildup of fuels. Today's forested areas within and surrounding LANL are generally overgrown with dense stands of unhealthy trees and excessive amounts of standing and fallen dead tree material. Forested areas with these conditions, coupled with the joint probability of unfavorable weather conditions, present an extreme hazard to nearby communities and properties as the danger of high-intensity wildfires is greatly enhanced. Given the terrain of the Pajarito Plateau, namely numerous narrow, finger-like mesas separated by deep west-to-east oriented canyons, institutionalized fire suppression of high-intensity wildfires is very difficult, particularly within the canyon reaches. Additionally, these same conditions have limited the number of roadways that could be used by the area population as

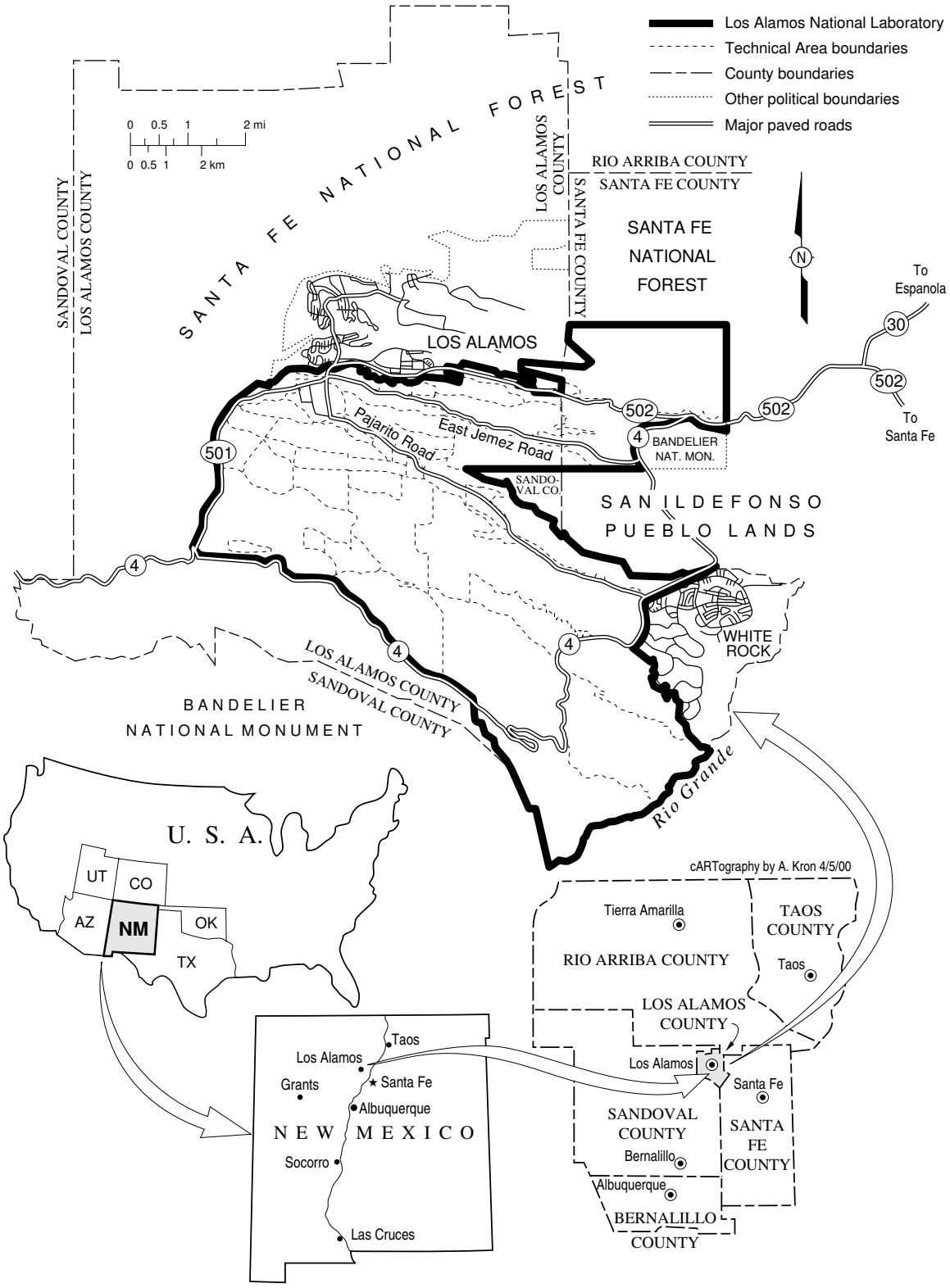


Figure 1. Location of Los Alamos National Laboratory

escape routes, which enhances the potential for increased harm to property and human life under extreme conditions.

The frequency and severity of wildfires in the LANL region over the past several decades have increased. In May 2000, the Cerro Grande Fire burned approximately 43,000 ac (17,200 ha) of land, of which about 7,650 ac (3,061 ha) were located within the boundaries of LANL (Figure 2). The remainder of burned land was located within Bandelier National Monument (BNM), the Santa Fe National Forest (SFNF), Los Alamos County, San Ildefonso and Santa Clara Pueblos, the Baca Ranch, and other small private holdings (BAER 2000). Over 230 private residences were burned in the Los Alamos townsite; and over 20,000 people evacuated their homes in the Los Alamos townsite, White Rock community, Santa Clara Pueblo, and the nearby town of Española.

Four other major wildfires and innumerable smaller wildfires have ignited within the local area of LANL over the past 50 years (Figure 2). In 1954, a wind-driven wildfire, known as the Water Canyon Fire, burned about 3,000 ac (1,200 ha) adjacent to the western boundary of LANL and raged over a period of several days. In the 1977 La Mesa Fire, about 15,300 ac (6,120 ha) of forest burned, including about 2,500 ac (1,000 ha) within LANL located near high explosives (HE) bunkers and other key facilities. Flame lengths exceeding 200 ft (60 m) and rates of spread over 2,300 ft per hour (690 m per hour) were observed in that wildfire, which was finally contained on the fifth day. In 1996, the Dome Fire exploded and grew from 300 ac (120 ha) consumed in the first day to over 6,000 ac (2,400 ha) on the second day. About 16,000 ac (6,400 ha) of forests near LANL were burned before this wildfire was finally contained. In 1998, the Oso Fire burned about 5,300 ac (2,120 ha) to the north of LANL and the Los Alamos townsite. In each of these fires, the weather changed to permit the fire to be controlled.

In conducting the analyses for the LANL Site-Wide Environmental Impact Statement (DOE 1999), DOE evaluated an accident scenario from a hypothetical catastrophic wildfire that was initiated on land adjacent to LANL and spread into LANL. The analysis, which closely mirrored the actual Cerro Grande Fire, concluded that a catastrophic wildfire engulfing buildings and materials used to perform operations was credible and likely to occur. The calculated probability for this scenario is in the order of 1 in every 10 years (0.1 per year); the conditions for occurrence exist at least once every year. While the Cerro Grande Fire and subsequent forest rehabilitation and flood control efforts have slightly reduced the probability of catastrophic wildfire at LANL over the next year or two, the amount of standing and downed fuel within the LANL boundaries has only slightly been decreased. Therefore, the current and future risks of catastrophic wildfires at LANL can only be lessened through purposeful environmental intervention and active changes to land management practices at LANL.

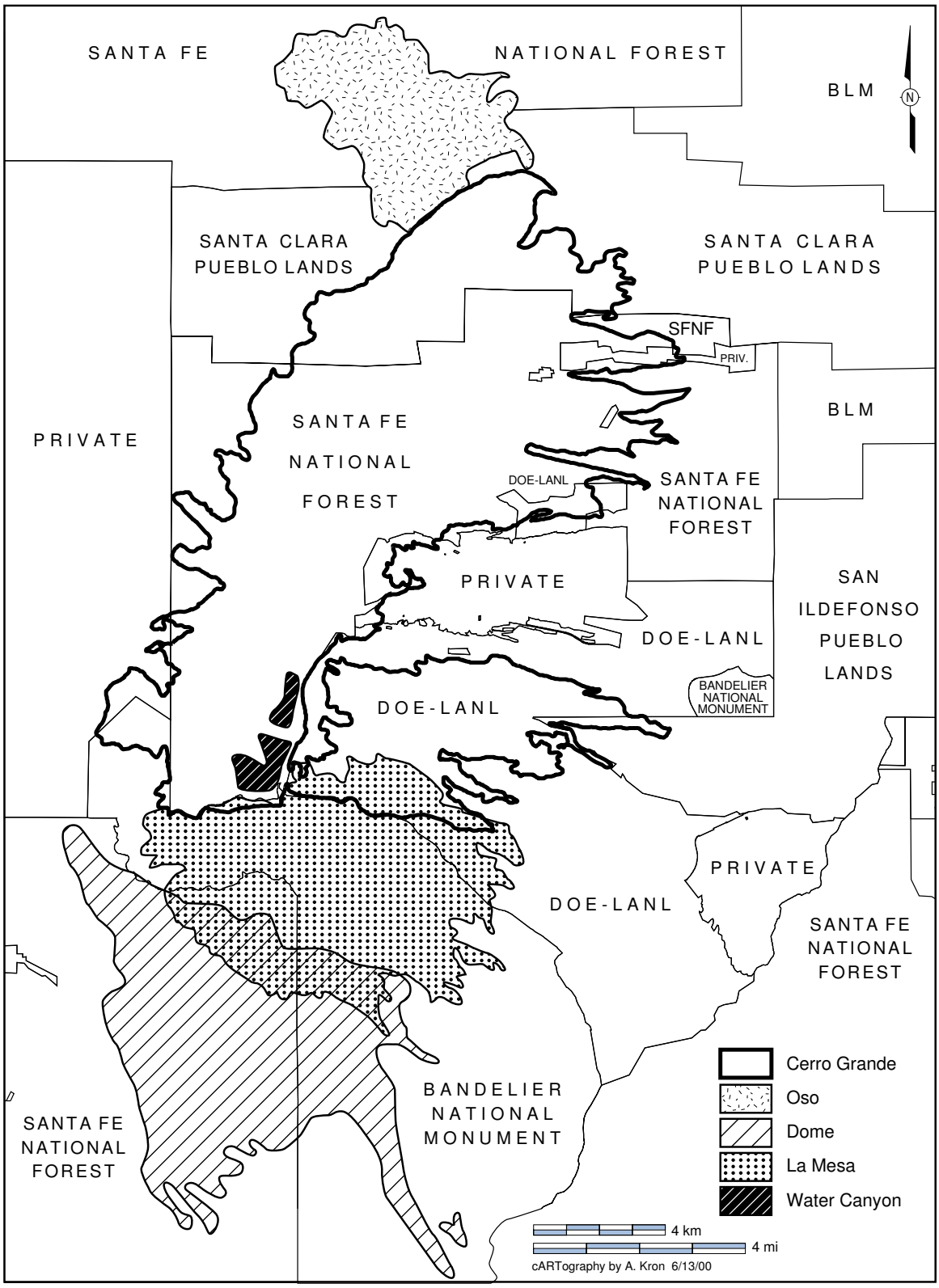


Figure 2. Locations of five major wildfires in the Los Alamos National Laboratory region in the past 50 years (locations and areas of fires on this map are approximate)

2.1 Wildfire Hazard Reduction Project

The Wildfire Hazard Reduction and Forest Health Improvement Program EA (DOE 2000b) addresses a program that will implement several different forest management elements including mechanical thinning of trees, the construction of new fire roads, upgrading of existing fire roads, and constructing new fuel breaks.

The Wildfire Hazard Reduction Project Plan is based on ecosystem management and is comprised of a series of individual, relatively small-scale projects using primarily mechanical thinning to be conducted through a three-phase basis. These carefully planned projects will be conducted to bring the forests at LANL to the desired end-state for wildfire risk followed by an on-going maintenance program to maintain the forests in this desired state with enhancements to improve overall forest health. Up to an estimated 35 percent, or approximately 10,000 ac (4,000 ha), of LANL will be treated under this program.

Wood materials generated by the treatment measures will be managed by the University of California (UC), which manages and operates LANL under contractual provisions; and Johnson Controls Northern New Mexico; this firm processes salvage materials for LANL under a sub-contract arrangement with UC. Usable materials, such as firewood, will be disposed of by donation or salvage. Waste wood materials (slash) would primarily be disposed of through chipping. Potentially contaminated wood would be disposed of according to a process described in Section 5.5.5 of this plan.

3.0 EXISTING CONDITIONS

Cerro Grande Fire

During the Cerro Grande Fire event, there were about 1,600 firefighters and 100 pieces of firefighting equipment present in the LANL vicinity performing fire suppression activities. The DOE actions taken in response to the Cerro Grande Fire event and shortly thereafter to address emergency post-fire circumstances have been documented in the September 2000 Special Environmental Analysis (SEA) (DOE 2000c). The SEA includes descriptions of the actions, the resulting impacts from the actions, mitigation measures taken for these actions that lessen the adverse effects, and an analysis of the cumulative impacts. The Cerro Grande Fire burned about 7,650 ac (3,061 ha) within the boundaries of LANL and about an additional 35,500 ac (14,200 ha) in neighboring areas.

3.1 Forest Fuels Hazard Areas Remaining Post Cerro Grande Fire

The 7,650-ac (3,061-ha) LANL burned area is comprised of 6,732 ac (2,724 ha) of low-burn intensity, 842 ac (340 ha) of moderate-burn intensity, and 76 ac (30 ha) of high-burn intensity. About 70 percent to 100 percent tree survival in the low- to moderate-burn intensity areas is anticipated. The unburned forested areas at LANL remain unchanged and still are rated generally as high fire hazard based on fuel accumulations and high tree densities. See Existing Conditions Map # 01-0123-07 in Section 6. High-burn intensity areas will experience natural tree falling of dead trees for the next 10 years adding fuel to the forest floor.

Vegetation

Six major vegetation zones are present over the Pajarito Plateau, and most of LANL is covered by ponderosa pine forest in the higher elevations and piñon-juniper woodland in the lower elevations, which, respectively, trend from the west to the east across the facility. Land to the west of LANL is administered by the U.S. Department of Agriculture, Forest Service, SFNF and is covered mostly by spruce-fir forest and mixed conifer forest. Land to the south is administered by the U.S. Department of the Interior (DOI), National Park Service, BNM and is covered mostly by piñon-juniper woodland and ponderosa pine forest. Most of the land to the east of LANL is administered by BNM, DOI (in trust for San Ildefonso Pueblo), and SFNF, and is covered mostly by piñon-juniper woodland and juniper savanna habitat. The community of White Rock is home to about 8,000 people and is located at the eastern end of LANL. Land to the north of LANL is occupied by the Los Alamos townsite, which is home to about 10,000 people and, beyond the townsite, lies more of SFNF (see Figure 1).

3.2 LANL Facilities and Infrastructure Risk

In general, many buildings, structures, and utilities at LANL are still susceptible to wildfire damage because of the high density of the existing tree stands. Since most of the acreage burned was at a low-burn intensity, tree survival is expected to be relatively high within the burned area, and the unburned areas have not changed from their high-fuel-dense tree status.

Before the Cerro Grande Fire, the LANL Facility Waste Operations Fire Protection Group prepared a list of wildfire risk assessments for each building at LANL. Since the fire, the Fire Protection Group has prepared a list of fire damaged facilities and is in the process of updating current wildfire risk assessments.

4.0 GOALS AND OBJECTIVES

4.1 Overall Goals

The overall goals of the WHRPP are to

1) Protect the public, LANL workers, facilities, and the environment from catastrophic wildfire.
2) Prevent interruptions of LANL operations from wildfire.
3) Minimize impacts to cultural and natural resources while conducting fire management activities.
4) Improve forest health and wildlife habitat at LANL and, indirectly, across the Pajarito Plateau.

The most important goal of wildfire management at LANL is to enhance the safety of human life and the protection of LANL facilities. This will be accomplished by reducing the fire hazard in the environments that are adjacent to developed and populated sections of LANL. Three additional priorities will be addressed by wildfire management activities at LANL. First, interruptions of

LANL operations will be lessened through the proactive coordination of management efforts so that the threat of uncontrolled wildland fires is minimized or eliminated. Second, new hazards associated with the effects of the Cerro Grande Fire will be addressed in coordination with other regional recovery efforts. Cultural and natural resources will be protected by altering vegetation structures, by implementing appropriate fire management activities, and by reducing the need for active fire suppression measures. Third, forest health will be improved by managing for uneven aged, more open forests, and removing diseased, malformed, or weakened trees. Some large-diameter trees will remain to form snags[1] for wildlife use.

4.2 Objectives

The above goals will be accomplished through the following specific objectives:

1) Reduce fuel loads within LANL forests to reduce wildfire hazards.
2) Reduce the risk of wildfire escapes at LANL designated firing sites by treating fuels.
3) Improve wildland fire suppression capability through fire road improvements.
4) Monitor the effectiveness of wildfire hazards reduction actions and modify management techniques as appropriate.
5) Conduct fire management activities in a manner that will comply with all applicable regulatory requirements.
6) Integrate WHRPP with other resource management plans including the Biological Resources Management Plan.

5.0 IMPLEMENTATION

This program would be composed of a series of strategically planned projects conducted over the next three years. These projects would be conducted to bring the forests at LANL to the desired end-state for wildfire risk and hazard reduction, followed by an on-going maintenance program to maintain the forests in this desired state with enhancements to improve overall forest health. An estimated 35 percent, approximately 10,000 ac (4,000 ha), of LANL would be treated under this program, including some portions of LANL burned during the Cerro Grande Fire.

Three phases of implementation have been developed according to wildfire hazard reduction priorities. They are:

- Phase 1: High priority strategic projects, primarily fuel breaks, in heavily forested urban interface areas to reduce the wildfire hazard to the public, LANL employees, and key facilities and infrastructure. Also included are firing site treatments to reduce the risk of wildfire ignition and escape. These projects are planned for FY01–FY02.
- Phase 2: Moderate priority, larger forest fuels reduction projects in heavily forested areas to reduce the general wildfire hazard and improve forest health. These projects are planned for FY02–FY03.

[1] Snags are dead, standing trees. These features of the forest are frequently used by birds and animals to perch and use in their food foraging practices.

- Phase 3: Lower priority, larger forest fuels reduction projects in more moderately forested and remote areas to reduce wildfire hazard in general and to improve forest health. These projects are planned for FY03.

Section 6 contains tables and maps that more fully describe planning areas and projects.

Initial and maintenance projects will be separately tailored to the specific needs and conditions of each forested area. All program projects and their related activities would be conducted in compliance with the current FONSI (DOE 2000a) and EA (DOE 2000b) guidelines.

The WHRPP actions will be conducted in a manner that complies with the LANL Integrated Safety Management (ISM) system. Under the ISM system, all planning, construction and operational activities must comply with the institutional process established under Laboratory Implementation Requirement (LIR) 404-30-02.0 – also known as the NEPA, Cultural Resources, and Biological Resources (NCB) LIR. The NCB LIR establishes the institutional requirements that are implemented to ensure that contractual work smart standards for NEPA, Cultural Resources, and Biological Resources are consistently met. These standards are measured by performance criteria contained in the Laboratory Performance Requirement 404-00-00 Appendix 3 (Environmental Protection – Ecological and Cultural Resources) and are the basis for all environmental protection measures implemented as part of this plan.

5.1 Individual Project Planning Measures

Each project, as it is developed and implemented, will follow the guidance of project planning found in EA Section 2.1.1 through 2.1.6 as appropriate. The first step in the implementation of each project will be to scope each project and prepare a LANL ESH-ID review in order to identify environmental issues. The second step will be to formulate a project plan by utilizing appropriate forest thinning standards described in Section 5.1.6.4 of this document and completing a wildfire project plan file (see an example wildfire project plan file Appendix A).

5.2 Treatment Measures

Initial and maintenance treatment measures will be identified for each project based on individual site conditions and the desired end-state results. Common to all projects will be the equipment, the use of qualified personnel, and the job performance involved.

In general, thinning will consist of mechanically and manually reducing the density of trees by selective cutting. Understory thinning removes select woody vegetation, fallen trees and limbs, and low-growing tree limbs that could act as so called “ladder fuel” to carry a surface fire upwards into the tree crowns. Tree thinning removes select trees to interrupt the continuity of the forest canopy and, consequently, the potential for a crown fire to spread. Trees selected for thinning

would be marked at least 6 in. (15 cm) above the ground and on the side away from trails or potential public viewing areas. Remaining tree stumps would be 6 in. (15 cm) or less. Large, fire-resistant species of trees, e.g., ponderosa pines, would be retained to increase the fire resistance of the forest.

Long-term maintenance projects will follow each initial program implementation project to maintain the desired end-state condition of the subject forest area. Long-term maintenance measures will be planned according to the previously stated planning measures when it is determined that maintenance is necessary. Project areas will be reviewed about every five years. In addition to measures utilized to initially treat an area, periodic mowing and grading of access roads will also be employed as treatments during the long-term maintenance of some project areas. Maintenance measures will include the implementation of environmental protection measures and forest product and waste disposal measures in a similar manner as employed by the initial project.

5.2.1 Equipment and Personnel Involved

A typical individual project will utilize from 6 to 20 qualified personnel, axes, chainsaws, chipping machines, one or two front-end loaders, one watering truck, one or two dump trucks, and possibly a small farm tractor. One or two logging trucks per project may also be required. Areas with greater than 30 percent slopes will not be treated using vehicular equipment, but hand-held equipment would be used to cut tree limbs or small-diameter trees on areas with slopes as great as 40 percent.

5.2.2 Job Performance

Treatment measures will likely be accomplished by UC personnel or their subcontractor's personnel. An additional possibility is that the treatment measures could be accomplished by other government agency personnel through an interagency agreement(s), although such an agreement has not yet been executed.

5.2.3 Construction or Reclamation of Access (Fire) Roads

New access roads will be constructed as part of treatment measures and for improved access to facilitate fire suppression efforts in the event of a wildfire (as in the case of the recent Cerro Grande Fire). As required, these roads will be constructed by blading an approximately 16-ft (4.8-m) wide swath. Bar ditches and turnouts will be integral to road construction as needed. Existing access roads may require improvement by such measures as grading and ditching. The planning process may demonstrate that some existing access roads as well as firebreaks are no longer necessary. In this case these existing access roads will be disced and revegetated with native plant species. See Fire Improvement Road Map 1 in the last chapter of this plan.

5.2.4 Facility and Forest Health Prescriptions

Facility Related Prescriptions

Fuel Breaks. LANL fuel breaks will be comprised of open forests and low surface fuel loads and can vary from 100 to 700 ft (30 to 213 m) in width. Trees should be spaced between10 to 25 ft (3 to 8 m), tree density should be about 50 trees per ac (124 trees/ha) or have about a 60-ft basal area, limbs could be removed from the lower 6 to 8 ft (2-2.5 m) on residual trees.

Firing Sites. LANL Firing Sites will be treated as fuel breaks as mentioned above except Firing Sites are treated out to 1200 ft (365 m), which is considered a "C" hazard circle.

Defensible Space Around Buildings. Protection measures will be based on "Urban-Wildland Interface Code 2000" (UWIC 2000). In extreme fire hazard areas, the first 50 ft (15 m) from a building would be cleared of combustible trees and brush. The next 50 ft (15 m) would be thinned to a fuel break specification. In high fire hazard areas, the first 25 ft (7.5 m) would be cleared of combustible trees and brush. The next 25 ft (7.5 m) would be thinned to a fuel break specification. In moderate fire hazard areas, the first 10 ft (3 m) and 20 ft (6 m) will be cleared and thinned respectively. Low fire hazard areas are cleared out to 10 ft (3 m) as a standard practice.

Utility Corridors. All above ground utilities would be cleared of trees within the easement corridor that potentially could interfere with the transmission of the utility. Power lines will be prioritized from most important to least important and cleared accordingly. Powerline corridors are usually cleared of trees depending on the size of the powerline (13.8-kv lines have a 50-ft (15-m) easement; 115-kv lines have a 100-ft (30-m) easement, and all lines are daylighted at a 45 degree angle from the edge of the corridor).

Forest Health and Fuel Reduction Prescriptions

Piñon-Juniper Woodlands. Proposed end-state conditions for piñon-juniper woodlands on LANL property will be a mix of open, savanna-like conditions with interspersed closed canopy woodland. The desired end-state conditions for thinned piñon-juniper woodlands will fall within the following parameters:

Wildfire Hazard Reduction:

- Individual tree crowns will be separated by a distance of no less than 25 ft (7.6 m).
- The crowns from a high-density cluster of trees will be isolated by at least 40 ft (12 m).
- Diseased, malformed, or weakened trees will be preferentially removed.
- The remaining trees should represent a mix of tree sizes and ages.

Thinning treatments should promote herbaceous plant response, reduce surface runoff of precipitation, and increase wildlife habitat quality. Areas appropriate for thinning will have the following characteristics:

- Woodland with less than 25 ft (7.6 m) between tree crowns.
- Relatively low slope (<40 percent).

Forest Health Considerations: Proposed end-state conditions and treatment measures for piñon-juniper woodland forest health treatments are essentially the same as those for wildfire hazard reduction. The major difference is that much of the slash generated during the thinning treatment will be left on site to help reduce soil erosion and promote herbaceous plant response. These specific areas will be isolated from adjoining woodlands to reduce the risk of wildfire spreading to other areas.

Ponderosa Pine Forests. The desired end-state conditions for thinned ponderosa pine forests will fall within the following parameters:

- Individual tree crowns (or in some cases groups of trees) will be separated by a distance of about 10 to 25 ft (3 to 7.5 m).
- The crowns from a group of trees will be separated by a distance of about 40 ft (12 m) from each other.
- Tree density will be about 50 to 150 trees per ac (124 to 370 trees per ha).
- Canopy cover will be between 40 percent to 60 percent of the project area.
- "Ladder" fuels that will allow fire to move from the ground into the tree crowns would be removed.
- The majority of trees to be removed will be approximately 9 in. (22.5 cm) in diameter breast height (dbh) or less.
- Some trees 12 to 16 in. (30 to 40 cm) dbh may be removed to achieve the desired spacings.
- Diseased, malformed, or weakened trees will be preferentially removed during thinning treatments.

Mixed Conifer Forests. The desired end-state conditions for thinned mixed conifer forests will fall within the following parameters:

- No more than 30 percent of mixed conifer habitat within a planning area will be treated in a 10-year period either manually or mechanically. This does not apply to prescribed burning.
- Retain all hardwoods and shrubs within the treatment area.
- Retain all large logs (12-in. diameter) for small mammal habitat.
- "Ladder" fuels that would allow fire to move from the ground into the tree crowns will be removed.
- The majority of trees to be removed will be approximately 9 in. (22.5 cm) dbh or less.
- Some trees 12 to 16 in. (30 to 40 cm) dbh may be removed to achieve the desired spacings.

- Diseased, malformed, or weakened trees will be preferentially removed during thinning treatments with the exception of a few wildlife snags.
- Treatment areas should be small (1 to 20 ac [.40 to 8 ha]), irregularly shaped, and designed in a mosaic pattern with untreated areas.
- The LANL Threatened and Endangered Species Habitat Management Plan Overview (HMP) guidelines will apply within Area of Environmental Interest (AEI) core areas (see further discussion in Section 5.3.5 of this plan).

5.2.5 Surface Fuels

Surface fuels will be managed according to disposal methods described in Section 5.5. When DOE finalizes its complex-wide policy on prescribed fire (in progress now), pile and broadcast burns will be considered as a means to reduce surface fuels. These types of burns were analyzed for potential environmental effects in the Wildfire Hazard Reduction and Forest Health Improvement EA (DOE 2000b). A decision to use these burn types would be reflected in later revisions of this Plan.

Forest treatment areas excluding fuel breaks, firing sites, and defensible space, will contain a few slash piles and logs at least 12 in. in diameter for small mammal habitat purposes and will be arranged so as not to create a fire hazard to surrounding trees.

5.3 Environmental Protection Measures

Integral to treatment measures will be complementary measures to protect public health and welfare and to protect and enhance cultural and natural resources. The various environmental protection measures are discussed in detail in the following sections. For any single project it will be unlikely that all the measures are employed at the same time, but a single project may well use multiple protective measures to complement the chosen treatment measure(s). All projects will include worker health and safety measures.

5.3.1 Worker Protection and Health and Safety Measures

Environmental protection measures that will be employed for the health and safety of involved workers, nearby employees, and the general public include the following:

- Workers will wear personal protective equipment appropriate to the project area site conditions.
- Workers will be appropriately trained when working in or near hazardous waste potential release sites (PRSs), radiological areas, and other hazardous areas.
- Areas potentially contaminated with HE materials or radioactive materials will be identified and no contaminated wood materials will be removed from LANL.
- Workers will be required to wear dosimeters, as appropriate.
- Access to treatment areas will be restricted to involved personnel.

- Treatment will take place at a safe distance from occupied buildings.
- Additional specific health and safety measures will be developed specific to site conditions as necessary.

5.3.2 Cultural Resources Protection Measures

The planning process will include the identification of cultural resources present within each site-specific project area. Protective measures that will be taken for thinning treatments and road construction include the following:

- Thinning within or near cultural resources will be avoided to the maximum extent practicable. The perimeter of identified features will be marked with flagging tape, or pin flags, or both. These sites will be field checked by trained archeologists with the tree thinning crews before thinning activities. If thinning is necessary within an identified cultural resource feature, tree thinning crews will be limited to cutting and removing branches by hand. No tree cutting, piling, or dragging of materials across the surface of a cultural site will be permitted.

- Road construction and ancillary drainage features will be planned to avoid cultural resources. Cultural resources located near road alignments will be identified with flagging tape, or pin flags, or both, to avoid inadvertent damage by equipment, personnel, etc. These resources may also be fenced. Identification and protection measures will be removed following treatment activities to prevent the identification of the cultural resource and potential for vandalism.

5.3.3 Air Quality Protection Measures

Environmental protection measures for maintaining air quality will include the following:

- Unpaved access roads will be treated to minimize dust generation during the treatment period by the use of standard dust suppression measures such as the use of water spray.

5.3.4 Water Quality Protection Measures

Environmental protection measures for avoiding potential adverse consequences on water quality are as follows:

- Silvicultural timber treatments are exempt from the National Pollutant Discharge Elimination System permit requirements.
- Areas severely disturbed or denuded will be revegetated.
- Water control structures will be constructed as needed.
- Channel stabilization measures will be employed as needed.
- Buffer zones along stream courses may be established for water quality and wildlife habitat purposes.
- Areas with slopes of greater than 30 percent will not be treated using vehicular equipment because of their high erosion potential; areas with

slopes of less than about 40 percent may be treated using hand-held equipment.

- Machinery will not be used during saturated soil conditions.
- New fire roads will be constructed on grades of less than 10 percent with bar ditches and turnouts, as appropriate.
- Slash/wood chips will not be placed in a water course.
- Any work that involves crossing a stream channel will require a 404 Dredge and Fill Permit and a 401 Water Quality Certification.

5.3.5 Threatened and Endangered Species Protection Measures

The presence of threatened and endangered species and their habitat will have prime planning considerations. There are two listed species that currently utilize the area at LANL as habitat – the bald eagle (*Haliaeetus leucocephalus*) and Mexican spotted owl (*Strix occidentalis lucida*). Potential habitat of the southwestern willow flycatcher (*Empidonax traillii extimus*) is present at LANL. All features of planned actions will be developed and implemented in accordance with guidance and restrictions contained in the LANL Threatened and Endangered Species Habitat Management Plan Overview (HMP) (LANL 1998a) or developed during further consultation with the USFWS. DOE determined that actions taken in accordance with the HMP would result in no affect or may affect but are not likely to adversely affect individuals of T&E species or their potential habitat at LANL; the USFWS has concurred with this determination.

Bald Eagle

The identified bald eagle area of environmental interest (AEI) is located primarily in piñon-juniper habitat. Trees that are located in this AEI, primarily along the Rio Grande and at the mouths of certain drainages, provide roosting and perching habitat. Consequently, no treatment involving the cutting of live or dead trees will be utilized within core and buffer areas. An exception to this provision is the treatment by thinning of ponderosa pines growing within 100 ft (30 m) of structures. Juniper and piñon trees and associated understory in the AEI buffer zone may be treated. Screening vegetation will be maintained at the edge of core areas.

For human health and safety reasons, any trees growing within 100 ft (30 m) of buildings but outside of a developed area will be thinned to achieve a 25-ft (7.5-m) spacing between tree crowns. The HMP does not restrict habitat alteration, including thinning, in developed areas. Nevertheless, live and dead trees along canyon rims will be retained if the rim is in a developed area. Any tree over 9 in. (22.5 cm) dbh that is within 1,200 ft (365 m) of an explosives testing firing site or a waste treatment area permitted under the Resource Conservation and Recovery Act (RCRA) or New Mexico Administrative Code 2.60 (NMAC) for burning explosives wastes will be delimbed to a height of 6 ft (1.8 m).

Mexican Spotted Owl (MSO)

The identified MSO AEIs are located primarily in ponderosa pine and mixed conifer forests. Wildfires can pose a serious threat to these forest types. USFWS's recovery plan for the MSO (USFWS 1995) lists high-intensity wildfires as a primary threat to spotted owl habitat and encourages land managers to reduce fuel levels and abate fire risks in ways compatible with spotted owl presence on the landscape (USFWS 1995). Several of the MSO AEIs at LANL burned with low to moderate intensity during the Cerro Grande Fire. All LANL AEIs are under revision to determine the effects of the fire on the quality and condition of the habitat areas. This information and other specific site conditions will be factored into project plans for treatments within AEIs. Within undeveloped core areas, on slopes greater than 40 percent, in the bottoms of steep canyons, and within 100 ft (30 m) of a canyon rim, thinning of trees less than 9 in. (22.5 cm) dbh and removal of fuels could be allowed. Exceptions allowing trees greater than 9 in. (22.5 cm) dbh to be thinned within 100 ft (30 m) of buildings will be made to protect facilities (see below). Large logs (12 in. [greater than 30 cm] midpoint diameter) at a minimum rate of 50 per ace and snags (large standing trees that are dead or diseased) should be retained at a minimum rate of 50 per ac. Thinning within core areas not meeting the characteristics listed above and in buffer areas may include trees of any size to achieve a 25-ft (7.5-m) spacing between tree crowns.

For human health and safety reasons, any trees growing within 100 ft (30 m) of buildings but outside of a developed area may be thinned to achieve a 25-ft (7.5-m) spacing between crowns. Habitat alterations including thinning will not be restricted in developed areas. However, trees and snags along canyon rims will be retained in a developed area. Because of the extreme fire danger associated with firing sites and the potential effect of a fire on MSO habitat (as in the Cerro Grande Fire), explosives testing and firing sites and waste treatment areas will be treated separately for the purpose of fuels management. Trees within 1,200 ft (365 m) of firing sites and burn areas in both core and buffer AEI areas may be thinned to a 50-ft (15-m) spacing between trees everywhere except on slopes greater than 40 percent or in the bottoms of steep canyons. Any tree over 9 in. (22.5 cm) dbh within 1,200 ft (365 m) of a firing site may have its lower limbs removed up to a height of 6 ft (1.8 m) above the ground to help prevent crown fires.

In historically occupied core areas, fuels treatments may not exceed 10 percent of the undeveloped core area and will not be allowed within 1,335 ft (400 m) of previously occupied nesting areas. In recently occupied core areas, forest management activities must occur during the nonbreeding season, which is from September 1st to the end of February (USFWS 1995).

Southwestern Willow Flycatcher

The identified southwestern willow flycatcher AEI is located primarily in drainage areas with willows and cottonwoods. Wildfires can pose a moderate to high

threat to these habitat types. Thinning within undeveloped buffer areas may include cutting trees of any size to achieve a 25-ft (7.5-m) spacing between tree crowns. No fuel management practices will be allowed in core areas. Habitat alterations including tree thinning will not be restricted in developed areas. Very little, if any, treatments are planned in these areas.

5.4 Other Wildlife Habitat Recommendations

5.4.1 Ponderosa Pine: Wildlife Considerations

There are currently no federal or state listed species that depend primarily or solely on ponderosa pine habitat. Wildlife species vary widely in the specific structural characteristics they prefer in ponderosa pine habitats. Stands in a moderately closed condition provide habitat for Abert's squirrel, western flycatcher, hermit thrush, black-headed grosbeak, pygmy nuthatch, and mantled ground squirrel, and can provide required cover for deer and elk. Thinned areas, particularly with downed woody materials, provide habitat for deer mouse, brush mouse, Mexican wood rat, western wood pewee, and yellow-rumped warbler, as well as forage areas for deer and elk (Patton 1991). Before European settlement, ponderosa pine stands probably were a mosaic of open, grass savanna and clumps of large yellow-bark ponderosa pine interspersed with a few dense patches and stringers of small, blackjack pines (Dahms and Geils 1997). Because there are open areas resulting from old fields, utility lines, buildings, firing sites, road development, and recent fires, the need to create openings in LANL's remaining ponderosa pine stands will be evaluated by area.

These ponderosa pine wildlife recommendations apply to areas outside of fuel breaks, utility lines, firing sites, and defensible space around buildings.

Recommendations for enhancing wildlife values in ponderosa pine treatment areas include the following:

- Retain all large snags.
- Retain all shrubs and deciduous trees for browse, fruit production, and structure.
- Maintain 10 percent to 20 percent of the treatment area as moderately dense ponderosa pine (60 percent to 90 percent canopy cover) in patches of 1/2 to 2 ac [.20 to .80 ha].
- Design treatment areas to be irregularly shaped.
- Leave slash of any size either scattered or piled where possible.
- Retain large down woody material on site where possible.
- In long-range planning, define areas where ponderosa pine regeneration will be allowed to occur and prescriptions for regenerating stands.
- Thin trees in a naturalistic pattern including interspersed groups and individual trees with a varying range of tree densities and sizes.

5.4.2 Piñon-Juniper: Wildlife Considerations

In general, piñon-juniper thinning increases the available browse for large ungulates and increases the biomass and sometimes species diversity of small mammals. However, several guilds of birds, specifically foliage gleaners, live bark foragers, foliage nesters, and snag nesters, tend to decline or be absent from treated piñon-juniper stands. This includes species such as the black-throated gray warbler, solitary vireo, juniper titmouse, and gray flycatcher. In addition the pinyon mouse, which nests in juniper trees and eats juniper berries, is closely associated with relatively dense stands of piñon-juniper. Dense piñon-juniper stands also provide thermal cover for wintering ungulates (such as elk) during storm events. Gray vireos, which are listed by the State of New Mexico as threatened, have the potential to occur in Los Alamos County during spring, summer, and fall. This species selects arid juniper woodlands on foothills and mesas, frequently with associated shrubs such as oaks and a well-developed grass component. The gray vireo tolerates a wide range of canopy values, and is likely to either be not affected or to benefit from piñon-juniper thinning.

These piñon-juniper wildlife recommendations apply to areas outside of fuel breaks, utility lines, firing sites, and defensible space around buildings.

Recommendations for enhancing wildlife values in piñon-juniper treatment areas are as follows:

- Retain all large snags in the treatment area.
- Retain all shrubs in the treatment area (oaks, mountain mahogany,
- skunkbush sumac, etc.).
- Consider girdling rather than cutting some trees, especially larger piñon trees.
- Leave individual live trees and small clumps of live trees scattered throughout the treatment area.
- Design treatment areas to be irregularly shaped, relatively narrow, and maintain proximity to dense piñon-juniper stands.
- Leave 40 percent to 50 percent of the planning areas untreated.

5.4.3 Mixed Conifer Wildlife Considerations

Considerations for this forest type are the same as the mixed conifer general prescription (see Section 5.2.4).

5.5 *Removal of Generated Wood Materials and Disposal of Waste*

Logs, piles of cut small branches, and brush will result from thinning activities. Some of this material could be donated or salvaged for use by the surrounding communities. However, some of the smaller logs, branches, and brush (slash) will require disposal as waste. Proposed methods of removal of wood materials and waste disposal are described in the following paragraphs. One, all, or a combination of measures may be utilized. Additional measures may also be developed and incorporated in this Plan

5.5.1 Donation of Materials

Thinned wood materials that are free from contamination would be made available to the public and governmental agencies, including nearby pueblos, for use as mulch, fuel wood, latillas, vigas, ceremonial purposes, handicrafts, and other similar purposes. The extent of availability of material would depend on practical site issues such as accessibility, environmental protection, security, and associated costs.

5.5.2 Salvage of Timber

Commercial size timber (typically at least 9 in. [22.5 cm] in diameter) that is free of contamination may be salvaged and sols for consideration to offset the costs of treatment operations or, similarly, provided to the party(ies) contracted with to accomplish treatment operations to again offset costs. Logs will be removed from the place where they were cut by truck either directly to off-site facilities owned or operated by contracted parties or to on-site temporary storage locations within the project area. Logs stored on-site will then be donated or salvaged and removed by third parties.

5.5.3 Waste Disposal On-site or Off-site

Slash and other wood wastes could be disposed of on- or off-site as waste by chipping and used as mulch or burned at a permitted on- or off-site location. The presence or absence of contamination and type of contamination within the waste will dictate the method(s) of disposal.

5.5.3.1 Contaminant-Free Wastes

These materials could be mechanically reduced (chipped). Wood chips produced during cleanup activities from slash could be used as mulch in selected areas at LANL to foster soil stability and establishment of grasses and shrubs. The depth of wood chip mulch will not exceed 2 in. (5 cm) if used at LANL. If slash is used for erosion control at LANL in an unchipped state it will not exceed 6 in. (15 cm) in depth and will be used in such a manner so as not to pose an enhanced fire hazard. Additionally, a recently purchased wood chipper/burn unit featuring an enclosed burn chamber may also be used at LANL to dispose of wood wastes resulting from forest treatments. This unit is permitted with the State of New Mexico Environment Department.

5.5.3.2 Potentially Contaminated Wood Materials

Wood materials produced in an identified PRS or other suspect site such as canyon focus areas will be managed according to the respective LANL Division Standard Operating Procedure for Waste Management. LANL staff have begun a wood sampling program to ensure that contaminants in wood do not pose a risk to human health or to the environment. If wood materials contain HE or depleted uranium (DU) or both, they could be burned at any of the RCRA- or NMAC-permitted burning facilities within LANL's TAs 14, 15, 36, 39, and 40. Contaminated wood material generated within Engineering Sciences and Applications Division (ESA) technical areas will follow LANL's Safe Operating

Procedure WMM-SOP-1.8.1-RO (LANL 1998b). Contaminated wood material generated within DX technical areas will follow LANL's Standard Operating Procedure DX-DO:SOP 01 Rev. B (LANL 2000). HE contamination is consumed during burning and DU does not aerosolize at typical wood burning temperatures. In general, the quantities of wastes disposed of in this manner will be small.

5.5 End-State Conditions and Post-Treatment Assessment

A key element of the wildfire management program will be post-treatment assessments. Field assessments will be conducted to monitor the effectiveness of treatment measures in achieving the desired goals, to modify the treatment measures used, and to help develop future management strategies. The majority of post-treatment assessments will be conducted in the field. At a minimum, all projects will incorporate an end-state condition assessment. The following activities will compose the various post-treatment assessment options:

- End-state conditions assessment
- Forest fuel load inventories
- Ecological field studies
- Watershed assessment and monitoring
- Data analysis and modeling

5.5.1 End-State Conditions Assessment

The successful implementation of a Wildfire Hazard Reduction Project Plan at LANL will be determined by assessing the achievement of resource goals and objectives listed in Section 4. This program will be deemed successful when fuel loads are reduced to a moderate- or low-hazard rating, the forest canopy at most project sites is less continuous with small patchy openings, and most forest stands are maintained at tree densities consistent with prescriptions described in Section 5. In effect, the potential risk and damage from an uncontrolled and catastrophic wildfire within the boundaries of LANL will be drastically reduced or eliminated if the end-state conditions planned for a particular project area have successfully been met. Attributes to be measured include tree density, crown separation, and canopy cover.

5.5.2 Forest Fuel Load Inventories

Preliminary studies have been initiated to survey the wildfire fuels in forests and woodlands at LANL and for the surrounding region. These studies are being performed by DOE in cooperation and collaboration with SFNF, BNM, and Los Alamos County. The results of these studies will provide pre-treatment knowledge of the forest fuels. Study areas will be resampled after the application of program-treatment actions and the post-treatment results will be compared to the pre-treatment conditions to determine if the goals and objectives of the wildfire treatment measures have been met.

5.5.3 Ecological Field Studies

Ecological studies are important tools for assessing the effects of forestry treatments on local fauna and flora. Based on need and funding, post treatment

studies may be initiated for threatened and endangered species and their habitat, large and small mammals, arthropods, amphibians, bio-contaminant availability, contaminant movement, and vegetation changes.

Field surveys for topographic and vegetational characteristics of forests and woodlands are currently being conducted in the Los Alamos region. The results of these quantitative surveys are being used to develop plant community classifications and to relate these classes to their respective environmental and topographic conditions. The classification provides an analytical framework for comparing and contrasting the effects of treatment measures and for determining changes in plant community structures.

5.5.4 Watershed Assessment and Monitoring

Best management practices for monitoring and protecting watersheds will be identified during the LANL ESH-ID review process. Part of the monitoring program will be linked to the existing water-sediment discharge sampling station network located throughout the major drainages at LANL. Routine monitoring of this network will be done to evaluate the effects of the forest treatments.

5.5.5 Data Analysis and Modeling

A geographic information system and other site-specific data bases are used extensively by LANL for analyzing ecological information. Examples of models that are used include topographic-vegetation models for determining suitable threatened and endangered species habitat, soil loss models for determining soil movement, watershed-hydrology models for determining water runoff, and a fire behavior model that is used to predict fire intensities and growth.

Data pertaining to the topographic characteristics and fuel levels at selected sample sites in forests and woodlands of the Los Alamos region are being summarized and analyzed for changes in the fuel levels that result from the application of regional wildfire treatment measures. In particular, these data are being evaluated to determine if the wildfire treatment measures achieved the desired end-state conditions.

Site-specific data may be used to estimate the average fuel levels of plant community types at various topographic conditions. The data may also be used to predict the fuel levels in unsampled areas throughout the Los Alamos region and as inputs to wildfire behavior models that assess wildfire hazards to LANL facilities and residential areas.

All post-treatment assessment activities will be reviewed for potential environmental, safety, and health issues and applicable requirements will be addressed as part of the Wildfire Hazard Reduction and Forest Health Improvement Program before beginning the post-treatment assessment activities.

5.6 Implementation of Maintenance Measures

Once an area has been treated, routine maintenance projects will be performed at least once every five years (or as necessary) to maintain the desired end-state conditions. In addition to the use of the previously discussed treatment measures that may be utilized to initially treat an area and later to maintain it, periodic mowing and maintenance of access roads would be employed. Also, project planning and environmental protection measures will be included in the formulation and implementation of maintenance projects as applicable.

Prescribed fire as a treatment method is precluded from use at this time by a DOE complex-wide moratorium. When used appropriately, prescribed burns can be a very effective means to maintain mechanically treated areas. DOE is in the process of developing a complex-wide policy on prescribed fire. When this is completed, the use of this method at LANL may be revisited.

5.7 Implementation Roles and Responsibilities

In order to be successful, the Wildfire Hazard Reduction Project must have participation from many entities. The following describes some of these and their major roles and responsibilities in this effort.

5.8 Roles and Responsibilities

U.S. Department of Energy, National Nuclear Security Administration: The responsible agency that oversees the three research laboratories in the DOE nuclear weapons complex.

LANL ESH-20: The Ecology Group provides environmental support to LANL and the DOE, NNSA through its six teams which are comprised of Biology, Contaminant Monitoring, Cultural Resources, Natural Resources Management, National Environmental Policy Act, and Publications and Design.

LANL ESH-17: The Air Quality Group is responsible for environmental air quality issues including environmental surveillance.

LANL ESH-18: The Water Quality and Hydrology Group is responsible for environmental water quality and hydrology issues including environmental surveillance.

LANL Facility and Waste Operations – Fire Protection: The Fire Protection Group serves LANL, DOE-NNSA, and the surrounding community by providing fire protection services in order to minimize risk to acceptable levels in support of the LANL mission.

LANL Emergency Management and Response (S-8, EM&R): EM&R is the Laboratory's core organization which provides LANL-wide emergency plans, preparedness programs, and oversight capability to respond to all LANL emergencies.

LANL Cerro Grande Recovery Project Office: This office is part of the Facility and Waste Operations Division, and is responsible for implementing Cerro Grande Recovery Project efforts.

LANL Facility Managers: LANL Facility Managers strive to provide world-class facilities to support LANL's mission. This is accomplished through the ISM process, readiness assessments, authorization basis, risk management, facility waste management, and monitoring.

Los Alamos Fire Department (LAFD): The LAFD is the primary UC subcontractor providing fire response to LANL.

Johnson Controls NNM: Support services subcontractor for UC at LANL.

Interagency Wildfire Management Team (IWMT): This is a DOE and UC sanctioned committee comprised of all adjoining land management agencies, including Los Alamos County. The IWMT routinely meets to coordinate and collaborate on wildfire related efforts.

6.0 PLANNING AREAS AND PROJECT DESCRIPTIONS

This section contains maps and tables that more fully describe the planning areas and projects that are part of the Wildfire Hazard Reduction Project.

Map 1 depicts various fire road improvements that are planned for the next three years. They consist of both new fire roads and upgrades, such as drainage improvements to existing fire roads. These projects are intended to provide improved access to remote areas for better suppression in the event of a wildfire.

Table 1, "Wildfire Hazard Reduction Project Descriptions" and the associated Map 2, describe the Phase 1 projects that are currently being planned in greater detail as per the requirements discussed in Section 5 of this document. Information provided includes project name, description-objectives, size, phase, comments, and status. These are high priority strategic projects, primarily fuel breaks, in heavily forested urban interface areas that reduce the wildfire hazard to the public, LANL employees, and key facilities and infrastructure. However, these projects are not necessarily listed in the order in which they will be performed. The Phase I projects are planned for completion in FY01-FY02.

Table 2, "Wildfire Hazard Reduction Planning Areas," and the associated Map 3, describe planning areas that will be planned in greater detail and treated in the future during Phases 2 and 3. Information provided includes description-objectives, size, (both total area and area planned for treatment), prescription, phase, and comments. According to this plan, individual projects will be developed and implemented in these areas during FY02-FY03. These individual projects will consist primarily of treatment of interior timber stands with the primary objective of general forest fuels reduction. These projects will be planned and implemented according to the process set out in Section 5 of this document. This detailed project planning has been scheduled for the future so as to allow for better integration with the Biological Resources Management Plan (BRMP) now under development and to take advantage of adaptive management concepts resulting from implementation of Phase 1. An update of the WHRPP will be issued when detailed planning has been completed.

Finally, Map 4, "Existing Conditions," depicts the related existing site conditions at LANL including land cover (forest type) and Cerro Grande burn severity information.

As already mentioned, Appendix A of this document provides the reader with a sample Wildfire Project Review form. Individual WPRFs are on file with DOE and ESH-20 for each of the projects conducted under this Plan and are available upon request. Please contact Pat Valerio at (505) 665-5716 for copies of these plans.

Table 1: Wildfire Hazard Reduction Project Descriptions.					
Project	**Description-Objectives, see map 2.**	**Acres/miles**	**Phase**	**Comments**	**Status**
Los Alamos Canyon (A)	Create a 200-300 ft wide fuelbreak below HRL, Medical Center, LAAO, and residences.	30	1	Follow HMP guidelines for core habitat.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
DP Canyon (TA-21) (B)	Create a 100-200 ft wide fuelbreak behind residences and businesses on both sides of canyon.	20	1	Coordination with LA County required, particularly regarding access issues.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
DARHT (Water and Valle Canyons, TA-15) (C)	Thinning treatment below DARHT facility at confluence of canyons to prevent wildfire starting from adjacent operations.	40	1	Follow HMP guidelines for core habitat. Less than 10% of core habitat to be treated.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
TA-16, Building 260, (O)	Create a 200 ft wide fuelbreak around facility.	5	1	Project started in FY00.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
TA-3 / TA-58, (E)	Create a 600 ft wide fuelbreak west of Vandegraff Bldg, SM-30, and Wellness Center Bldg to protect TA-3 area.	80	1	Project is underway.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
TA-48 Mortandad Canyon, (F)	Create a 100-200 ft wide fuelbreak in canyon and mesa top.	10	1	Project has not been planned in detail yet. Apply fuel break prescription.	Needs NCB LIR and ESH-ID review.

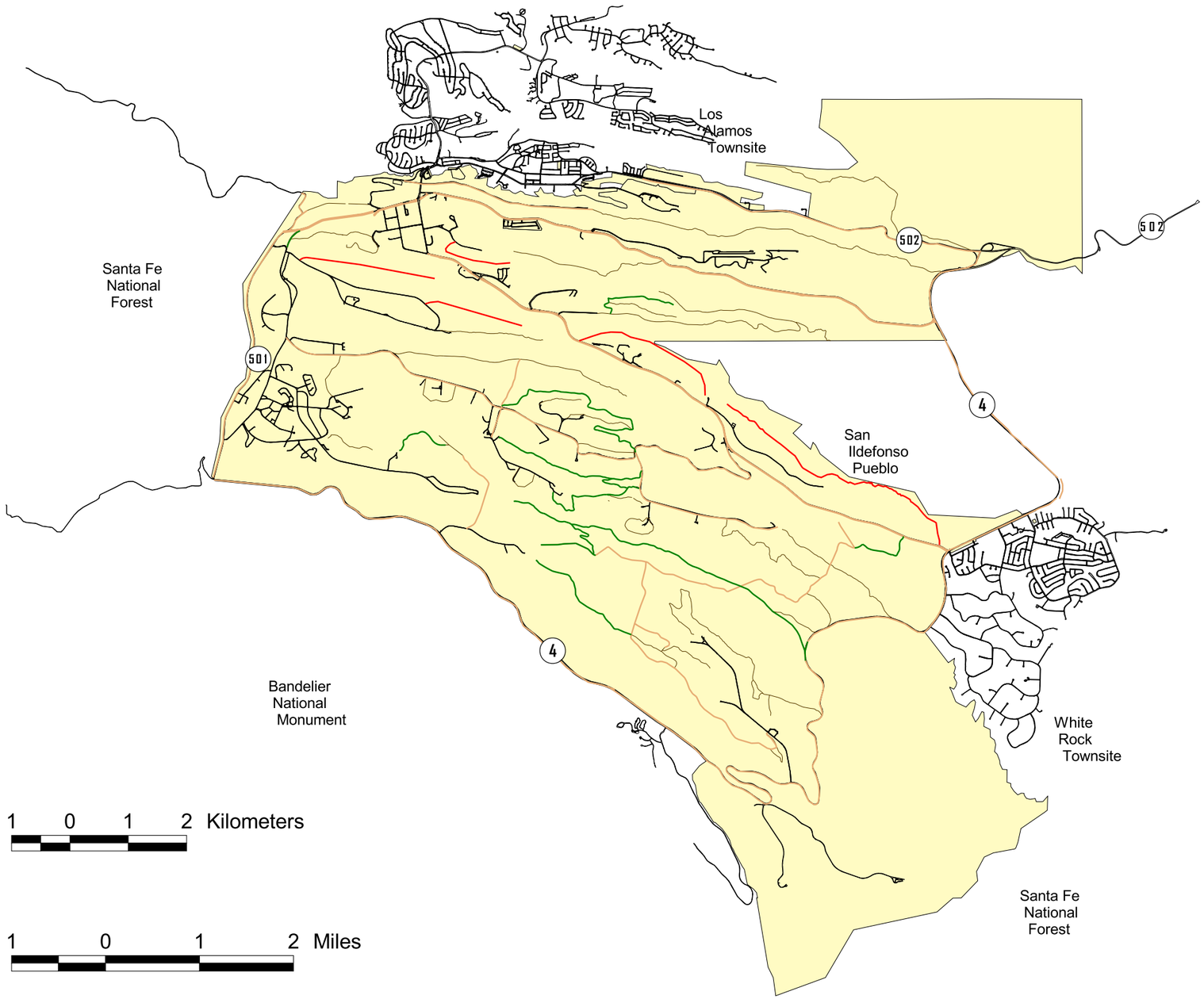
Table 1 Continued.					
TA-8, 9 and 16 Access Road, (G & O)	Create a 300 ft wide fuelbreak along access road to protect emergency ingress/egress in the event of a wildfire.	50	1	Project has not been planned in detail yet. Apply fuel break prescription.	Needs NCB LIR and ESH-ID review.
Rendija Canyon Land Transfer Tract. (H)	Create a 300 ft wide fuelbreak along the Baranca Mesa Subdivision and DOE boundary.	50	1-3	Project has not been planned in detail yet. Apply fuel break prescription.	Needs NCB LIR and ESH-ID review.
DOE/White Rock Urban Interface, (I)	Create a 250 ft wide fuelbreak along western, northern, and southern edge of DOE/White Rock urban interface including all powerlines.	100	1	Project has not been planned in detail yet. Apply fuel break prescription.	Needs NCB LIR and ESH-ID review.
Research Park Area, TA-3, (J)	Create a 250 ft wide fuelbreak along Highway 501 and all facilities within the Research Park footprint. Use Research Park Biological Assessment guidelines.	40	1	Project has not been planned in detail yet. Follow Research Park BA guidelines for thinning. Coordinate project with LAEDC and LAAO.	Needs NCB LIR and ESH-ID review.
Royal Crest Trailer Park, (L)	Thin along east side and chip ground fuels.	10	1	Project initiated in FY 00.	Project is compliant with NCB LIR 404-30-02.0 and ESH-ID completed.
TA-21 Los Alamos Canyon gas pipeline, (M)	Create a 250 ft wide fuelbreak along gas pipeline corridor to protect upper Los Alamos Canyon area.	8	1	Project has not been planned in detail yet. Apply HMP guidelines.	Needs NCB LIR and ESH-ID review.
TA-54, (Area G) (N)	Create a 250 ft wide fuelbreak along western edge (mesa top) of facility.	25	1	Project has not been planned in detail yet. Follow on to FY99 project.	Needs NCB LIR and ESH-ID review.

Table 1 Continued.					
DX and ESA Firing Sites (K).	Firing sites fuel mitigation within the hazard zone will be extended about 300 ft.	About 130 acres, total.	1-3	Project has not been planned in detail yet. HMP guidelines apply within certain firing sites.	Needs NCB LIR and ESH-ID review.
LANL wide facilities assessment and protection.	Create defensible space and fuelbreaks when appropriate at all facilities.	TBD	1-3	Follow Wildland-Urban Interface Code.	Needs NCB LIR and ESH-ID review.
LANL wide powerline vegetation maintenance.	Protect all powerlines per standard maintenance requirements.	Approximately 50 miles	1-3	Three year effort following utility corridor prescription. Follow HMP guidelines when appropriate for utility corridor maintenance.	Needs NCB LIR and ESH-ID review.
LANL wide fire road construction and improvements.	Construct new fire roads and improve existing fire roads (crossings, culverts, water bars, etc.) to increase accessibility and reduce maintenance. See Fire Road Map # 01-0123-04.	TBD	1-3	Three year project. See Fire Road Map # 01-0123-04.	Needs NCB LIR and ESH-ID review.
Treat interior timber stands according to Table 2 Planning Area descriptions.	Utilize approved wildfire EA treatment measures to reduce wildfire hazard and improve forest health in accordance with Biological Management Plan (BRMP) currently under development.	Up to 10,000 acres.	2-3	Phase 2 and 3 planning areas may be viewed on map # 01-0123-06.	Needs NCB LIR and ESH-ID review.
Conduct LANL wide routine maintenance on previously treated areas to control natural tree regeneration and natural fuel buildup.	Mowing, cutting, and chipping (along with prescribed burning asallowed by DOE) would be the preferred treatment methods.	TBD	FY04 and beyond	Treat every 5 years or when necessary.	Needs NCB LIR and ESH-ID review.

Table 2: Wildfire Hazard Reduction Planning Areas.					
Planning Area	**Description/Objectives, see map 3.**	**Acres**	**Prescription may be found in text**	**Phase**	**Comments**
1	FMU 70. Reduce general wildfire hazard. Improve fire road system.	2300 total (about 1200 planned for treatment).	Ponderosa Pine, Mixed Conifer.	2	Area contains HMP core habitat and was impacted by the Cerro Grande Fire.
2	TA-49. Reduce wildfire hazard to key facilities. Improve fire road system.	1200 total (about 100 planned for treatment).	Ponderosa Pine, Mixed Conifer, Grassland, PJ.	2	Area contains HMP core habitat and was impacted by the Cerro Grande Fire.
3	Upper FMU 67. Reduce general wildfire hazard. Improve fire road system.	5700 total (about 3000 planned for treatment).	Ponderosa Pine, Mixed Conifer.	2	Area contains firing sites, powerlines, access roads, habitat for wildlife, and was impacted by the Cerro Grande Fire.
4	Lower FMU 67. Reduce general wildfire hazard, protect T&E species habitat, and reduce firing site ignition risk. Improve fire road system.	3300 total (about 1500 planned for treatment).	Pinyon Juniper woodlands.	3	Area contains firing sites, powerlines, access roads, habitat for wildlife, and was impacted by the Cerro Grande Fire.
5	TA-3 Administration Area. Reduce wildfire hazard to critical area of the Laboratory. Improve fire road system.	1000 total (about 500 planned for treatment).	Ponderosa Pine, Mixed Conifer.	2	Area contains high numbers of LANL personnel, powerlines, utilities, HMP core areas, and was impacted by the Cerro Grande Fire and is a key interface area with the townsite.
6	TA-21, 53, 55, 35, 48, 46, 54. Reduce general wildfire hazard including critical infrastructure. Improve fire road system.	5500 total (about 2000 planned for treatment).	Ponderosa Pine, Mixed Conifer, and Pinyon Juniper woodlands.	3	Area contains high numbers of LANL personnel, powerlines, utilities, MHP core areas, and was impacted by the Cerro Grande Fire and is a key interface area with White Rock and San Ildefonso Pueblo.

Table 2 Continued.					
Planning Area	**Description/Objectives, see map 3.**	**Acres**	**Prescription may be found in text**	**Phase**	**Comments**
7	TA-33, 70, 71. Reduce wildfire hazard to White Rock and LANL. Reduce erosion and improve forest health.	3700 total (about 1200 planned for treatment.)	Pinyon Juniper woodlands	3	Area contains powerlines, HMP core areas, and winter habitat for deer and elk.
8	White Rock Canyon Reserve. Protect reserve, improve forest health, reduce erosion, and remove exotic plant species.	1000 total (about 200 planned for treatment.)	Pinyon Juniper woodlands	3	Area contains powerlines, HMP core areas, hiking trails, winter habitat for deer and elk, and bald eagles. Treatments should conform to HMP guidelines and resource plans to be developed.
9	Land Transfer Tracts scheduled for eventual disposal. TA-74, Rendija Canyon, White Rock, TA-21 including the Airport Tract. Strategic fuel breaks will be completed to reduce wildfire hazard to adjacent areas.	4700 total (about 300 planned for treatment.)	Ponderosa Pine, Mixed Conifer, and Pinyon Juniper woodlands.	3	Area contains powerlines, utilities, airport, urban interface, winter habitat for deer and elk, and many cultural sites.

Map 1. Wildfire Hazard Reduction Project Plan - Fire Road Improvements



Legend

- Proposed new fire roads
- Proposed upgrades to existing fire roads
- Existing fire breaks
- Other existing fire roads
- Major roads
- LANL

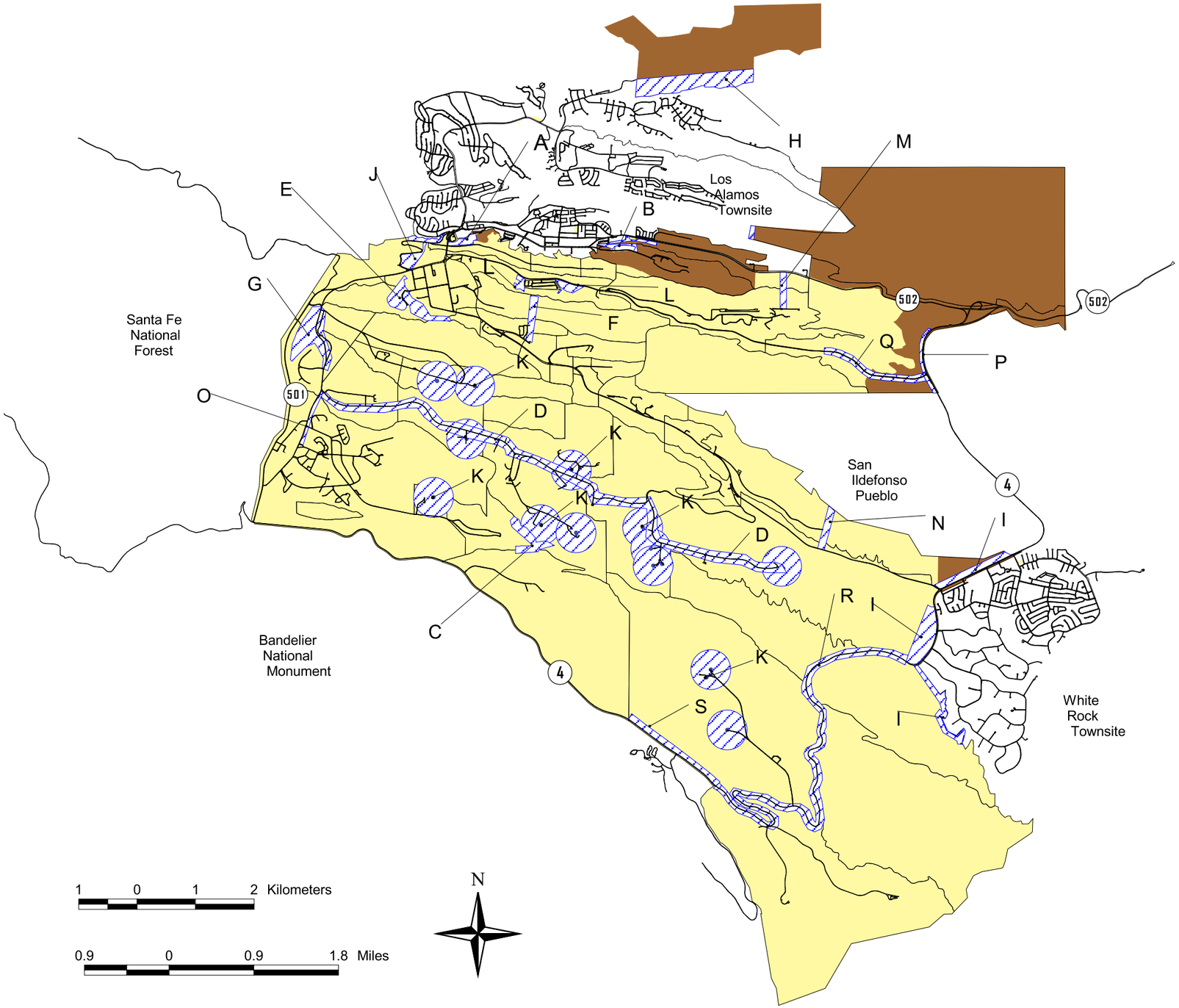
Data have not been field verified therefore subject to change. New Mexico State Plane, Central Zone, North American Datum of 1983.

Existing fire roads/fuel breaks data managed and provided by JCI Utility Mapping. Facilities data managed and provided by FIMAD.

Los Alamos National Laboratory
ECOLOGY GROUP
Environment, Safety and Health

Map produced by Marjorie Wright, ESH-20
Map number: 01-0123-04

Map 2. Wildfire Hazard Reduction Project Plan - Phase 1



Legend

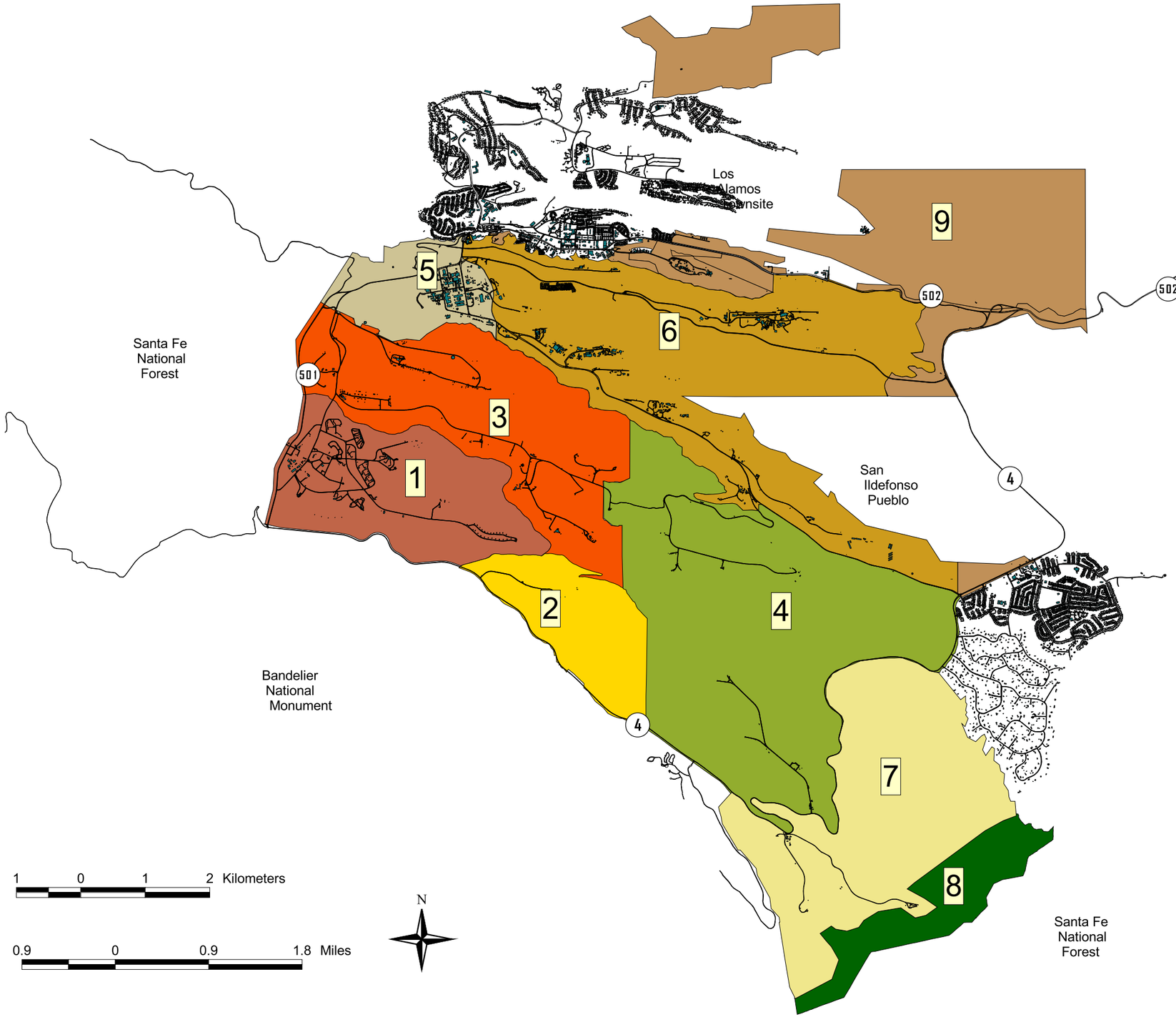
- Firing sites
- Proposed projects
- Proposed land transfer tracts
- LANL
- TA
- Major roads

Data have not been field verified, therefore subject to change. New Mexico State Plane, Central Zone, North American Datum of 1983.

Facilities data managed and provided by FIMAD.

Map produced by Marjorie Wright, ESH-20
Map number 01-0123-05

Map 3. Wildfire Hazard Reduction Project Plan - Phases 2 & 3



Legend

- Major roads
- Buildings/structures

Planning area

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

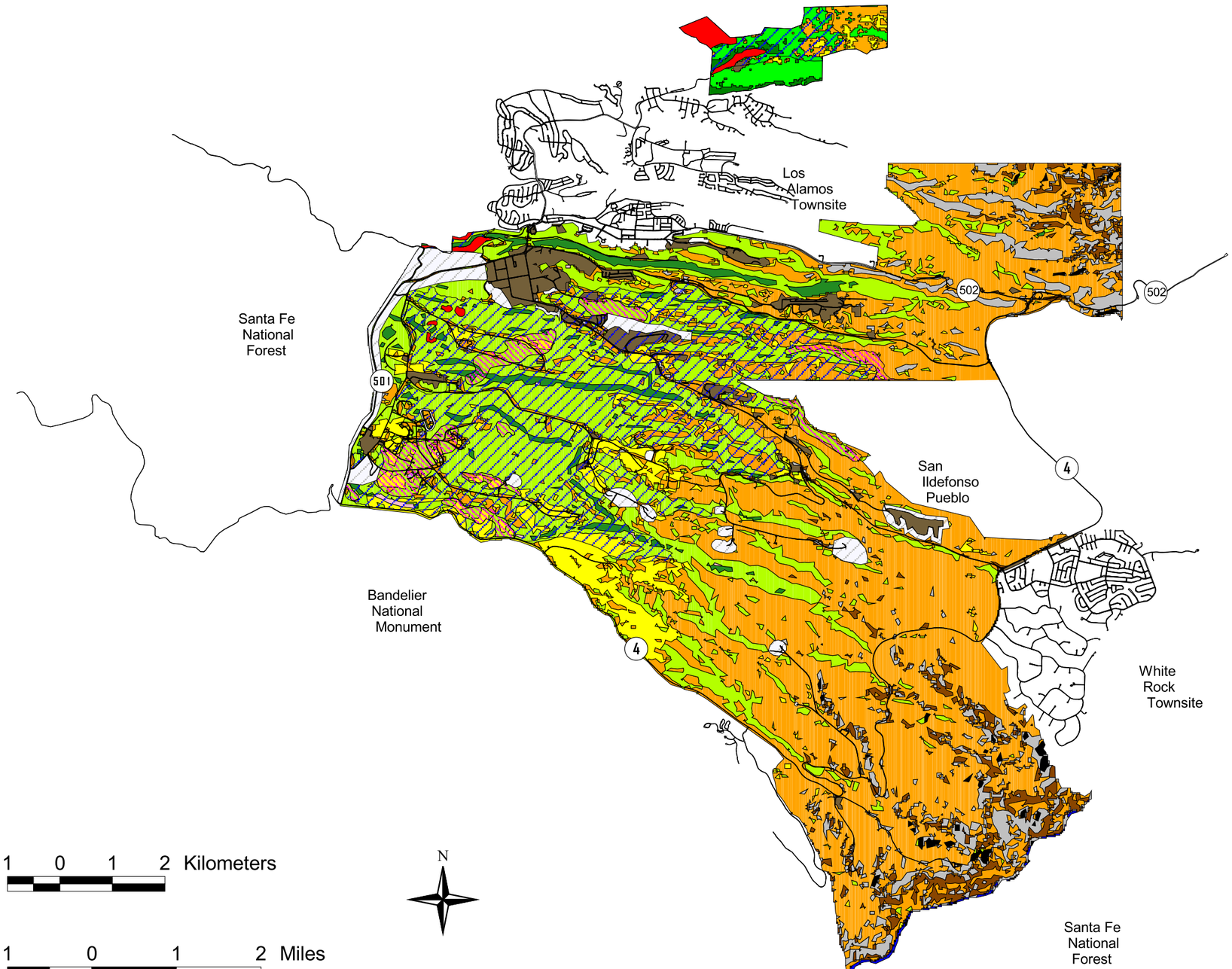
Data have not been field verified, therefore subject to change. New Mexico State Plane, Central Zone, North American Datum of 1983

Facilities data managed and provided by FIMAD.

Los Alamos National Laboratory
ECOLOGY GROUP
Environment, Safety and Health

Map Produced by Marjorie Wright, ESH-20
Map number: 01-0123-06

Map 4. Wildfire Hazard Reduction Project Plan - Existing Conditions



Legend

Major roads

Burn severity class
- High
- Low/Unburned
- Moderate

Past treatment areas

Buildings/structures

Vegetation type
- Water
- Unvegetated Land
- Mixed Conifer
- Aspen/Other Decidous
- Ponderosa Pine
- Pinon-Juniper
- Juniper Savannah
- Grassland
- Developed
- Unclassified

Data have not been field verified, therefore subject to change. New Mexico State Plane, Central Zone, North American Datum of 1983.

Facilities data managed and provided by FIMAD

Los Alamos National Laboratory — ECOLOGY GROUP — Environment, Safety and Health

Map produced by Marjorie Wright, ESH-20.
Map number:01-0123-07

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APPENDIX A: Wildfire Project Review Form

LANL Wildfire Project Review Form

In accordance with DOE-EA-1329, Wildfire Hazard Reduction and Forest Health Improvement Program (WHRFHIP), the following planning measures are for the "Los Alamos Canyon Urban Interface Wildfire Hazard Reduction Project".

1. Individual Project Planning

☐ Routine Maintenance Project.
☒ Forest Thinning Project.
☒ ESH-ID Complete.
The ESH-ID# for this project is 00-0133 and was submitted for review on 4/24/00 and completed on 5/10/00.
Facility and Forest Fire Hazard Assessment was rated as *moderate.*
The cultural resource survey for this area was completed on September 12, 2000 and no effect on historical cultural resources was determined.
The Clean Water Act exempts the NPDES permitting of Silvicultural activities including fuel mitigation, thinning, and forest rehabilitation, and no NPDES permit will be required.
This project was developed in cooperation with the IWMT committee.
The Forest Fire Hazard Assessment for this project was rated at a moderate level.
End-state conditions for this project are consistent and comply with those identified in WHRFHIP EA page 16, third paragraph.

2. Treatment Measures

☒ Forest Thinning.
☒ Fuel Break Construction.
☐ Fuel Break Maintenance.
☐ Fire Road Construction.
☐ Fire Road Improvements.

3. Environmental Protection Measures

☒ Worker Protection and Health and Safety Measures Addressed in SOPs, HCPs, LIRs
☒ Cultural Resource Survey Completed
☒ Air Quality Reviewed
☒ Water Quality Reviewed
Threatened and Endangered Species Issues:
This area is within the core zone of the Los Alamos Canyon AEI and forest treatment measures contained in the HMP apply. The US Fish and Wildlife Service concurred with DOE's determination of affects associated with this project on 12/1/00. Letter attached.

4. Removal of Generated Wood Materials.

☒ Wood Material Cleared for Public Release.
☐ Wood Material Suspect Contaminated. All wood material to remain on LANL.

5. End-State Conditions and Post-Treatment Assessment.

☐ End-State Conditions Assessment Planned.
☐ Forest Fuel Load Assessment Planned.
☒ Ecological Field Studies Planned.
☐ Watershed Assessment Planned.
☐ Fire Behavior Modeling Planned.

Reviewed and approved by:

_____Date_____
Carey Bare,
Ecology Group, ESH-20
Natural Resource Management Team Leader.

Los Alamos Canyon Urban Interface Wildfire Hazard Reduction Project Plan.
(Identified as "A" on Table 1 and on map 2.)

Project Objective. The objective of this project is to create a 200 to 300 ft fuel break between the edge of the forest and the Health Research Laboratory Building (HRL)-Los Alamos Medical Center-DOE LAAO complex and the Fairway Street areas. See map 2 for exact location.

Thinning Prescription.
Because the project is located within a T&E AEI, the guidelines found within the Habitat Management Plan apply regarding tree removal. For health and safety reasons, any size tree growing within 100 ft (30 m) of a building may be removed to achieve a 25-ft spacing between crowns. Outside of the 100 ft area, trees 9 inches in diameter or less may be thinned to achieve a 25-ft spacing and any size tree may be limbed up to 6-ft.

Access, and Staging Areas.
Wood materials that are not salvaged will be chipped or piled on site. The project will be accessible to the contractor from the top of the canyon adjacent to the HRL and LAAO Buildings.

Environmental Issues.
Avoid disturbing the bottom of Los Alamos Canyon that contains a watercourse. NMED must approve necessary permits before watercourses may be disturbed. No tree felling may occur from March 1 through May 15 in order to complete T&E wildlife surveys.

ESH-ID Review
Based on the scope of work for this project, the following LANL ESH-ID Subject Matter Experts provided the following comments for this project:

ESH-17, Air Quality: "Tree thinning activities may generate some particulate emissions, however, tree thinning activities for wildfire protection are considered maintenance. Therefore, any emissions generated are exempt from permitting under Title 20 of the New Mexico Administrative Codes, Sections 2.72 and 2.70. Mechanical equipment including cranes, forklifts, backhoes, and chippers are also exempt (Section 202 A.3.) from permitting under NMAC 2.72."

ESH-18, Water Quality and Hydrology: "Do not place any wood debris in or near drainage swales or storm drains. All debris will need to be properly disposed of so that it does not contaminate storm water runoff. All disturbed areas will need to be re-vegetated and permanently stabilized after completion of the project." "The Clean Water Act exempts the NPDES Storm Water permitting of Silvicultural activities so a NPDES permit will not be required."

ESH-19, Hazardous and Solid Waste: "The project description shows that only wood debris will be generated which will be recycled or chipped onsite. Based on this waste stream and location, this waste does not have the potential to be hazardous."

ESH-20, Ecology: “For health and safety reasons, any tree within 30 m of buildings but outside a developed area, may be thinned to achieve a 7.6-m spacing between crowns.” No thinning may occur between March 1 to May 15 in order to conduct T&E surveys. “The proposed tree-thinning project will have no effect on historic cultural resources.” “The proposed work is within the scope of the FONSI for the Wildfire Risk Reduction and Forest Health Improvement EA(DOE/EA-1329). The NEPA review is complete.”

S-8, Emergency Management and Response: “EM&R fully supports this activity to reduce the fuel load. No additional requirements are applicable to the project.”

To: Patrick Valerio <valeriop@lanl.gov>
Subject: Re: LA Medical Center Project

The proposed work is within the scope of the FONSI for the Wildfire Risk Reduction And Forest Health Improvement EA (DOE/EA-1329). The NEPA Review is complete.

At 03:56 PM 12/5/2000 -0700, you wrote:
> Peggy, we received a letter from US Fish and Wildlife Service on 12/4/00 whereby they concurred with our actions. This was the last approval we were waiting for before our NEPA approval. Thanks

Peggy Powers
505-665-5717
505-667-0731 (fax)
peggy.powers@lanl.gov

ESH-20, MS M887
Los Alamos National Laboratory
Box 1663
Los Alamos, NM 87545

X-Sender: wbmasse@esh-mail.lanl.gov
X-Mailer: QUALCOMM Windows Eudora Pro Version 4.1
Date: Tue, 12 Sep 2000 14:16:47 -0600
To: valeriop@lanl.gov
From: "W. Bruce Masse" <wbmasse@lanl.gov>
Subject: ESH-ID 00-0133 (Los Alamos Medical Center-DOE Wildfire Fuel Reduction): ESH-20 Cultural Resources concluding review
Cc: bennettk@lanl.gov, manzk@lanl.gov, peggy.powers@lanl.gov, hth@lanl.gov, gonzales_g@lanl.gov, aparagon@lanl.gov, dckeller@lanl.gov

CULTURAL RESOURCES: The proposed tree-thinning project will have no effect on historic cultural resources. This review and determination concludes the requirements for cultural resources under the existing project scope of work.

W. Bruce Masse
Cultural Resources Team
ESH-20 Ecology Group
Mail Stop M887
Los Alamos National Laboratory
Los Alamos, NM 87545

Telephone: (505) 665-9149
Fax: (505) 665-4693
Email: wbmasse@lanl.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

Cons. #2-22-01-I-065

David A. Gurulé, P.E., Area Manager
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Gurulé:

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) receipt of your November 27, 2000, letter requesting concurrence under section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq.*). This consultation concerns the effects of implementing two forest treatment projects on the Mexican spotted (*Strix occidentalis lucida*). It is our understanding that the project proposes to thin 60 acres near Los Alamos to reduce fuels, maintain visual quality, and protect nearby developed and historic areas from potential fires. Areas proposed to be thinned include: 1) 35 acres of ponderosa pine forest within the canyon bottom (Water Canyon/Cañon de Valle project); and 2) 25 acres of ponderosa pine forest within the canyon bottom and along the canyon sides (Los Alamos Canyon project). The proposed project would begin in December 2000 and be completed by February 28, 2001. You determined in the BA/letter that this project "may affect, but is not likely to adversely affect" the spotted owl.

The U.S. Fish and Wildlife Service (Service) strongly supports the U.S. Department of Energy in fire abatement projects, such as this, especially in areas of wildland-urban interface. Protecting human life and property should be the highest priority. In addition, threats of wide-scale habitat loss due to fire are real and immediate in some areas. Reducing fuels in these areas also may help to protect habitat for other threatened and endangered species.

The BA/letter states that the project is not expected to change stands meeting or those needed to maintain threshold conditions, because trees over 9 inches diameter basal height (dbh) will not be cut. The Water Canon and Cañon de Valle project is within historically occupied Mexican spotted owl habitat. The Los Alamos Canyon project is within potential Mexican spotted owl habitat that has not historically been occupied. The removal of trees will occur only during the nonbreeding season (September 1 - February 28). This type of project is consistent with the fire abatement recommendations in the recovery plan (USDI 1995) and will not appreciably alter the structure of spotted owl habitat. The breeding season restriction also will minimize any potential adverse affects on the owl.

The implementation of this project will: 1) be limited to those trees less than 9 inches dbh; 2) reduce the potential for catastrophic fire; 3) improve habitat conditions for spotted owl prey; 4) not affect stands meeting threshold conditions; and 5) follow the recommendations set forth in the recovery plan for the spotted owl (United States Department of Interior 1995). Therefore, we concur with your finding that the project "may affect, but is not likely to adversely affect" the critical habitat of the spotted owl.

Please contact the Service to verify the above determinations and concurrence is still valid if: 1) future surveys find threatened or endangered species in areas where they have not been previously observed; 2) the project is changed or new information reveals effects of the actions to the listed species or their habitat to an extent not considered in the BE; or 3) a new species is listed that may be affected by these projects.

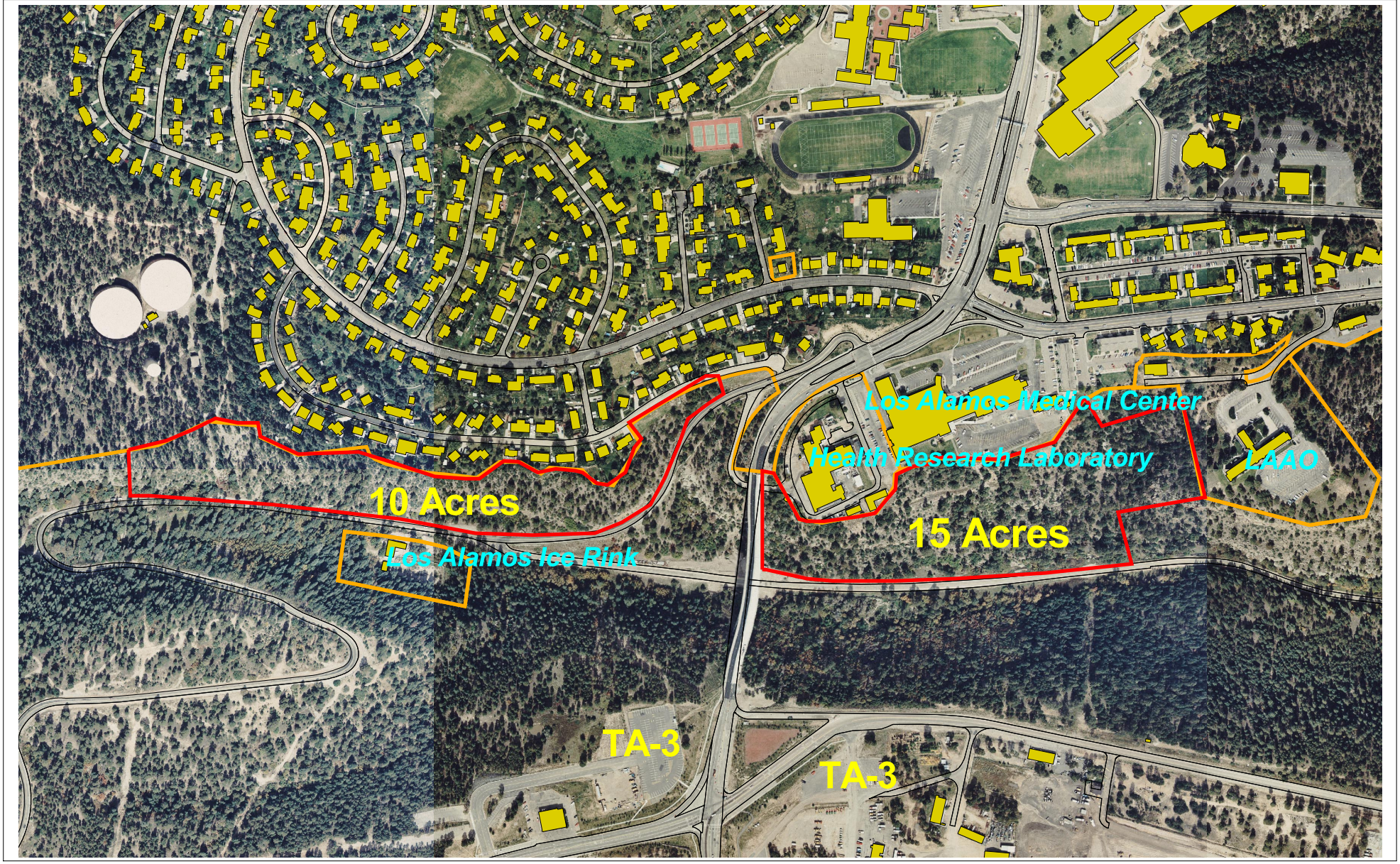
Thank you for your concern for endangered species and New Mexico's wildlife habitats. If we can be of further assistance, please contact Lyle Lewis of my staff at the letterhead address or at (505) 346-2525, extension 114.

Sincerely,

Joy E. Nicholopoulos

Joy E. Nicholopoulos
Field Supervisor

Los Alamos Canyon Site



0.04 0 0.04 0.08 0.12 Kilometers

0.02 0 0.02 0.04 0.06 Miles

N

Legend

- Thinning area
- Buildings/structures
- Roads
- LANL

Data have not been field verified, therefore subject to change. New Mexico State Plane, Central Zone, North American Datum of 1983.

Facilities data managed and provided by FIMAD

Map produced by Marjorie Wright, ESH-20
Map number: 01-0123-08

APPENDIX B: DOE FONSI for the Wildfire Hazard Reduction and Forest Health Improvement Program at LANL and the EA for the Wildfire Hazard Reduction and Forest Health Improvement Program at LANL

Department of Energy
Finding of No Significant Impact
for the
Wildfire Hazard Reduction and Forest Health Improvement Program
at
Los Alamos National Laboratory,
Los Alamos, New Mexico

U. S. Department of Energy
Los Alamos Area Office
528 35th Street
Los Alamos, NM 87544

DEPARTMENT OF ENERGY
FINDING OF NO SIGNIFICANT IMPACT

Wildfire Hazard Reduction and Forest Health Improvement Program

at Los Alamos National Laboratory,

Los Alamos, New Mexico

FINAL ENVIRONMENTAL ASSESSMENT: The Environmental Assessment (EA) for *Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory (DOE/EA-1329)* (attached) provides sufficient evidence and analysis to determine that a Finding Of No Significant Impact (FONSI) is appropriate for the Proposed Action (the No Burn Alternative). The EA documents the evidence and analysis in the following chapters: 1. Purpose and Need for Agency Action; 2. Description of the Proposed Action and Associated Alternatives; 3. Affected Environment; and 4. Environmental Consequences.

Analyses performed in the EA conclude that potential adverse effects of the Proposed Action, under normal conditions, would be minimal. No short-term or long-term adverse effects are expected to occur to air quality, visual resources, water quality, soil erosion, cultural resources, waste management, human health, socioeconomics, or utilities and infrastructure. Only biological resources would be affected long-term; beneficial effects to a variety of resources including biological are expected. Engineering and administrative controls or considerations that serve to lessen any potential for adverse environmental effects have been incorporated as integral features of the Proposed Action. Examples of this type of mitigating feature include: the careful planning that must go into each project before it is implemented, including a Facility and Forest Fire Hazard Assessment, Identification of Resource Issues, coordination with neighboring land management agencies and land owners, development of end-state conditions, formulation of treatment and environmental protection measures; the use of worker protection and health and safety measures tailored to each project; the use of hand tools to remove vegetation from cultural resource sites; the use of non-sparking equipment during periods of extreme fire danger; and the use of Best Management

Practices to prevent surface soil erosion and sediment migration controls where soil disturbances are unavoidable.

The Environmental Assessment (EA) has analyzed the potential environmental consequences of three additional alternatives besides the Proposed Action. These other alternatives are the: Limited Burn (waste only), Burn (both treatment and forest waste) and No Action. Presently DOE has a moratorium that will likely be in effect until the December 2000 time frame when the DOE plans to issue its new policy on the use of prescribed burning. This policy development effort will be coordinated with the U.S. Department of the Interior and the U.S. Department of Agriculture. Accordingly, DOE will not make a decision on the appropriateness of issuing a FONSI on either the Limited Burn Alternative or the Burn Alternative until after this policy has been issued.

The EA considered the cumulative effects of the Proposed Action with past, present and reasonably foreseeable future actions. The Wildfire Hazard Reduction and Forest Health Improvement Program would enhance the forest recovery efforts associated with the Cerro Grande Fire within LANL boundaries. Future foreseeable non-Department of Energy activities on land administered by neighboring land- owners and agencies are likely to be of a similar nature to the forest thinning proposed. The impacts from implementation of this management program and associated activities over about 10,000 acres (4,000 ha) would be a minor contribution to the overall cumulative adverse and positive impacts due to forest management practices and the implementation of other projects within the region of concern along the Pajarito Plateau in the East Jemez Mountains.

PREDECISIONAL DRAFT REVIEW & COMMENT: On July 6, 2000, the Department of Energy invited review and comment on the predecisional draft EA from the State of New Mexico; four nearby American Indian Tribes: Cochiti, Jemez, Santa Clara and San Ildefonso (sometimes referred to as the four accord pueblos because each tribe has entered into an accord with the Department of Energy); and the Mescalero Apache Tribe. In addition, the Department of Energy made the predecisional draft EA available to the general public at the same time it was provided to the State and Tribes. The availability of the EA to the public was accomplished by placing it in the Department of Energy Public Reading Rooms located within the Los Alamos National Laboratory's Community Outreach Center and Reading Room, and in the University of New Mexico's Zimmerman Library in Albuquerque. A notice was placed in three local newspapers announcing the availability of the draft EA for review, and the availability of the

document was also announced during a public meeting sponsored by DOE that was broadcast live by the KRSN AM radio station on July 7,2000. The predecisional draft EA was also placed on the World Wide Web Computer Internet System. Additionally, over 50 local stakeholder groups and individuals, which have identified themselves as interested parties with regards to LANL activities, were notified by letter of the availability of the predecisional draft on July 6, 2000. Copies of the EA were provided to all interested parties for their review upon their requests. The review and comment period was 22 days long and ended on July 28, 2000, although comments received after that time period had lapsed were considered. Six separate parties provided comments to the draft EA. Comments were received from: the Department of Agriculture, Forest Service, Santa Fe National Forest; Mr. Terrell Johnson; the Rio Grande Chapter of the Sierra Club; the State of New Mexico, Environment Department; the Department of the Interior, Fish and Wildlife Service, New Mexico Ecological Services Field Office and Mr. Raymond Tell, P.E. These sets of comments were addressed in the Final EA, individual responses to the comments were prepared by DOE, and these responses were sent to the respondents together with copies of the Final EA.

AGENCY CONSULTATIONS: No likely adverse effects to Federally-listed threatened and endangered species or their habitat are anticipated during the implementation of projects conducted under the Wildfire Hazard Reduction and Forest Health Management Program. DOE implemented a Threatened and Endangered Species Habitat Management Plan (HMP) for LANL in March 1999; all projects implemented under this Management Program will comply with the HMP or with additional restrictions developed through consultation with the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service has concurred on DOE's determination that the proposed action "may affect but is not likely to adversely affect" the Mexican spotted owl, the bald eagle, the whooping crane and the southwestern willow flycatcher or their critical habitat for the implementation of the HMP. The Service will be consulted on the Wildfire Hazard Reduction and Forest Health Improvement Program's management plan (which will be part of the Biological Resources Management Plan) before individual projects are performed. It is expected that all activities whether covered by the HMP or under the to-be-developed Biological Resources Management Plan would be designed to avoid an adverse affect to either species individuals or their critical habitat. Similarly, there are not likely to be adverse effects to historic, prehistoric or other cultural

resources as a result of implementation of this program. The State Historic Preservation Officer has recently entered into a Programmatic Agreement with DOE regarding undertakings of no effect to cultural resources. Projects implemented under the Wildfire Hazard Reduction and Forest Health Improvement Program would be expected to comply with the provisions of the Programmatic Agreement or any additional provisions developed through the to-be-developed LANL Cultural Resources Management Plan's consultation process. DOE's compliance requirements under the Endangered Species Act and the National Historic Preservation Act will be on-going for the Wildfire Hazard Reduction and Forest Health Improvement Program due to the long term nature of the program. The U.S. Department of Agriculture, Forest Service, Santa Fe National Forest and San Ildefonso Pueblo participated in the preparation of the subject EA as Cooperating Agencies (as defined in 40 CFR 1501.6). The Interagency Wildfire Management Team also provided information that was used in the preparation of this EA.

FINDING: The United States Department of Energy finds that there would be no significant impact from proceeding with its proposal to implement the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory as described in the Proposed Action. This finding is based on the EA that analyzes the consequences of the relevant issues of environmental concern. The Department of Energy makes this Finding of No Significant Impact pursuant to the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.], the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act [40 CFR 1500] and the Department of Energy National Environmental Policy Act Implementing Procedures [10 CFR 1021]. Therefore, no environmental impact statement is required for this proposal.

Signed in Los Alamos, New Mexico this 10th day of August, 2000, 2000.

David A. Gurulé

David A. Gurulé, P.E.
Area Manager
Los Alamos Area Office

FOR FURTHER INFORMATION: For further information on this proposal, this Finding Of No Significant Impact (FONSI), or the Department of Energy's National Environmental Policy Act (NEPA) review program concerning proposals at Los Alamos National Laboratory, please contact:

Elizabeth Withers, NEPA Compliance Officer

Los Alamos Area Office

U.S. Department of Energy

528 35th Street

Los Alamos NM 87544

(505) 667-8690

Copies of this FONSI (with the Environmental Assessment attached) will be made available for public review at the DOE Public Reading Room within the Los Alamos National Laboratory Community Relations Office, 1619 Central Avenue, Los Alamos, New Mexico, 87544 at (505) 665-4400 or (800) 508-4400. Copies will also be made available within the DOE Public Reading Room at the Zimmerman Library, University of New Mexico, Albuquerque, New Mexico, 87131 at (505) 277-5441.