LA-UR-06-6679

Approved for public release;
distribution is unlimited

Title: **BIOLOGICAL ASSESSMENT OF THE CONTINUED OPERATION OF LOS ALAMOS NATIONAL LABORATORY ON FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES**

Prepared by: **ECOLOGY AND AIR QUALITY GROUP (ENV-EAQ)**

Submitted to: **DOE/NNSA Los Alamos Site Office**

An Affirmative Action/Equal Opportunity Employer

Contents

Tables

Figures

Acronyms

AEI	Area of Environmental Interest
AOC	area of concern
CASA	Critical Assembly Storage Area
CMRR	Chemistry and Metallurgy Research Facility Replacement
COPEC	contaminant of potential ecological concern
CY	calendar year
DARHT	Dual-Axis Radiographic Hydrodynamic Test (Facility)
dB(A)	A-weighted decibels
DBH	diameter at breast height
DD&D	decontamination, decommissioning, and demolition
DOE	Department of Energy
DynEx	Dynamic Experiment
ECR	Environmental Characterization and Remediation (Project/Group)
ENV-ECO	Ecology (Group)
EPA	Environmental Protection Agency
ER	Environmental Restoration (Project)
ERAGS	ecological risk assessment guidance for Superfund
ESA	Endangered Species Act
ESL	ecological screening level
FY	fiscal year
GIS	geographic information system
HI	hazard index
HMP	Threatened and Endangered Species Habitat Management Plan
HQ	hazard quotient
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
MDA	Material Disposal Area
MGY	million gallons per year
NEPA	National Environmental Policy Act
NMED	New Mexico Environment Department
NMSSUP	Nuclear Materials Safety and Security Upgrades Project
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
PAC	protected activity center
PCB	polychlorinated biphenyl
PHERMEX	Pulsed High-Energy Radiation Machine Emitting X-Rays (Facility)
PIDADS	perimeter intrusion detection, assessment, and delay system
PRS	potential release site
PTLA	Protection Technology Los Alamos
RAC	Risk Assessment Corporation
RBES	risk-based, end-state (vision)
RCRA	Resource Conservation and Recovery Act
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision
SAL	screening action level
SR	State Route
SWEIS	Site-Wide Environmental Impact Statement
SWMU	solid waste management unit
TA	Technical Area
UC	University of California
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

Executive Summary

This biological assessment considers the effects of continuing to operate Los Alamos National Laboratory on Federally listed threatened or endangered species, based on current and future operations identified in the 2006 Site-wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (SWEIS; DOE In Prep.). We reviewed 40 projects analyzed in the SWEIS as well as two aspects on ongoing operations to determine if these actions had the potential to affect Federally listed species. Eighteen projects that had not already received U.S. Fish and Wildlife Service (USFWS) consultation and concurrence, as well as the two aspects of ongoing operations, ecological risk from legacy contaminants and the Outfall Reduction Project, were determined to have the potential to affect threatened or endangered species. Cumulative impacts were also analyzed. The assessment results are as follows:

PROJECT	**Mexican spotted owl finding**	**Bald eagle finding**	**Southwestern willow flycatcher finding**
Ecological risk from legacy contaminants	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*
Outfall Reduction Project	*Likely to adversely affect*	*No effect*	*No effect*
Science Complex	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
TA-3 Replacement Office Buildings	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Nuclear Materials Safeguards and Security Upgrade	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Security-Driven Transportation Modifications	*Likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Security-Driven Transportation Modifications Options	*Likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
TA-48 Radiological Science Institute	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Characterization and Remediation of MDA C	*May affect, not likely to adversely affect*	*No effect*	*No effect*
Radioactive Liquid Waste Treatment Facility Replacement	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
TA-72 Warehouse and Truck Inspection Station	*No effect*	*May affect, not likely to adversely affect*	*No effect*
Disposition of the Flood Retention Structure and Steel Diversion Wall in Pajarito Canyon	*May affect, not likely to adversely affect*	*No effect*	*May affect, not likely to adversely affect*

PROJECT	Mexican spotted owl finding	Bald eagle finding	Southwestern willow flycatcher finding
Decontamination, Decommissioning, and Demolition of TA-18	*May affect, not likely to adversely affect*	*No effect*	*May affect, not likely to adversely affect*
Remediation of MDAs G, H, and L at TA-54	*No effect*	*No effect*	*May affect, not likely to adversely affect*
Remediation of MDAs A, T, and U at TA-21	*May affect, not likely to adversely affect*	*No effect*	*No effect*
Decontamination, Decommissioning, and Demolition of TA-21	*May affect, not likely to adversely affect*	*No effect*	*No effect*
DynEx Assembly Chamber	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Remediation of MDAs N and Z at TA-15	*May affect, not likely to adversely affect*	*No effect*	*No effect*
Remediation of MDA D at TA-33	*No effect*	*No effect*	*May affect, not likely to adversely affect*
Cumulative Impacts: Core Planning Area	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Cumulative Impacts: Pajarito West/Sigma Mesa Planning Areas	*Likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Cumulative Impacts: Pajarito East Corridor Planning Area	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*
Cumulative Impacts: Omega West Planning Area	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Cumulative Impacts: Water Canyon Planning Area	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*	*No effect*
Cumulative Impacts: Rio Grande Corridor Planning Area	*No effect*	*May affect, not likely to adversely affect*	*No effect*

Reasonable and Prudent Measures: The following standard reasonable and prudent measures were proposed for projects that may affect, but are not likely to adversely affect a threatened or endangered species. In addition, some project-specific reasonable and prudent measures are proposed for individual projects in the document text based on the proposed action.

Standard bald eagle (foraging habitat effects):

- No potential bald eagle winter roosting trees would be disturbed during project activities.
- Presence or absence of bald eagles would be monitored during project activities in the fall and winter (November 1–March 31). If a bald eagle is present within 0.25 mile (400 meters) of the project area in the morning before project activity begins, or arrives during breaks in project activity, the contractor would be required to suspend all activity until the bird leaves of its own volition; or an Ecology Group (ENV-ECO) biologist, in consultation with the USFWS, determines that the potential for harassment is minimal.

- If bald eagles are consistently found in the immediate project area during the construction period, an ENV-ECO biologist would informally contact the USFWS to determine if formal consultation under the Endangered Species Act is necessary.
- All new lighting must be in compliance with the New Mexico Night Sky Protection Act, which states that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, must be projected below a horizontal plane running through the lowest point on the fixture where light is emitted. Lights will be directed away from canyons.
- Disturbance and noise would be kept to a minimum during project activities.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Avoid unnecessary disturbance to vegetation. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- All exposed soils must be re-vegetated as soon as feasible after project activities to minimize erosion. All trees and other plant species that are used for re-vegetation purposes will be native species appropriate for the natural vegetation and the habitat conditions of the surrounding area.

Standard Mexican spotted owl (work in habitat):

- Work with heavy equipment or loud-noise-generating equipment such as chainsaws or generators will not be started between March 1 and May 15 or until the completion of surveys, whichever comes first, in any given year. If the habitat is determined to be occupied during surveys, restrictions on beginning work may be extended through August 31. Once work is started, it will continue until completed.
- LANL will continue to perform annual presence/absence surveys adjacent to the project area before and during the action. If any areas of potential Mexican spotted owl activity are found in the project area, USFWS will be consulted before the start of the action.
- All new lighting must be in compliance with the New Mexico Night Sky Protection Act, which states that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, must be projected below a horizontal plane running through the lowest point on the fixture where light is emitted. Light will be directed away from canyons and canyon rims.
- Disturbance and noise would be kept to a minimum during project activities.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Unnecessary disturbance to vegetation will be avoided. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- There will be no trees with a diameter at breast height (DBH) greater than 8 inches (20 centimeters) removed outside of the project area without ENV-ECO evaluation.
- All exposed soils must be re-vegetated as soon as feasible after remediation to minimize erosion. All trees and other plant species that are used for re-vegetation purposes will be native species appropriate for the natural vegetation conditions of the surrounding area.

Site-Wide Reasonable and Prudent Measures

In addition, the following reasonable and prudent measures were proposed for projects that were likely to adversely affect a threatened or endangered species and for site-wide implementation:

- LANL should support or encourage the presence of water resources that are supported or supplemented by outfalls or storm water runoff, including wetlands, intermittent stream reaches, and perennial stream reaches, in or adjacent to Mexican spotted owl habitats, where such resources do not hinder water quality protection goals or other compliance requirements.
- All further actions affecting water flow volumes in Mortandad and Sandia canyons should be carefully assessed for positive and negative impacts.
- Hiking trails into Mortandad and Sandia canyons near documented nesting or roosting areas will be signed as permanently closed to pedestrians and enforced by PTLA.
- LANL will inventory, monitor, and protect water supplies for natural springs within canyon systems.
- LANL will inventory, monitor, and protect riparian areas within canyon systems.
- LANL will develop and implement a wetlands/floodplains management plan that will address protection of wetlands, riparian areas, and springs.
- Surveys for Mexican spotted owls will continue to be conducted in all identified habitats annually.
- Span bridges will be used in preference to land bridges to develop transportation options crossing canyons in threatened and endangered species habitats. To facilitate wildlife crossings, span bridges will be constructed to standards identified in peer-reviewed literature. All land bridge proposals will require consultation with USFWS.
- Future projects on undisturbed buffer in Areas of Environmental Interests with over 10 percent developed—or proposed to be developed—buffer will require USFWS consultation.
- Continue watershed-specific assessments of ecological risk to threatened and endangered species, and conduct site-wide modeling of ecological risk for species on which information is outdated.
- A detailed master development plan will be developed for Sigma Mesa, and will be consulted on with USFWS. Projects or uses not identified in the master development plan for Sigma Mesa will not be permitted in Mexican spotted owl habitat.
- LANL will reinitiate consultation for any projects assessed in this biological assessment that undergo a significant change in scope or location unless the project's impacts to threatened or endangered species decrease as a result of those changes.
- No wetland or riparian vegetation or trees with a DBH greater than 8 inches (20 centimeters) in undeveloped threatened and endangered species habitats will be removed outside of approved project areas without ENV-ECO evaluation.

1.0 Introduction

Los Alamos National Laboratory (LANL) is located in north-central New Mexico within a region characterized by forested areas with mountains, canyons, and valleys, as well as diverse cultures and ecosystems. 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 Department of Energy (DOE), and the National Nuclear Security Administration (NNSA). The University of California (UC) is the current LANL Management and Operating Contractor and has served in this capacity since the facility's inception in 1943. Los Alamos National Security, LLC will take over operation of LANL as the Management and Operating Contractor effective June 1, 2006.

LANL is located within the Incorporated County of Los Alamos (also referred to locally as "the County" or "the County of Los Alamos"). The two primary residential areas within Los Alamos County are the Los Alamos town site and the White Rock residential development. These two residential areas are home to about 18,400 people. About 13,000 people work at LANL.

This biological assessment considers the effects of continuing to operate LANL on Federally listed threatened and endangered species, based on the 2006 Site-wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (SWEIS; DOE, in prep). The DOE's missions are explained below.

National security as it relates to the safety and reliability of the nuclear weapons stockpile and its maintenance, the stemming of international spread of nuclear weapons material and technologies, and the production of propulsion plants for the U.S. Navy;

Energy resources, including research and development for energy efficiency, renewable energy, fossil energy, and nuclear energy;

Environmental quality, including waste treatment, storage and disposal of DOE's wastes, pollution prevention, storage and disposal of civilian radioactive wastes, and development of technologies to reduce risks and reduce cleanup costs; and

Science, which includes fundamental research in physics, material science, chemistry, nuclear medicine, basic energy sciences, computational sciences, environmental sciences, and biological sciences.

In 1999, Congress created the NNSA as a semiautonomous administration within the DOE (see the 1999 National Nuclear Security Administration Act [Title 32 of the Defense Authorization Act for Fiscal Year 2000 (Public Law 106-65)]). The assigned mission of the NNSA is "(1) To enhance U.S. national security through the military application of nuclear energy; (2) To maintain and enhance the safety, reliability, and performance of the U.S. nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements; (3) To provide the U.S. Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants; (4) To promote international nuclear safety and nonproliferation; (5) To reduce global danger from weapons of mass destruction; and (6) To support U.S. leadership in science and technology" [50 USC Chapter 41, § 2401(b)].

Congress identified LANL as one of three national security laboratories to be administrated by the NNSA for the DOE. As the NNSA's mission set is a subset of the DOE's original mission assignment, the work performed at LANL in support of NNSA has remained unchanged in character from that performed for DOE prior to the creation of the NNSA in 1999.

LANL work provides support to each of the NNSA and DOE missions, although work may not be performed for all the various elements of the DOE and NNSA missions (for example, LANL work does not include work to produce nuclear propulsion plants for the U.S. Navy). LANL, originally built for the U.S. Army with a single focus on developing the world's first atomic weapon, currently is focused primarily on research and development work supporting NNSA's national security mission. Nuclear weapons pit production work takes place at LANL on a limited scale. NNSA and DOE assign mission element work to LANL based on the facilities and expertise of the staff located there, as well as other factors. Facilities and expertise at LANL are used to perform theoretical research (including analysis, mathematical modeling, and high-performance computing), experimental science and engineering, advanced and nuclear materials research, and development and applications (including weapons components testing, fabrication, stockpile assurance, replacement, surveillance, and maintenance). These capabilities allow research and development activities such as high explosives processing, chemical research, nuclear physics research, materials science research, systems analysis and engineering, human genome "mapping," biotechnology applications, and remote sensing technologies applied to resource exploration and environmental surveillance to be performed at LANL.

Projects considered in this biological assessment are those projects described in the 2006 Draft Site-wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (DOE, in prep.) or else ongoing Laboratory operations that were judged to have a potential impact on threatened or endangered species at LANL. The following table lists the specific projects that were considered for this assessment. Projects were determined to either fall under the guidelines of LANL's current Threatened and Endangered Species Habitat Management Plan (HMP), and therefore not to require further assessment ('consultation not needed'), to already have completed consultation ('consultation complete'), or to need consultation ('needs consultation'). Except for discussions of cumulative impacts, projects not needing consultation or with consultation complete are not further discussed in this document. All projects were considered in evaluating cumulative impacts. In addition to these projects, the ecological risks of legacy contaminants in the LANL area to threatened or endangered species was also assessed.

Project Name	***Consultation Status***
Site-wide Projects	
Outfall Reduction Program	Needs consultation
Land Conveyance and Transfer	Consultation complete #2-22-01-F-634
Power Grid Infrastructure Upgrade	Consultation complete #2-22-00-I-043R
Wildfire Hazard Reduction	Consultation complete #2-22-01-F-432
Trails Management Program	Consultation not required
Natural Gas Line	Consultation complete #2-22-02-I-410
Projects Addressing Security Upgrades	
Security Perimeter Project	Consultation complete #2-22-02-I-0553R
Nuclear Materials Safeguards and Security Upgrades Project (NMSSUP)	Needs consultation
Security-Driven Transportation Modifications and Options	Needs consultation
Projects to Maintain Existing Capabilities	
Center for Weapons Programs Research	Consultation not needed
Technical Area (TA) 3 Replacement Office Buildings	Needs consultation
Radiological Science Institute	Needs consultation
Radioactive Liquid Waste Treatment Facility (RLWTF)	Needs consultation
Los Alamos Neutron Science Center (LANSCE) Refurbishment	Consultation not needed
Radiography Facility	Consultation not needed
Plutonium Facility Complex Reinvestment	Consultation not needed
Science Complex	Needs consultation

Project Name	***Consultation Status***
Closure and Remediation Actions	
Warehouse and Truck Inspection Station	Needs consultation
Decontamination, Decommissioning, and Demolition (DD&D) of TA-18	Needs consultation
DD&D of TA-21	Needs consultation
Closure of Los Alamos County Landfill	Consultation not needed
Replacement of low-level radioactive waste support facilities	Consultation not needed
Replacement of mixed low-level waste support facilities	Consultation not needed
Construction of a transuranic waste consolidation facility	Planning not sufficiently advanced for determination
Material Disposal Area (MDA) Remediation and other Compliance Order Actions	
Firing Sites	Consultation not needed
TA-21 MDAs (V, A, B, T, U)	Needs consultation
MDA AB	Consultation not needed
MDA C	Needs consultation
TA-33 MDAs (D, E, K)	Needs consultation (MDA D only)
TA-54 MDAs (G, H, L)	Needs consultation
MDA F	Consultation not needed
MDA Q	Consultation not needed
TA-15 MDAs (N, Z)	Needs consultation
MDA R	Consultation not needed
MDA AA	Consultation not needed
MDA Y	Consultation not needed
Projects Associated with New Operations	
Metropolis Center	Consultation not needed
TA-Specific Projects	
TA-3 Combustion Turbine Generators	Consultation not needed
Chemistry and Metallurgy Replacement Facility	Consultation underway (re-initiation of #2-22-03-I-0302)
Engineering Science and Application Division Consolidation Project	Consultation not needed
Dynamic Experimentation Division Consolidation Project	Consultation not needed
Dynamic Experiment (DynEx) Assembly Chamber	Needs consultation

To facilitate assessment of cumulative impacts, projects were divided into the planning areas of LANL in which they occur (Figure 1-1). The following list shows the planning area associated with each project determined to need consultation.

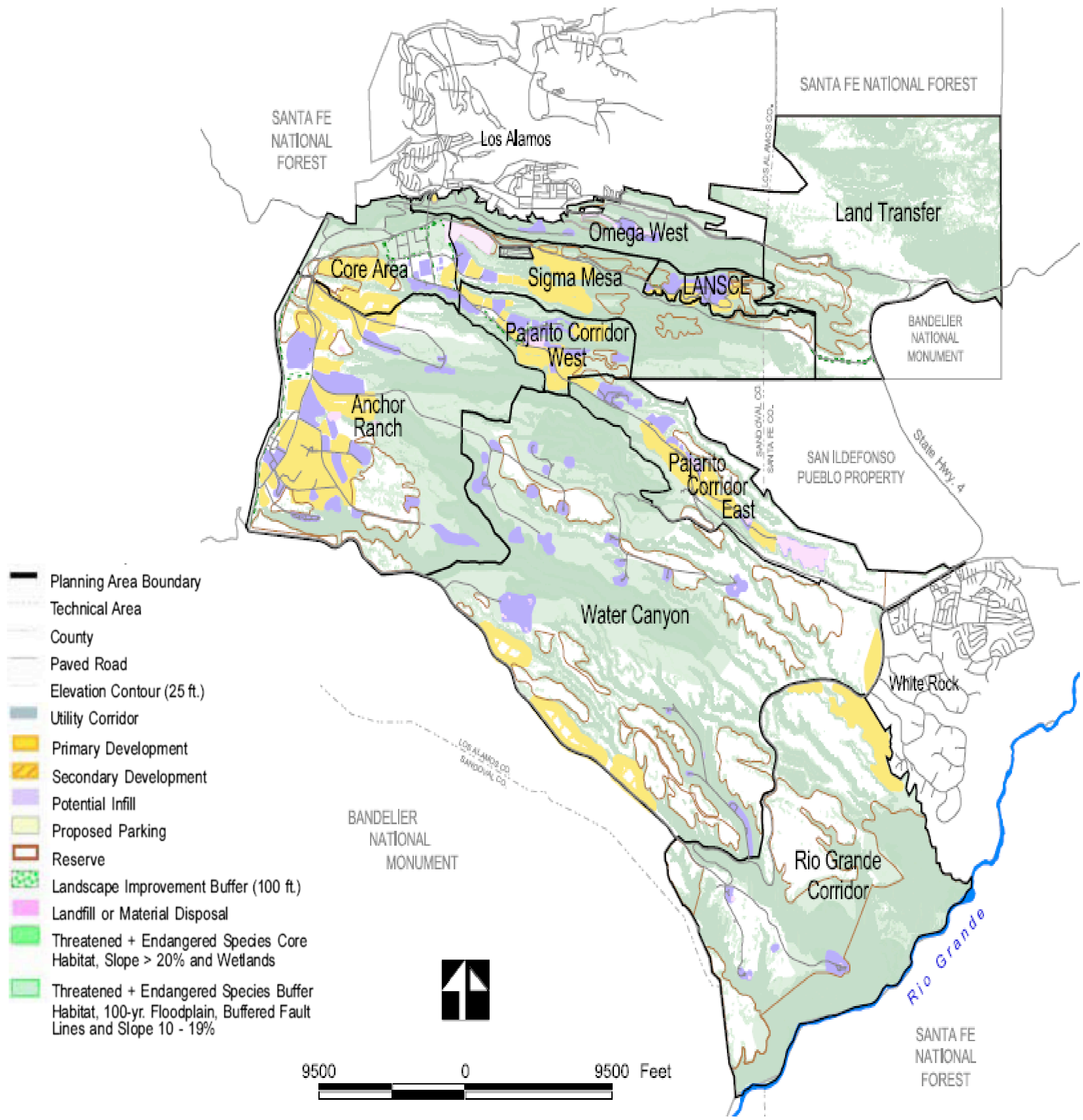


Figure 1-1. Planning areas at LANL.

Site-wide Projects:

- Outfall Reduction Program

Core Area Projects:

- Science Complex
- TA-3 Replacement Office Buildings

Pajarito West Corridor/Sigma Mesa Projects:

- NMSSUP
- Transportation Modifications
- Transportation Modifications (Optional Actions)
- TA-48 Radiological Science Institute
- Characterization and Remediation of MDA C
- RLWTF Replacement
- Warehouse and Truck Inspection Station

Pajarito East Corridor Projects:

- Disposition of Flood Retention Structure and Steel Diversion Wall (part of the Flood Retention Structure is also in the Pajarito West Corridor Planning Area)
- DD&D of TA-18
- Remediation of MDAs G, H, and L at TA-54

Omega West Projects:

- Remediation of MDAs A, T, and U at TA-21
- DD&D of TA-21

Water Canyon Projects:

- DynEx Assembly Chamber
- Remediation of MDAs N and Z at TA-15

Rio Grande Corridor Projects:

- Remediation of MDA D at TA-33

LANSCE Mesa and **Anchor Ranch Planning Areas** did not have any projects identified in the SWEIS that needed consultation.

2.0 Environmental Baseline
2.1 Regional Description
2.1.1 Location Within the State

LANL and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County, north-central New Mexico, approximately 60 miles (100 kilometers) north-northeast of Albuquerque and 25 miles (40 kilometers) northwest of Santa Fe (Figure 2-1). The 25,600-acre (10,240-hectare) LANL site is situated on the Pajarito Plateau. This plateau is a series of fingerlike mesas separated by deep east-to-west-oriented canyons cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 feet (2,400 meters) on the flanks of the Jemez Mountains to about 6,200 feet (1,900 meters) at their eastern termination above the Rio Grande.

Most LANL and community developments are confined to mesa tops. The surrounding land is largely undeveloped. Large tracts of land north, west, and south of the LANL site are held by the Santa Fe National Forest, Bureau of Land Management, Bandelier National Monument, General Services Administration, and Los Alamos County. The Pueblo of San Ildefonso borders LANL to the east.

2.1.2 Geologic Setting

Most of the fingerlike mesas in the Los Alamos area are composed of Bandelier Tuff, which consists of ash fall, ash fall pumice, and rhyolite tuff. The tuff, ranging from nonwelded to welded, is more than 1,000 feet (300 meters) thick in the western part of the plateau and thins to about 260 feet (80 meters) eastward above the Rio Grande (Broxton et al., 1995). Tuff was deposited after major eruptions in the Jemez Mountains Volcanic Field about 1.2 to 1.6 million years ago (Self and Sykes 1996).

On the western part of the Pajarito Plateau, the Bandelier Tuff overlaps onto the Tschicoma Formation, which consists of older volcanics that form the Jemez Mountains (Self and Sykes 1996). The conglomerate of the Puye Formation underlies the tuff in the central plateau and near the Rio Grande. Chino Mesa basalts interfinger with the conglomerate along the river. These formations overlay the sediments of the Santa Fe Group, which extend across the Rio Grande Valley and are more than 3,300 feet (1,000 meters) thick. LANL is bordered on the east by the Rio Grande, within the Rio Grande rift. Because of the faulting associated with the rift, the area experiences frequent minor seismic disturbances.

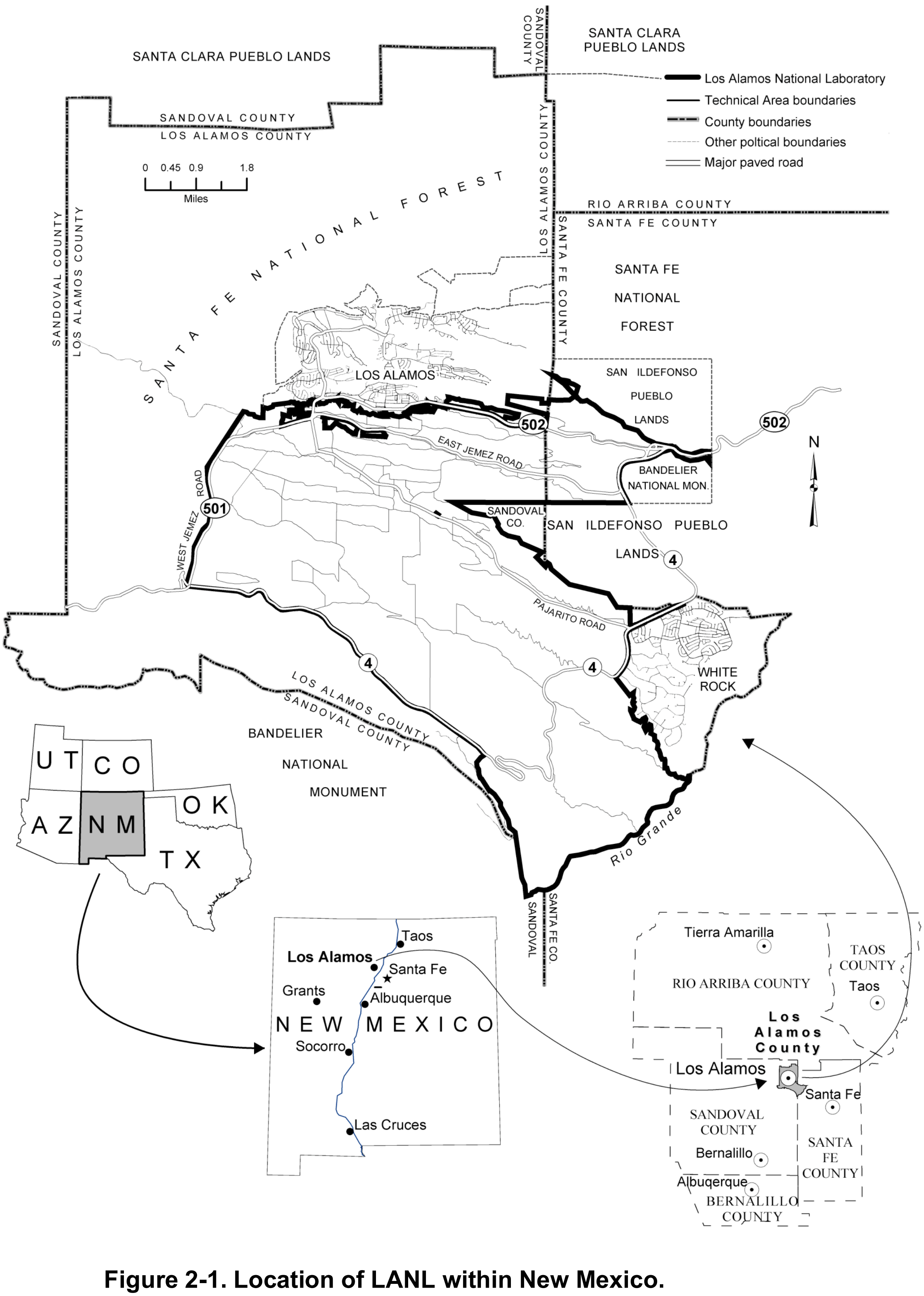


Figure 2-1. Location of LANL within New Mexico.

Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the LANL site before they are depleted by evaporation, transpiration, and infiltration (DOE 1999a). Runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year in some drainages. Effluents from sanitary sewage, industrial waste treatment plants, and cooling-tower blowdown enter some canyons at rates sufficient to maintain surface flows for varying distances.

Groundwater in the Los Alamos area occurs in three forms: (1) water in shallow alluvium in canyons, (2) perched water (a body of groundwater above a less permeable layer that is separated from the underlying main body of groundwater by an unsaturated zone), and (3) the main aquifer of the Los Alamos area. Ephemeral and intermittent streams have filled some parts of canyon bottoms with alluvium that ranges from less than 3 feet (1 meter) to as much as 100 feet (30 meters) in thickness. Runoff in canyon streams percolates through the alluvium until its downward movement is impeded by layers of weathered tuff and volcanic sediment that are less permeable than the alluvium. This process creates shallow bodies of perched groundwater that move downgradient within the alluvium. As water in the alluvium moves down the canyon, it is depleted by evapotranspiration and movement into underlying volcanics (Purtymun et al., 1977). The chemical quality of the perched alluvial groundwaters shows the effects of discharges from LANL.

In portions of Pueblo, Los Alamos, and Sandia canyons, perched groundwater occurs beneath the alluvium at intermediate depths within the lower part of the Bandelier Tuff and within the underlying conglomerates and basalts. Perched groundwater has been found at depths of about 120 feet (37 meters) in the midreach of Pueblo Canyon to about 450 feet (137 meters) in Sandia Canyon near the eastern boundary of LANL (Purtymun 1995). This intermediate-depth perched water discharges at several springs in the area of Basalt Spring in Pajarito Canyon. These intermediate-depth groundwaters are formed in part by recharge from the overlying perched alluvial groundwaters and show evidence of radioactive and inorganic contamination from LANL operations (Purtymun 1995).

Perched water may also occur within the Bandelier Tuff in the western portion of LANL, just east of the Jemez Mountains. The source of this perched water might be infiltration from streams discharging from the mouths of canyons along the mountain front and underflow of recharge from the Jemez Mountains. Industrial discharges from LANL operations may also contribute to perched groundwater in the western portion of LANL. Perched groundwater in the Tschicoma Formation is the source of water supply for the ski area located just west of the LANL boundary in the Jemez Mountains.

The main aquifer of the Los Alamos area is the only aquifer in the area capable of serving as a municipal water supply (Griggs 1964). The surface of the aquifer rises westward from the Rio Grande within the Tesuque Formation (part of the Santa Fe Group) into the lower part of the Puye Formation beneath the central and western part of the plateau. Depth to the main aquifer is about 1,000 feet (300 meters) beneath the mesa tops in the central part of the plateau. The main aquifer is separated from alluvial and perched waters by about 350 to 620 feet (110 to 190 meters) of tuff and volcanic sediments with low (less than 10 percent) moisture content (Griggs 1964).

Water in the main aquifer is under artesian conditions under the eastern part of the Pajarito Plateau near the Rio Grande (Purtymun and Johnson 1974). The source of recharge to the aquifer is presently uncertain. Early research studies concluded that major recharge to the main aquifer is probably from the Jemez Mountains to the west because the piezometric surface slopes downward to the east, suggesting easterly groundwater flow beneath the Pajarito Plateau (Purtymun 1995). However, the small amount of recharge available from the Jemez Mountains relative to water supply pumping quantities, along with differences in isotopic and trace element composition, appear to rule this out. Further, isotopic and chemical composition of some waters from wells near the Rio Grande suggest that the source of water underlying the eastern part of the Pajarito Plateau may be the Sangre de Cristo Mountains (Blake et al., 1995).

Groundwater flow along the Rio Grande rift from the north is another possible recharge source. The main aquifer discharges into the Rio Grande through springs in White Rock Canyon. The 11.5-mile (18.5-kilometer) reach of the river in White Rock Canyon between Otowi Bridge and the mouth of Rito de los Frijoles receives an estimated 4,300 to 5,500 acre-feet (5.3 to 6.8×10^6 cubic meters) annually from the aquifer (Griggs 1964).

2.1.3 Topographic Setting

LANL and its surrounding environments encompass a wide range of environmental conditions. This is due in part to the prominent elevational gradient in the east-west direction.

This is also attributable to the complex, local topography that is found throughout much of the region.

The spectacular scenery that is a trademark of the Los Alamos area is largely a result of this regional gradient. The difference between its lowest elevation in the eastern extremities and its highest elevation on the western boundaries represents a change of approximately 5,146 vertical feet (1,568 meters). At the lowest point along the Rio Grande, the elevation is approximately 5,350 feet (1,631 meters) above mean sea level. At the opposite elevational extreme, the Sierra de los Valles, which is part of the more extensive Jemez Mountains, forms a continuous backdrop to the landscapes of the region being studied. The tallest mountain peaks in the Sierra include Pajarito Mountain at 10,441 feet (3,182 meters), Cerro Rubio at 10,449 feet (3,185 meters), and Caballo Mountain at 10,496 feet (3,199 meters).

In addition to the prominent elevational gradient, the Los Alamos region is also topographically complex. Within Los Alamos County, there are three main physiographic systems (Nyhan et al., 1978). From east to west, these systems are the White Rock Canyon, the Pajarito Plateau, and the Sierra de los Valles. White Rock Canyon is 6,200 feet (1,890 meters) above mean sea level. This rugged canyon is approximately 1 mile (1.6 kilometers) wide and extends to a depth of nearly 900 feet (275 meters). White Rock Canyon occupies about 5 percent of Los Alamos County. The Pajarito Plateau is the largest of the three physiographic systems, occupying nearly 65 percent of Los Alamos County. The Pajarito Plateau is a broad piedmont that slopes gently to the east and southeast. At a more localized scale, the Pajarito Plateau is also topographically complex. The surface of the plateau is dissected into narrow mesas by a series of east-west-trending canyons. Above 7,800 feet (2,377 meters), the Sierra de los Valles rises to the western extremity of the study region. These mountains occupy approximately 30 percent of Los Alamos County. The Sierra is also dissected into regularly spaced erosional features, although these canyons in the mountains are not so prominent as the canyons on the Pajarito Plateau.

2.1.4 Weather and Climate

Los Alamos has a temperate, semiarid mountain climate. However, its climate is strongly influenced by elevation, and large temperature and precipitation differences are observed in the area because of the topography.

Los Alamos has four distinct seasons. Winters are generally mild, but occasionally winter storms produce large amounts of snow and below-freezing temperatures. Spring is the windiest season of the year. Summer is the rainy season in Los Alamos, when afternoon thunderstorms and associated hail and lightning are common. Fall marks the end of the rainy season and a return to drier, cooler, and calmer weather. The climate statistics discussed below summarize analyses given in Bowen (1990 and 1992).

Several factors influence the temperature in Los Alamos. An elevation of 7,400 feet (2,256 meters) helps to counter its southerly location, making for milder summers than nearby locations with lower elevations. The sloping nature of the Pajarito Plateau causes cold-air drainage, making the coolest air settle into the valley. The Sangre de Cristo Mountains to the east act as a barrier to arctic air masses affecting the central and eastern U.S. The temperature does occasionally drop well below freezing, however. Another factor affecting the temperature in Los Alamos is the lack of moisture in the atmosphere. With less moisture, there is less cloud cover, which allows a significant amount of solar heating during the daytime and radiative cooling during the nighttime. This heating and cooling often causes a wide range of daily temperature.

Winter temperatures range from 30°F to 50°F (-1°C to 10°C) during the daytime to 15°F to 25°F (-9°C to -4°C) during the nighttime. The record low temperature recorded in Los Alamos (LANL 2005a) is -18°F (-28°C). Winter is usually not particularly windy, so extreme wind chills are uncommon at Los Alamos. Summer temperatures range from 70°F to 88°F (21°C to 31°C) during the daytime to 50°F to 59°F (10°C to 15°C) during the nighttime. Temperatures occasionally will break 90°F (32°C). The highest temperature ever (LANL 2005a) in Los Alamos is 95°F (35°C).

The average annual precipitation in Los Alamos from 1971 to 2000 (LANL 2005a) was 18.95 inches (48.13 centimeters). The average snowfall for a year was 58.2 inches (147.8 centimeters). Freezing rain and sleet are rare at Los Alamos. Winter precipitation in Los Alamos is often caused by storms entering the U.S. from the Pacific Ocean, or by cyclones forming or intensifying in the lee of the Rocky Mountains. When these storms cause upslope flow over Los Alamos, large snowfalls can occur. The snow is usually a dry, fluffy powder, with an average equivalent water-to-snowfall ratio of 1:20.

The summer rainy season accounts for 48 percent of the annual precipitation. During the July–September period, orographic thunderstorms form when moist air from the Gulf of Mexico and the Pacific Ocean moves up the sides of the Jemez Mountains. These thunderstorms can bring large downpours, but sometimes they only cause strong winds and lightning. Hail frequently occurs from these rainy-season thunderstorms.

Winds in Los Alamos are also affected by the complex topography, particularly in the absence of a large-scale disturbance. There is often a distinct daily cycle of the winds around Los Alamos. During the daytime, upslope flow can produce a southeasterly wind on the plateau. In the evening, as the mountain slopes and plateau cool, the flow moves downslope, causing light westerly and northwesterly flow. Cyclones moving through the area disturb and override the cycle. Flow within the canyons of the Pajarito Plateau can be quite varied and complex.

2.1.5 Plant Communities

The Pajarito Plateau, including the Los Alamos area, is biologically diverse. This diversity of ecosystems is due partly to the dramatic 5,000-foot (1,500-meter) elevation gradient from the Rio Grande on the east to the Jemez Mountains 12 miles (20 kilometers) to the west, and partly to the many steep canyons that dissect the area. Five major vegetative cover types are found in Los Alamos County: juniper (*Juniperus monosperma* Englem. Sarg.)-savanna, piñon (*Pinus edulis* Engelm.)-juniper, ponderosa pine (*Pinus ponderosa* P. & C. Lawson), mixed conifer, and spruce (*Picea* spp.)-fir (*Abies* spp.). All of the communities and their distribution are described in Balice (1998). The juniper-savanna community is found along the Rio Grande on the eastern border of the plateau and extends upward on the south-facing sides of canyons at elevations between 5,600 to 6,200 feet (1,700 to 1,900 meters). The piñon-juniper cover type, generally in the 6,200- to 6,900-foot (1,900- to 2,100-meter) elevation range, covers large portions of the mesa tops and north-facing slopes at the lower elevations. Ponderosa pines are found in the western portion of the plateau in the 6,900- to 7,500-foot (2,100- to 2,300-meter) elevation range. These three cover types predominate, each occupying roughly one-third of the LANL site. The mixed conifer cover type, at an elevation of 7,500 to 9,500 feet (2,300 to 2,900 meters), overlaps the ponderosa pine community in the deeper canyons and on north-facing slopes and extends from the higher mesas onto the slopes of the Jemez Mountains. Spruce-fir is at higher elevations of 9,500 to 10,500 feet (2,900 to 3,200 meters). An inventory of wetlands at LANL in 2005 found 30 wetlands with a total area of 34 acres (13.8 hectares) (Green et al., 2005).

2.2 Land Use

Table 2-1 shows that the land resources at LANL are distributed over 10 usage categories.

Table 2-1. Site-Wide Land Use

Land Use Category	Acreage in CY 2002
Service/Support	140
Environmental Science	514
High Explosives Research and Development	1,310
High Explosives Testing	7,096
Nuclear Materials Research and Development	374
Physical/Technical Support	336
Public/Corporate Interface	31
Theoretical/Computational	2
Waste Management	186
Reserve	17,874
Total	27,863

Note: To convert acres to hectares multiply by 0.40469. Source: LANL 2003a.

Most land use categories are not expected to change significantly in the next five years. The size of LANL has changed because of land transfers. During 2002, 2,209 acres (894 hectares) were transferred to Los Alamos County and the Pueblo of San Ildefonso; the change was mostly at TA-74 where 2,089.9 acres (845.7 hectares) were transferred to the Pueblo of San Ildefonso in Santa Fe County. Table 3.7.5-2 on page 3-26 of the 2002 SWEIS Yearbook (LANL 2003a) provides specifics on these land transfers. Another 2,558 acres (1,035 hectares) could be transferred to Los Alamos County, San Ildefonso, and the New Mexico Highway Department between now and 2007.

2.3 Land Transfer

DOE was mandated under Public Law 110-119, the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, Fiscal Year 1998 (Section 632, 42 United States Code § 2391) to convey to the Incorporated County of Los Alamos, New Mexico, or to the designee of the County, and to transfer to the Department of the Interior, in trust for the San Ildefonso Pueblo, parcels of land meeting specific suitability requirements that are under the jurisdictional administrative control of the Secretary of Energy at or in the vicinity of LANL. DOE's responsibilities under the act include, among other activities, identifying potentially suitable tracts of land for conveyance or transfer; conducting National Environmental Policy Act (NEPA) review of the conveyance or transfer of the tracts; identifying any restoration or remediation that would be needed for each tract, and to the maximum extent practicable, completing those activities and the conveyance or transfer within 10 years of enactment, i.e., by November 26, 2007. DOE published its *Final Environmental Impact Statement for the*

Conveyance and Transfer of Certain Land Tracts Administered by the Department of Energy and Located at Los Alamos, National Laboratory, Los Alamos and Santa Fe Counties, New Mexico, in October 1999 (DOE 1999b). The Record of Decision (ROD) for this environmental impact statement was issued on March 20, 2000 (DOE 2000). The ROD identified 10 discrete tracts comprising a total of approximately 4,600 acres (1,862 hectares) that met the suitability requirements for conveyance or transfer either in the near term or after restoration or remediation activities. The ROD indicated that conveyance or transfer of some tracts or portions of tracts would be delayed because they are being used or may be used for mission support activities. However, DOE committed to pursuing restoration and remediation activities, as well as relocation of workers and DOE mission support function from the tracts so that encumbered portions of land can be conveyed or transferred to the greatest extent practicable by November 2007 (DOE 2000).

Approximately 2,200 acres (890 hectares) were conveyed or transferred in calendar year (CY) 2002 (LANL 2003a), and another approximately 720 acres (291 hectares) were conveyed or transferred in CY 2003 (LANL 2004a). Table 2-2 provides a summary of the land parcels and anticipated or actual transfer dates.

2.4 Cerro Grande Fire

During 2000, land resources were impacted by the Cerro Grande Fire, which burnt across approximately 7,500 acres (3,035 hectares), or 27 percent, of LANL land. Of the 332 structures affected by the fire, 236 were impacted, 68 damaged, and 28 destroyed (ruined beyond economic repair). Fire mitigation work such as flood retention facilities modified less than 50 acres (20.2 hectares) of undeveloped land (LANL 2003a).

As a result of the fire, various facility changes occurred that were not anticipated before the fire or were expedited directly or indirectly because of the fire: operations have been or are planned for removal from canyon locations; buildings were destroyed by the fire or were vacated and demolished after operations were relocated; and new buildings were constructed after the fire as part of the recovery effort. Post-fire environmental effects have included an alteration of watershed areas within LANL and an alteration in the forest fuel loading (due to the fire and subsequent tree thinning activities).

Table 2-2. Land Conveyance and Transfer

Designator	Description	Recipient	Transfer Date	Acreage
		TO BE TRANSFERRED		
B-3	TA-74-4 (Middle) (Little Otowi)	Pueblo	12/30/05	3.40
C-1	White Rock	Highway	TBD	15.41
C-2	White Rock "Y"-1	Highway	TBD	104.10
C-3	White Rock "Y"-3	Highway	TBD	53.60
C-4	White Rock "Y"-4	Highway	TBD	20.10
A-8-A	DP Road-1 (South)	County	10/30/05	22.05
A-10	DP Road-3 (East)	County	12/30/05	13.80
A-18-a	TA-74 South a	County	12/30/05	623.00
A-18-b	TA-74 South b	County	12/30/05	48.00
A-13	LAAO-2 (West) (LAAO Bldg)	County	9/30/07	8.82
A-4	Airport-2 (North) (90 ac.)	County	9/30/06	92.60
A-11	DP Road-4 (West)	County	3/31/07	3.09
A-14	Rendija	County	9/30/07	918.30
		DEFERRED FROM TRANSFER		
A-5-2	Airport (South) Canyon side to bottom	County	None	43.78
A-5-3	Airport South (within LANSCE)	County	None	14.94
A-16	TA-21-2 (East)	County	None	252.10
A-20	White Rock "Y"-2	County	None	323.40
A-8-B	DP Road-1 (South) (25 ac.)	County	Deferred	2.87
A-15-2	TA-21-1 (West)	County	Deferred	1.18
		TRANSFERRED		
A-1	Manhattan Monument (0 ac.)	County	10/31/02	0.07
A-12	LAAO-1 (East)	County	10/31/02	4.51
A-17	TA-74-1 (West) (3 ac.)	County	10/31/02	5.52
A-19	White Rock-1	County	10/31/02	76.33
A-2	Site 22 (0 c.)	County	10/31/02	0.17
A-3	Airport-1 (East) (8 ac.)	County	10/31/02	9.44
A-6	Airport-4 (West)	County	10/31/02	4.18
A-9	DP Road-2 (North) (Tank Farm)	County	10/31/02	4.25
B-1	White Rock-2	Pueblo	10/31/02	14.94
B-2	TA-74-3 (North)(Includes B-4)	Pueblo	10/31/02	2,089.88
A-7	Airport-5 (Central) (7 ac.)	County	4/1/05	5.83
A-5-1	Airport-3 (South) Rim to Canyon	County	12/14/05	32.30
A-15-1	TA-21-1 (West)	County	12/14/05	7.55

2.5 Post-Fire Plant Communities

An assessment of fire-induced vegetation mortality was made by the Burned Area Emergency Rehabilitation Team (BAER 2000). As a result of the fire, approximately 7,684 acres (10,240 hectares), or 28 percent, of the vegetation at LANL was burned in some fashion. However, few areas on LANL were burned severely. About 20 percent (16 acres [7.2 hectares]) of the total wetlands at LANL were burned in the Cerro Grande Fire. Wetlands in Mortandad, Pajarito, and Water canyons received increased amounts of ash and hydromulch runoff as a result of the fire (Marsh 2001).

2.6 Pre- and Post-Fire Hydrology

McLin (1992) modeled all major 100-year floodplains for LANL using Army Corps of Engineers Hydrologic Engineering Center HEC-1 and HEC-2 computer-based models. These data represent pre-fire flow rates for all of the floodplains on LANL. Post-fire analyses have been completed (McLin et al., 2001, 2002). These new models show increases in peak flow of one to two orders of magnitude per unit drainage basin area.

2.7 Effects of Drought

The extreme drought conditions prevalent in the Los Alamos area between 1998 and 2006 have resulted directly and indirectly in the mortality of many trees. To date, over 90 percent of the piñon trees greater than 10 feet tall have died in the Los Alamos area (Balice, pers. comm.). Lower levels of mortality are also occurring in ponderosa and mixed conifer stands. There has been widespread mortality of mixed conifers on north-facing canyon slopes at lower elevations. While these changes are ongoing and have not been completely assessed, there will be long-term changes in vegetation community composition and distribution as a result of the drought.

2.8 Noise

Noise, airblasts, and ground vibrations are intermittent aspects of the LANL-area environment. Existing LANL-related publicly detectable noise levels are generated by a variety of sources, including truck and automobile movements to and from the LANL technical areas, high explosives testing, and security guards' firearms practice activities. Other noise sources in Los Alamos County are dominated by traffic and, to a much lesser degree, other residential-, commercial-, and industrial-related activities. High explosives detonation represents the peak noise levels generated by LANL operations. The SWEIS lists the primary source of these activities as the LANL Pulsed High-Energy Radiation Machine Emitting X-Rays (PHERMEX)

Facility and surrounding facilities with active firing sites. The SWEIS also lists facilities that were expected to begin operations, including the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility. A reduction in activities at the PHERMEX Facility was expected when the DARHT Facility began operations. Representative explosives tests indicated that a special permit would not be required for noise related to explosives testing since testing is not prolonged or unusual to the community (DOE 1999c).

3.0 Federally Listed Threatened and Endangered Species

3.1 Regional Lists

Table 3-1 presents the list of threatened and endangered species potentially occurring on the Pajarito Plateau.

Table 3-1. Threatened and Endangered Species Potentially Occurring on the Pajarito Plateau

Scientific Name	Common Name	Status[1]	Habitat	Potential to Occur[2]
Mustela nigripes	Black-footed ferret	FE	Prairie dog towns greater than 80 acres (32 hectares).	Low
Haliaeetus leucocephalus	Bald eagle	FT	Permanent rivers, lakes, and large streams, nests in cliffs or large trees.	High
Empidonax trailii extimus	Southwestern willow flycatcher	FE	Riparian areas with stands of willow, buttonbush, or tamarisk.	Moderate
Strix occidentalis lucida	Mexican spotted owl	FT	Forested mountains and canyons. Generally uneven aged, multistoried forest with closed canopy.	High

1 Codes for Legal Status
FE = Federal Endangered
FT = Federal Threatened
2 Potential to Occur
High = Species is known to occur or all of the habitat components exist in the area.
Moderate = The area has some species habitat components.
Low = The area does not have species habitat components.

3.2 Status of Species

Population trends of the threatened and endangered species potentially occurring in or near LANL are outlined below. Three of the species (bald eagle, southwestern willow flycatcher, and Mexican spotted owl) either occur on LANL or have suitable nesting or foraging habitat and require an assessment relative to the potential effects of LANL operations. The remaining species (black-footed ferret) was determined not to have suitable habitat on LANL property and will not require detailed evaluation. Habitat requirements and survey methods for all species will be discussed in the following sections.

3.3 Species Dismissed from the Evaluation

3.3.1 Black-footed Ferret

The black-footed ferret is listed by the U.S. Fish and Wildlife Service (USFWS) as endangered in the State of New Mexico but has no potential suitable habitat on or near LANL.

This species has not been included in LANL's HMP site plans and did not receive a detailed assessment.

Status: Federal Endangered

Regional Trends: In 1992, the black-footed ferret was listed as the rarest mammal in North America. In 1981, a remnant population in northwest Wyoming was removed for captive breeding and reintroduction. Reintroduction has begun in Wyoming, Montana, and South Dakota (Finch 1992).

State Trends: Last reported in New Mexico in 1934 (Frey and Yates 1996). If any animals survive, the northwestern part of the state is the most likely area (Findley et al., 1975).

Local Trends: No reported sightings of black-footed ferrets in Los Alamos County for at least the last 50 years. In addition, no large prairie dog towns have been observed on LANL lands.

3.3.1.1 Habitat Description

The black-footed ferret 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. There is prehistoric evidence of this ferret occurring from the Yukon Territory in Canada south to New Mexico and Texas (Anderson et al., 1986). Black-footed ferrets depend almost exclusively on prairie dogs for food and shelter (NMDGF 2000). 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. There are specimen records of black-footed ferrets from ranges of three species of prairie dogs: the black-tailed prairie dog (*Cynomys ludovicianus*), white-tailed prairie dog (*Cynomys leucurus*), and Gunnison's prairie dog (*Cynomys gunnisoni*) (Anderson et al., 1986). Only prairie dog colonies with a combined area greater than 80 acres (32 hectares) are large enough to support black-footed ferrets.

3.3.1.2 Survey Methods

The black-footed ferret is surveyed by spotlighting prairie dog towns at night. The perimeters of the prairie dog town are marked with wooden stakes with reflective tape. The researcher spotlights the prairie dog town for 20 minutes, turns the light off for 20 minutes, then repeats the light survey. Spotlighting has been carried out from both stationary locations and from moving vehicles. Where possible ferret sign was sighted, cameras were used for verification. In general, camera systems include an infrared movie camera with a trip-release tied to bait (chicken or prairie dog) and several time-lapse movie cameras with bait wired to a nearby stake.

3.3.1.3 Results

There are no prairie dog colonies of the appropriate size in Los Alamos County, and there are no prairie dog colonies near the proposed project. The proposed actions should have no effect on the black-footed ferret.

3.4 Species-specific Habitat Information—Evaluated Species

3.4.1 Mexican Spotted Owl

Status: Federal Threatened

Regional Trends: In 1993, 2,160 owls existed and now 20 percent of owl habitat has been rendered no longer suitable (Federal Register 1993).

State Trends: In 1994, 250 to 300 territories were occupied (NMDGF 1994).

Local Trends: Surveys for Mexican spotted owls have been conducted on LANL property since 1994. In 1995 a pair of Mexican spotted owls was located as well as a nest. Each year the territory has been occupied and has resulted in successful nesting in several years (Keller et al., 1996). A second territory was found to be occupied in 2004.

3.4.1.1 Habitat Description

The Mexican spotted owl is found in northern Arizona, southeastern Utah, and southwestern Colorado south through New Mexico, west Texas, and into Mexico. It is the only subspecies of spotted owl recognized in New Mexico (USFWS 1995a). The Mexican spotted owl generally inhabits mixed conifer and ponderosa pine-Gambel oak (*Quercus gambelii* Nutt.) forests in mountains and canyons. High canopy closure, high stand diversity, multilayered canopy resulting from an uneven-aged stand, large mature trees, downed logs, snags, and stand decadence as indicated by the presence of mistletoe are characteristic of Mexican spotted owl habitat. Some spotted owls have been found in second-growth forests, i.e., younger forests that have been logged; however, these areas were found to contain characteristics typical of old-growth forests. No spotted owls were found in forests less than 36 years of age (USFWS 1995b). Mexican spotted owls in the Jemez Mountains seem to prefer cliff faces in canyons for their nest sites (Johnson and Johnson 1985). The recovery plan for the Mexican spotted owl recommends that mixed conifer and pine-oak woodland types on slopes greater than 40 percent be protected for the conservation of this owl (USFWS 1995a).

A mated pair of adult spotted owls may use the same home range and general nesting areas throughout their lives. A pair of owls require approximately 1,976 acres (800 hectares) of suitable nesting and foraging habitat to ensure reproductive success. Incubation is carried out by the female. The incubation period is approximately 30 days, and most eggs hatch by the end of May. Most owlets fledge in June, 34 to 36 days after hatching (USFWS 1995b). The owlets are "semi-independent" by late August or early September, although juvenile begging calls have been heard as late as September 30 (Ganey 1992). Young are fully independent by early October. The nonbreeding season runs from September 1 through February 28 (Ganey 1992). Although seasonal movements vary among owls, most adults remain within their summer home ranges throughout the year.

The diet of the Mexican spotted owl consists primarily of small rodents and rabbits with lesser amounts of reptiles, birds, and insects. A majority of the prey consumed by the Mexican spotted owl during the nesting season probably comes from a relatively small area surrounding the nest site. Ganey and Balda (1994) found areas of individuals (i.e., where owls spent 60 percent of their time) averaged 331 acres (134 hectares), and areas for pairs averaged 395 acres (160 hectares). High-use areas tended to correspond to steep slopes.

3.4.2 Southwestern Willow Flycatcher

Status: Federal Endangered

Regional Trends: 300 to 500 breeding pairs remain (USFWS 1995b).

State Trends: Surveys from 1993 to 1995 found 100 breeding pairs and 75 percent occurred in a local area. Surveys and data gathered in 1987, 1991, and 1994 suggest the population is declining (NMDGF 1994).

Local Trends: Willow flycatcher surveys have been conducted at LANL and Bandelier National Monument since 1995. Willow flycatchers have been detected, but no nesting flycatchers have been found. Willow flycatchers have been found nesting along the Rio Grande in Española (Keller et al., 1996).

3.4.2.1 Habitat Description

The southwestern willow flycatcher is one of four subspecies of the willow flycatcher. The historic range of the southwestern willow flycatcher included Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Currently, this flycatcher breeds in riparian habitats from southern California to Arizona and New Mexico and as far north as southern Utah and Nevada. In winter it is found in southern Mexico, Central America, and northern South America.

Willow flycatchers are present in New Mexico from early May through mid-September, and breed from late May through late July. The flycatcher's nesting cycle is approximately 28 days. Three or four eggs are laid at one-day intervals, and incubation begins when the clutch is complete (Walkinshaw 1966). The female incubates eggs for approximately 12 days, and the young fledge about 13 days after hatching (King 1955). Southwestern willow flycatchers typically raise one brood per year.

The southwestern willow flycatcher only nests along rivers, streams, and other wetlands. It is found in close association with dense stands of willows (*Salix* spp.), arrowweed (*Pluchea* spp.), buttonbush (*Cephalanthus* spp.), tamarisk (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia* L.), and other riparian vegetation, often with a scattered overstory of cottonwood (Phillips 1948, King 1955, Zimmerman 1970, Hubbard 1987, Unitt 1987, Brown and Trosset 1989, Finch 1992, USFWS 1995b). The size of vegetation patches or habitat mosaics used by southwestern willow flycatchers varies considerably and ranges from as small as 2 acres (0.8 hectares) to several hundred hectares. The southwestern willow flycatcher nests in thickets of trees and shrubs approximately 6.5 to 50 feet (2 to 15 meters) tall, with a high percentage of canopy cover and dense foliage from 0 to 13 feet (0 to 4 meters) above ground. Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Sogge et al., 1997).

The southwestern willow flycatcher is an insectivore. It forages within and occasionally above dense riparian vegetation, taking insects on the wing and gleaning them from foliage (USFWS 1993). The flycatcher's prey includes flies, bees, wasps, ants, beetles, moths, butterflies, grasshoppers, crickets, dragonflies, damselflies, and spiders (NMDGF 2000).

3.4.3 Bald Eagle

Status: Federal Threatened

Regional Trends: South of Canada bald eagles declined drastically in numbers and range. Some U.S. populations have recovered in recent years (NMDGF 1988).

State Trends: Numbers of wintering bald eagles have increased in recent years averaging about 430 birds per year from 1990 to 1994 (early 1980s, 220 birds). There are only two known nesting pairs in the state (NMDGF 1994).

Local Trends: Since 1979, average winter counts near the Cochiti Reservoir area have doubled. As total counts have increased, the number of bald eagles using areas farther upstream has increased. Surveys in March 1992 were conducted for roost tree use on LANL lands. This survey indicated occasional bald eagle use of trees near the mouths of Water and Chaquehui canyons (Keller et al., 1996).

3.4.3.1 Habitat Description

Bald eagles occur casually to occasionally in summer and during migration in New Mexico. Bald eagles winter almost statewide. Main wintering areas in New Mexico include the San Juan, upper Rio Grande, upper and middle Pecos, Canadian, San Francisco, Gila, and Estancia valleys (Hubbard 1978). At LANL, bald eagles winter along White Rock Canyon adjacent to the Rio Grande.

Bald eagles are carnivores (mainly piscivores) and scavengers. They winter beside rivers and lakes or where carrion is available (Isaacs et al., 1993). The birds typically roost at night in trees that offer weather protection, security from predators, and accessibility to foraging areas. At LANL, they may roost overnight in ponderosa pine trees located in the lower portions of the tributary canyons near the Rio Grande (Johnson 1996), particularly near the mouths of Water, Ancho, Potrillo, and Chaquehui canyons. Bald eagles also use snags close to foraging areas as loafing sites, lookout posts, and hunting/hawking perches (Maser et al., 1988).

Overall, the major food items of bald eagles in New Mexico appear to be waterfowl, fish, and carrion (NMDGF 1988). Mammals such as jackrabbits (*Lepus* spp.) are also taken. Eagles occurring around LANL will forage on the Rio Grande, Cochiti Reservoir, and the Pajarito Plateau (Johnson 1996). Diet analysis of eagles wintering along White Rock Canyon includes fish, waterfowl, deer (*Odocoileus hemionus*), and elk (*Cervus elaphus*). The wetland habitat above Cochiti Reservoir has expanded since 1979, providing suitable habitat for fish, wintering waterfowl, and bald eagles (Allen et al., 1993).

4.0 Assessment Methodology

4.1 Habitat Management Plan Habitat Identification

The LANL HMP was a document prepared by Ecology Group (ENV-ECO) personnel as part of the DARHT Facility Mitigation Action Plan. The purpose of the HMP is to provide for the protection of threatened and endangered species and their habitats on LANL. The HMP is designed to be a comprehensive landscape-scale management plan that will balance the current operations and future development needs of LANL with the habitat requirements of threatened and endangered species. It will also facilitate DOE compliance with the Endangered Species Act (ESA) and related Federal regulations. The HMP is updated as needed.

The HMP defines site plans and monitoring plans for threatened and endangered species that occur or may occur on LANL. Currently, there are site plans for each of the following Federal threatened and endangered species occurring or potentially occurring at LANL: bald eagle, southwestern willow flycatcher, and Mexican spotted owl. The purpose of site plans is to provide guidelines that ensure LANL operations do not adversely affect these species or their habitats. Suitable habitats for these species, along with a protective buffer area surrounding the habitats, have been designated as Areas of Environmental Interest (AEIs). Site plans provide information on the location of AEIs and guidelines for their management. Defining AEIs was a multistep process that included a literature review, development of a land cover map, species surveys, data and technical reviews from regional species experts, guidance from State and Federal regulatory agencies, and output from habitat suitability models. In 2005, new boundaries were established for Mexican spotted owl AEIs at LANL (Consultation #22420-2006-I-0100).

Site plans identify the particular areas of LANL where operations might impact threatened and endangered species. They also provide a broad list of activities, which, if they are conducted in accordance with the guidelines in the site plan, will not adversely affect the species. Projects over 5 acres (2 hectares) in size or costing more than $5 million require an individual ESA compliance review even if they are not located in an AEI. Projects and activities that had the potential to affect threatened and endangered species or their habitats required biological assessments and concurrence from the USFWS before they can proceed.

4.2 Field Survey Methods

4.2.1 Mexican Spotted Owl

There are three primary techniques that can be used to survey for the Mexican spotted owl. The choice of calling technique should be based on the best way to cover all of the suitable habitat. The three calling techniques are point, continuous, and leapfrog.

In point calling, an electronic recording of an owl call is played at a fixed point. The observer will spend at least 15 minutes at a point and alternate between playing the recording of the owl and listening for a response. The primary four-note location call of the Mexican spotted owl should be the major call played during surveys. However, the surveyor should occasionally use other types of calls to elicit a response. The time and location of all responding owls are recorded. Compass triangulation may be required to locate owls. Points are approximately 0.5 mile (0.8 kilometer) apart and cover all suitable habitat to within 0.5 mile (0.8 kilometer). Point calling is usually done from points along a road in suitable habitat.

In continuous calling, a surveyor walks a route (e.g., the edge of a canyon), stops and plays the tape, and waits for a response. The distance between points is much shorter than in point calling and much less time is spent at each point. All owl responses are noted.

In leapfrog calling, two people do a continuous calling route with one vehicle. The first person alternates between calling and listening as the second person drives approximately 0.5 mile (0.8 kilometer) up the road and begins their calling route. Once the first person reaches the vehicle they drive another 0.5 mile (0.8 kilometer) down the road to begin the process over again. This technique will cover more area more quickly. All owl responses should be noted.

Surveys are conducted annually in the Mexican spotted owl AEIs. At least four surveys are conducted in each field season between April 1 and August 31 of any given year. No more than two surveys can be conducted before April 16 of any given year for any particular survey location. The first survey must be completed before July 1 of any given year for any given area of habitat. At least three surveys must be completed before August 1 of any given year for any given area of habitat. A survey of one area of habitat must be completed within seven days. The next complete survey cannot happen for at least five days and must be started before 21 days has elapsed (e.g., if a survey is completed on May 5, the next complete survey can not begin before May 11 and must begin before May 26). At least two surveys must be completed when owls are detected in an area. The best time to perform calls is before sunrise and the two hours after dark.

However, the time of calling and the route through the habitat should be varied to cover the habitat.

Surveys can only be conducted when the survey is likely to be effectively completed. Field surveys are not conducted during existing or predicted wind (>15 mph) or during stormy weather. Surveys are not conducted when there are access problems due to snow or poor road conditions.

4.2.2 Southwestern Willow Flycatcher

Surveys are conducted in the southwestern willow flycatcher AEI. A minimum of one survey is conducted during each of the following survey periods: May 15 to May 31, June 1 to June 21, and June 22 to July 10. Surveys must be at least five days apart. The surveys start at first light and continue until the entire AEI has been surveyed. This protocol is primarily a tape-playback survey. At each site, surveyors broadcast recorded vocalizations of southwestern willow flycatchers. Sogge et al. (1997) describe the survey methods in detail. If a flycatcher is found, its behavior is observed and recorded to determine if the individual is nesting in the area.

4.2.3 Bald Eagle

Roosting counts are conducted by trained personnel along the Rio Grande portions of LANL during late-winter months. Roosting counts provide the most effective way to census wintering bald eagles, which tend to congregate at regular roosts (Johnson 1996). Collection of castings and other prey remains under roost trees provide the most comprehensive picture of diet, but under-represent the absolute proportion of fish in the diet. These late-winter surveys of suitable roost trees for accumulated castings, feathers, and droppings have proven to be the most efficient method of documenting occasional use of trees for roosting and perching.

4.3 Ecological Risk Assessment Methods

4.3.1 Introduction and Background Studies

Various types of activities have been performed at LANL over the past decade that qualitatively or quantitatively appraise impacts (actual or potential) or effects of one or more contaminants on non-human biota. These include screening assessments, modeling, empirical studies, and higher-level (Tiers 2 and 3) assessments.

4.3.1.1 Area-Specific Ecological Risk Studies

Over the past several years the Environmental Characterization and Remediation (ECR) Project (formerly Environmental Restoration [ER]) has led the completion of numerous screening-level ecological risk assessments. These assessments have been completed on a systematic basis across the entire Laboratory, usually based on specific potential release site (PRS) locations, in accordance with guidance by the Environmental Protection Agency (EPA) on ecological risk assessment guidance for Superfund (ERAGS) (EPA 1997) sites and New Mexico Environment Department (NMED) guidance (NMED 2000a, 2000b). The methods for the screening assessments are documented in an internal report (LANL 2004c). Following the ERAGS eight-step process, some sites, such as Cañon de Valle, the Los Alamos and Pueblo canyons watershed, and Mortandad Canyon are escalated to a level of more robust risk assessment.

Cañon de Valle: Cañon de Valle was the first area elevated to a baseline, or Tier 3, level of ecological risk assessment because there were contaminants in the canyon that exceeded ecological screening levels (ESLs) by orders of magnitude. Also the canyon is a nesting area for the Mexican spotted owl, a Federal protected threatened species; threatened and endangered species require assessments of effects for individuals. Thus, ECR Project personnel designed a pilot ecological risk assessment process for Cañon de Valle that was comprised of baseline risk assessment problem formulation, field sampling, field verification, site investigation, baseline risk characterization, and risk management (LANL 2003b). Both aquatic and terrestrial components of the ecosystem were investigated. The terrestrial lines of evidence compared small mammal populations and contaminant body burdens between Cañon de Valle and a reference site (upper Pajarito Canyon). The approach was to measure contaminant concentrations in the food web as an indication of potential impacts to the owl and other carnivores. Contaminant body burden data from small mammals provided the information necessary to make direct estimates of contaminant intake. Based upon home range, potential for bioaccumulation, and prey size preferences of the Mexican spotted owl, the dusky shrew (*Sorex monticolus*) and deer mouse (*Peromyscus maniculatus*) were selected for assessing contaminant transfers to the owl. The body burden data were used to compare relevant (metals and high explosives) contaminant concentrations between Cañon de Valle and a reference canyon (upper Pajarito Canyon) and to estimate the dose to the Mexican spotted owl. The aquatic lines of evidence were comparison of benthic macroinvertebrate communities between Cañon de Valle and three reference canyons, comparison of Cañon de Valle benthic macroinvertebrate data from 1997 and 2001, and comparison of sediment toxicity testing using *Chironomus tentans* sampled in Cañon de Valle and a reference location ("Starmer's Gulch").

Los Alamos and Pueblo Canyons: Field studies, model calculations, and laboratory toxicity tests were completed on the Los Alamos and Pueblo canyons watershed as lines of evidence to evaluate the potential for adverse ecological effects from contaminants in sediment and persistent surface water (LANL 2004c). Biological investigation plans were developed based on the application of the eight-step ERAGS process to contaminants of potential ecological concern (COPECs). ERAGS was applied to affected canyons media. Concentrations of COPECs in sediment and water were compared with ESLs as part of the problem formulation (Katzman 2002). The ESLs were used to evaluate combined sediment and water exposures to wildlife. Screening of affected media in the watershed identified many COPECs (metals, semivolatile organic compounds, polyaromatic hydrocarbons, polychlorinated byphenyls [PCBs], pesticides, americium-241, and isotopic plutonium), which led to developing a plan to characterize ecological risk based on the ERAGS process (EPA 1997). Risk to three receptors (deer mouse, Mexican spotted owl, and western bluebird [*Sialia mexicana*]) was also modeled using the FORTRAN model "ECORSK.7" (Gonzales et al., 2004a) to assess the entire watershed and supplement the screening and field study results.

Skinks and Organic Contaminants: In 2000 a study was conducted in two canyons (DP and Sandia) at LANL to establish upper levels of PCBs, DDE, and other organic contaminants in biological organisms (arthropods, skinks, small mammals, and great horned owls [*Bubo virginianus*]) (Gonzales et al., 2001). Although measured concentrations of organic contaminants were within safe limits, biomagnification was demonstrated and deformities were discovered in the many-lined skink (*Eumeces multivirgatus*), so in 2001 a study was conducted on the association between contamination in the canyons and morphological deformities in the skink (Gonzales et al., 2002). The study question was whether the deformities were the result of natural or abnormal processes. Two contaminated canyons and two uncontaminated canyons were trapped for skinks for two seasons. Morphological anomaly was measured by loss or malformation in appendages, the presence or absence of abnormal dorsal patterns, and tail malformation. The frequency, prevalence, and intensity of morphological anomalies were compared between canyons, and other standard measurements of lizard morphology were recorded.

Fish and Organic Contaminants: In the late 1990s, concentrations of PCBs, pesticides, and other organic contaminants in fish from waters within the influence of LANL were measured and compared to control sites and to suggested safe limits for fish and piscivores (Gonzales et al., 1999, Gonzales and Fresquez 2003). Although the levels of organochlorines in fish were inferred to be safe to the fish themselves and to predators such as the bald eagle, the lack of sensitivity in the chemical analyses, other uncertainties, and the potential for higher exposures resulting from the Cerro Grande Fire of 2000 resulted in questions about actual effects on fish. This prompted a study in 2001 and 2002 on the gross and histologic pathology of channel catfish (*Ictalurus punctatus*) collected at Cochiti and Abiquiu reservoirs, which are downstream and upstream of LANL, respectively; and of channel catfish collected from the Rio Grande upstream and downstream of LANL (Lewis et al., 2003).

The Ecological and Physiological Costs of Contaminants on Cavity-nesting Birds: A Long-term Avian Nest Box Monitoring Project: Since 1997, LANL has been monitoring cavity-nesting birds for the impacts of stress and potential effects of contaminants on both individuals and populations. Since inception, this research utilizing almost 650 nest boxes has attempted to link the endpoints of individual birds and the population as a whole. The first step was to investigate physiological endpoints in response to survival; the next step is to develop a population viability analysis to evaluate sensitive life-history traits for the population. These "critical" traits can then be monitored cost-effectively through existing environmental monitoring programs. Current efforts also include investigating the home ranges of western bluebirds and ash-throated flycatchers (*Myiarchus cinerascens*) in relation to potentially contaminated sites.

Mexican Spotted Owl Ecological Risk Assessments: The protection status and presence of the Mexican spotted owl on DOE/LANL property has made it the subject of several assessments and studies at LANL since about 1996 that investigated potential effects of environmental contaminants. In 1996 a FORTRAN computer model, "ECORSK.4," was developed to assess potential effects to the owl and other protected species present or having suitable habitat at LANL using the standardized EPA Quotient Method. Integrated with geographic information system (GIS) tools, ECORSK.4 was used to estimate doses to the owl at up to 100 hypothetical nest sites under a spatially weighted foraging regime (Gallegos et al., 1997). Exposure doses were estimated based on contaminant concentrations in soil that were then essentially passed through a food chain to the receptor of interest. The exposure dose estimates included factors of biomagnification through the food chain and receptor-specific parameters. The doses were compared against safe limits to generate hazard indices (HIs) and hazard quotients (HQs) over extensive spatial areas. A more thorough discussion of this methodology occurs later in descriptions of subsequent versions of the model. An HI or HQ greater than one was the threshold above which adverse risk might exist. The ability to separate potential effects from Lab-added contaminants compared with potential effects from natural sources was programmed into the model. Safe limits more appropriately applied to humans than to nonhuman biota were used because safe limits to nonhuman biota did not exist, and the soil/contaminant data base was inferior in many regards.

4.3.2 ECORSK.7 Site-Wide Methodology

Subsequent to the applications of ECORSK.4 the model underwent many improvements resulting in the current version—ECORSK.7. ECORSK.7 was last applied at a site-wide scale in 2003. Those results were reported in an information document (LANL 2004cd) that will supplement the LANL SWEIS currently in development. A contaminant database compiled by the Risk Assessment Corporation (RAC) was reduced from over 2.5 million records covering several environmental media to 290,015 records of soil/sediment contaminant data that are pertinent to potential ecological effects estimates and appropriate for use in ECORSK.7. The data consist of measured and interpolated values. The resulting data set contains approximately three times more data than the amount available the last time (1999) that site-wide applications of the model were made. Figure 4-1 compares locations of soil/sediment contaminant data used in Fiscal Year (FY) 2000 and FY 2003 with the same type of data from the reduced RAC data set, which is designated FY 2004.

The site-wide applications also applied to a risk-based end-state (RBES) project at LANL (LANL 2003c, Gonzales et al., 2004b). (Because RBES is consistent with the Federal government's definition of risk as the probability that a substance or situation will produce harm under specified conditions, the vision is referred to as a risk-based end-state.) Comparisons will be made of current (baseline) site-wide effects data and end-state (year 2015) effects data in which soil and sediment contaminant levels are hypothetically reduced to levels that would result

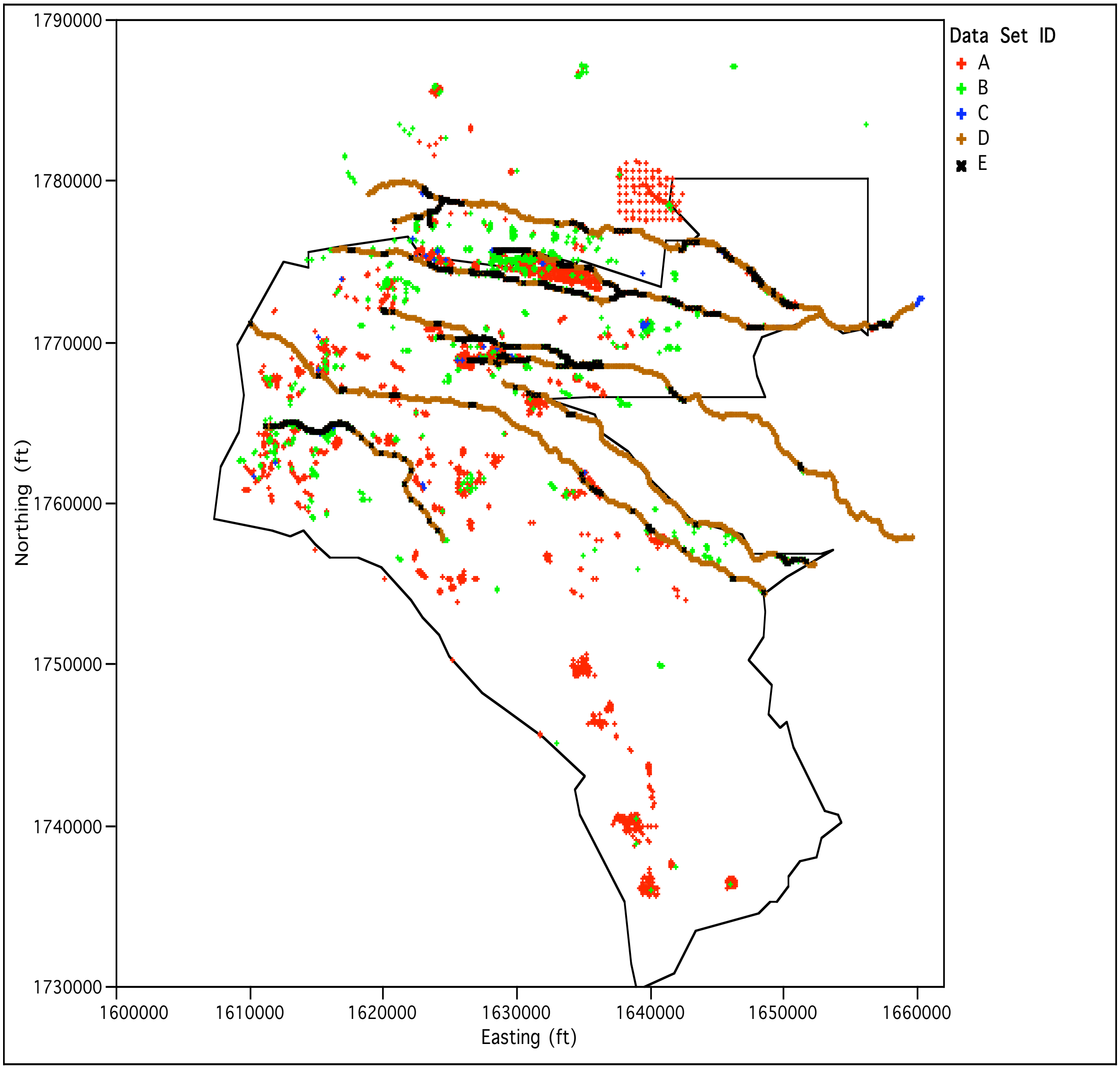


Figure 4-1. Locations of contaminant data for soils and sediments at LANL used in ECORSK.7.[1]

1 Map shows matches/mismatches between current "eeuinp.dat" (reduced RAC data set) and previous "eeuinp.dat" (FY03 and, primarily, FY00 data). Data include measured and interpolated values. A = Locations having data in both FY04 RACER and FY00+FY03 data sets (2,310 grid cells); B = Locations having data in RACER only (1,019 grid cells); C = Locations having data in FY00+FY03 data sets only (69 grid cells); D = Locations with unique interpolated value locations (i.e., locations w/interpolated data only) (2,706 grid cells); E = Locations with overlapping interpolated and measured data (i.e., locations with some measured values where "missing" analytes were supplemented w/interpolated values) (563 grid cells). There are approximately 6,035 30 × 30 m grid cells with measured and/or interpolated data from the reduced RAC set and it consists of ~290,015 records.

from postulated clean-up through 2015. The RAC database was filtered by units of measure, lab sample type, lab qualifer, field matrix, bottom depth, excavation flag, field quality control type, sample location, lab analytical method, analyte suite, analytical results, and safe limits. This reduced raw data set (290,015 records) consists of measured contaminant values in canyon and non-canyon areas across the Laboratory. Effects of the Cerro Grande Fire of 2000 on contaminant release and transport are somewhat reflected in data used in ECORSK.7 as the canyons data are reflective of some post-fire sampling. The raw data set was further reduced by averaging contaminant values within each 100- × 100-foot (30- × 30-meter) grid cell. The measured canyons values are then used to interpolate (predict) from points at which they were measured through sampling to points along a canyon reach at which they were not measured but known to exist based on logic. So the resultant data set consists of measured non-canyons data, measured canyons data, and interpolated canyons data.

Assessment methods using ECORSK.7 and operations of ECORSK.7 are described in detail in previous reports (Gonzales et al., 2004a, 2002). ECORSK.7 provides a measure of effect using the HQ methodology for wildlife receptors (EPA 1997). ECORSK.7 integrates biological, ecological, and toxicological information using GIS interfaces so that all model input and output are spatially explicit (Gonzales et al., 2004b). Effects are characterized by evaluating impacts on individual animals using a measure of population effects as the proportion of the population with an HI greater than 1. Exposure pathways considered in ECORSK.7 are incidental soil ingestion and food ingestion. The model assigns nest sites or focal locations (the center of the animal's home range) within land cover types that incorporate measurements on the distribution of these animals. An animal then can forage across its home range weighted on the basis of their natural distribution, in a uniform manner, or forage based on the central-place foraging theory with greater amounts of food and greater COPEC exposure near the nest or focal point. Relative usage of vegetation classes or habitat type can be intersected with the proportion of LANL occupied by a given vegetation class or habitat type. The model calculates unadjusted, adjusted, and background HI values for each nest site or focal point. The unadjusted HI is equivalent to the total exposure from COPECs, including anthropogenic and background sources. The adjusted HI removes the contribution of background sediment concentrations. The adjusted HI provides information on the COPECs that might have originated from Laboratory releases and does not reflect background sources.

ECORSK.7 assesses potential adverse effects of COPECs to terrestrial animals over large spatial areas on the basis of the EPA Quotient Method. Estimates of animal exposure over a gridded area are compared with assumed health effects levels to generate HIs using the equations:

$$HQ_{ij} = \frac{Exposure_{ij}}{effects\ level_{ij}\ (or\ safe\ limit)} \quad (1)$$

$$HI_i = \sum_{j=1}^{n} HQ_{ij}, \quad (2)$$

where HQ_{ij} = hazard quotient for receptor i to COPEC j (unitless), $exposure_{ij}$ = amount of contaminant or COPEC j to which is exposed receptor i (units are mg of COPEC per kg body weight per day or mg/kg/day), $effects\ level_{ij}$ = amount of contaminant or COPEC j for receptor i (mg/kg/day) below which is considered safe, and HI_i = hazard index for receptor i to n COPECs (unitless). ECORSK.7 repeats equation #1 for each COPEC within each grid cell that is within the home range of a given animal and for the number of nest sites or focal points (up to 1,000) chosen by the operator. The mean total HI represented by equation #2 is the arithmetic average of HIs for a specified total number of nest sites established for a receptor. The receptors chosen for application of ECORSK.7 often include the Mexican spotted owl and previous versions of the model have been applied to several other species. The owl represents a unique combination of social/cultural and ecological importance.

4.3.3 Project Impact Assessment

Descriptions of new project activities and locations were taken from the 2006 Draft SWEIS (DOE in prep.). The designs of projects evaluated in the SWEIS were at different stages of completeness, so, in some cases, for projects that did not have a definitive design or siting, we evaluated the worst-case scenario for that project. If there was not enough information on a project to assess its impacts on threatened and endangered species, we did not evaluate it in this document.

Project locations were mapped onto a GIS. GIS analyses were used to determine the distance of the project from threatened or endangered species habitats and the area of undeveloped habitats for threatened or endangered species that might be disturbed or impacted by the project. To evaluate noise impacts of a project, we estimated noise levels in species habitat using the following noise attenuation equation and recommended adjustments to assess the change in point source noise levels between any two distances from the source (CalTrans 1998):

$$\mathbf{dBA_2 = dBA_1 + 10\ Log_{10}\,(D_1/D_2)^{2+\alpha}}$$

where:
dBA_1 is the noise level at distance D_1,
dBA_2 is the noise level at distance D_2,
α is a site parameter that takes on the value of 0 for a hard site (parking lot, smooth body of water) and 0.5 for a soft site (soft dirt, grass, scattered bushes, and trees).

In extremely complex terrain, use of equations to estimate sound levels are likely to be highly inaccurate (CalTrans 1998). The "α scheme" is only an approximation. CalTrans (1998) research shows that the α scheme is fairly accurate within 100 feet (30 meters) of a sound source. Between 100 and 200 feet (30 and 60 meters), the α scheme overestimates the noise level by an average of 2 dB(A). At 200 to 500 feet (60 to 150 meters), the α scheme overestimates the noise level by an average of 4 dB(A).

Potential light impacts were estimated from project descriptions, but were not quantified.

5.0 Continued Operation of Los Alamos National Laboratory
5.1 Current Levels of Environmental Influence
5.1.1 Work Force Size and Traffic Volumes
5.1.1.1 Current

The LANL-affiliated workforce includes UC employees and others who work for KSL, Protection Technology Los Alamos (PTLA), and numerous contractors. There were 13,261 employees in 2004.

Existing roadway network constraints and the unique topography of the Pajarito Plateau dictate the location of major roadways (Figure 5-1). LANL has a number of roads, including major thoroughfares, which can be used for unrestricted vehicular access to LANL technical areas and buildings. There are four main access points to LANL that convey about 43,000 average daily trips. These roads and their average daily trips are shown in Table 5-1. The LANL TA-3 area is accessed from Pajarito Road, East and West Jemez Roads, and Diamond Drive. Traffic on these roadways can be heavy, particularly during peak commuting hours. At present, the nearby Diamond Drive and Jemez Road intersection experiences considerable congestion during peak traffic periods (DOE 1997). Los Alamos County peak period traffic volumes and resulting congestion are greatly influenced by the over 12,000 LANL employees in the region, because LANL is the main source for employment in northern New Mexico.

Table 5-1. LANL Main Access Points

Location	Average Daily Vehicle Trips
Diamond Drive across the Los Alamos Canyon Bridge	28,000
Pajarito Road	8,000
East Jemez Road	6,000
State Route (SR) 4/West Jemez Road from the west	1,000
Total	43,000

Source: DOE 1997

SR 501 (also known as West Jemez Road) lies within LANL boundaries. It provides public access between Los Alamos town site and SR 4 (which provides access to Bandelier National Monument and to the Valle Grande and points beyond). It also provides the primary access between LANL’s TA-3 and TA-16 areas and to other interior technical areas. Although designated as a State Road, it is not the property of the State of New Mexico; NNSA retains administrative control of this highway. East Jemez Road (also called the Truck Route) also lies within LANL and is under NNSA control. It serves as the primary access road between LANL and White Rock and to locations beyond Los Alamos County. A truck inspection station is

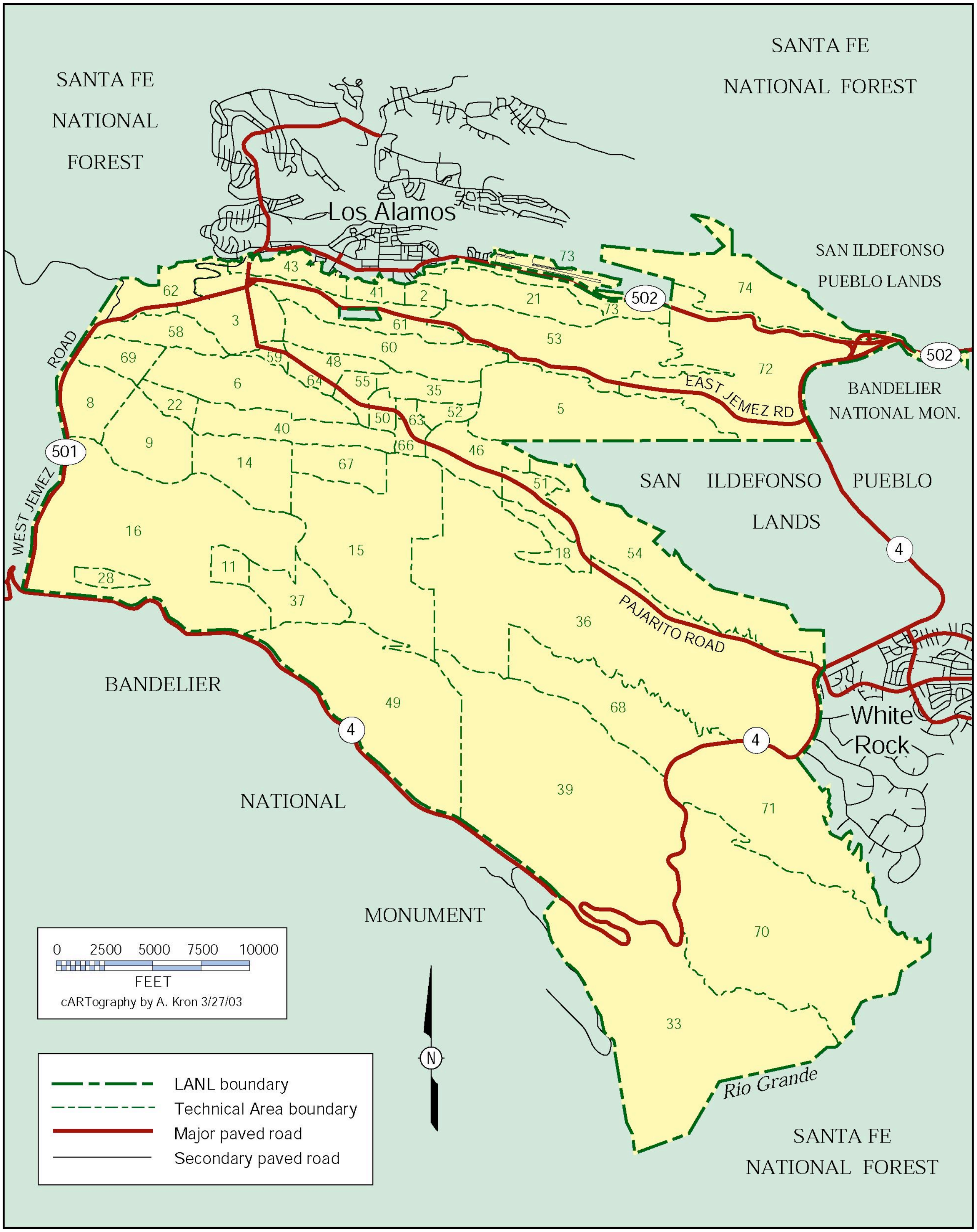


Figure 5-1. Roadway network.

located on East Jemez Road just west of SR 4. The entrance to LANSCE (TA-53) is along East Jemez Road; the Los Alamos County Landfill and Royal Crest Trailer Park are also served by East Jemez Road.

Pajarito Road is also within LANL boundaries and is administered by the NNSA. It was open to vehicular access by the public for many years; however, it was closed to the public in 2004. There are many LANL facilities along or accessed from Pajarito Road, including TA-54, TA-18, -50, and -55. There are no sidewalks or improved bicycle lanes along West Jemez, East Jemez, or Pajarito Roads.

5.1.1.2 Changes Since the 1999 SWEIS

There were 12,663 LANL-affiliated workers in 1999 (LANL 1999a). Figure 5-2 shows the distribution and density of workers in 1999 (LANL 1999a). At that time, when the 1999 SWEIS was published, 51 percent of the workforce occupied facilities in and around the Core Area of TA-3, while 28 percent were located along the Pajarito Road Corridor, 8 percent in Water Canyon and Anchor Ranch, and another 8 percent at LANSCE. The remaining 5 percent were situated in the Omega West area and in Los Alamos town site or White Rock (LANL 1999a). As of 2004, 44 percent of the workforce occupied facilities in and around the Core Area of TA-3, while 27 percent were located along the Pajarito Road Corridor, 10 percent in Water Canyon and Anchor Ranch, and another 6 percent at LANSCE. Another 13 percent were housed in Los Alamos town site or White Rock (Breiner, pers. comm.). The number of employees has exceeded 1999 SWEIS ROD trends. There were 1,910 more employees in 2004, compared to the SWEIS ROD trends of 11,351. SWEIS ROD trends were based on 10,593 employees identified for the index year (employment as of March 1996).

5.1.1.3 Trends

The number of LANL-affiliated workers is not expected to grow by more than 2.8 percent a year through 2009 because the budget forecast is flat (LANL 2004a). The distribution of LANL-affiliated workers is expected to continue to aggregate in existing developed areas such as TA-3, the Pajarito Corridor, and the town site as a result of new facilities now under construction or being planned and the need to house workers in leased space as an economically feasible interim space strategy. Population will also continue to consolidate into TA-16 and TA-22. Areas outside of those planned for redevelopment and investment will likely lose population.

The completion of the new access controls is imminent. Access control stations will be built on East Jemez near Diamond Drive and at the West Gate on SR 4 near West Jemez

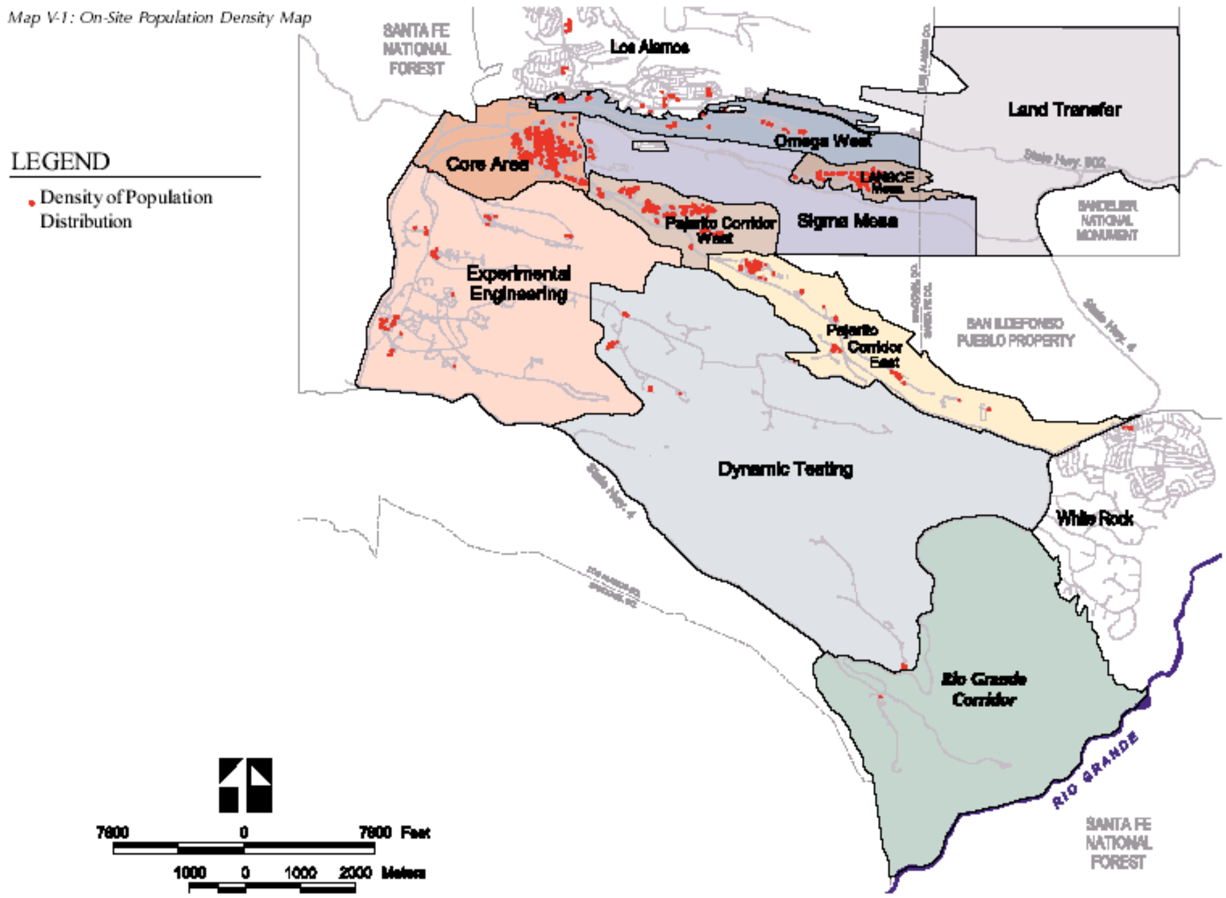


Figure 5-2. Worker density distribution at LANL (LANL 1999a).

Road. New parking lots are also being constructed at TA-3 and on Pajarito Road. These changes will not affect traffic volumes but may cause delays or changes in route selection around LANL.

5.1.2 Environmental Restoration and Contaminants

5.1.2.1 Current

During LANL's 60-year history, radionuclides and chemicals, referred to as legacy waste, have been released to the air, soil, and surface water, and indirectly, to groundwater as a result of routine operations, accidents, and waste disposal practices. There are also natural and non-LANL anthropogenic sources of some of the contaminants. Environmental contaminants at LANL include the radionuclides tritium, strontium-90, cesium-137, uranium-234, -235, and -238, plutonium-238 and -239,240, and americium-241; the metals silver, aluminum, arsenic, boron, barium, beryllium, cadmium, cobalt, chromium, copper, iron, mercury, manganese, molybdenum, nickel, lead, antimony, selenium, tin, strontium, thallium, vanadium, and zinc; and the organics PCBs, dioxins, and other chlorinated hydrocarbons; DDT and its breakdown products and other pesticides; and volatile and semivolatile hydrocarbons.

Although the Laboratory has substantially reduced radionuclide and chemical releases and has reduced environmental deposits of the contaminants, the impact and risk associated with remaining deposits of legacy waste continue to be of concern to individuals in nearby communities. The cleanup, removal, and treatment of historical releases of radionuclides and chemicals are also concerns.

LANL's ECR Project was established in 1989 as part of a DOE nation-wide program to characterize and remediate over 2,100 PRSs and areas of concern (AOCs) known, or suspected, to be contaminated from 60 years of LANL operations. The ECR Project initially identified a total of 2,124 PRSs; 1,099 PRSs administered by the NMED and 1,025 PRSs administered by the DOE. A PRS may be a solid waste management unit (SWMU) or an AOC. A SWMU is defined as any discernible unit at which solid wastes have been placed at any time, irregardless of whether it was intended for the management of solid waste. These units include any area at or near a facility at which solid wastes have been routinely and systematically released. These sites, managed by NMED, may include radioactive materials and some hazardous substances not included in the Resource Conservation and Recovery Act (RCRA) definitions of solid waste, hazardous waste, or hazardous constituents and are not subject to the provisions of the Hazardous and Solid Waste Amendments. However, the installation work plan requires ECR to address the potential release of radioactive and hazardous substances. Sites that conceivably contain hazard substances, but not hazardous wastes or constituents, are defined by RCRA as AOCs and are overseen by DOE.

At present, there are 764 PRSs. To date, 145 NMED sites have been removed from the Hazardous Waste Facility Permit and 178 have been added. A total of 628 DOE AOCs have been removed and 2 added. The consolidated reduction of NMED sites has reduced the total number of NMED PRSs to 549; 405 discrete SWMUs and 144 consolidated SWMUs. The total number of DOE AOCs, after a consolidated reduction of 120 units, stands at 279. Currently, 56 NMED and 8 DOE AOCs are pending approval for No Further Action.

In 2000, the ECR Project organized its site investigation and remediation efforts according to the watersheds in which PRSs or AOCs were found. A watershed is composed of one or more mesas, all of the drainages from those mesas, and the major canyon into which the drainages converge. A watershed is evaluated from a mesa top, through a canyon, to the Rio Grande to understand how contamination moves in sediments, soils, surface water, and groundwater. Taking the entire watershed system into consideration helps staff make remediation decisions regarding the amount of contaminants, the type of contamination, public accessibility to the watershed, and human health and ecological risks. The ECR Project also uses the evaluation results to prioritize its remediation efforts so the most contaminated and most publicly accessible sites are addressed first. Each watershed presents unique challenges because of location and topography and because of the cleanup solutions required by the types of hazardous chemical and/or radioactive wastes found in the watershed.

5.1.2.2 Changes Since the 1999 SWEIS

By the end of 2000, the number of PRSs totaled 883. In 2001, the total number of PRSs was reduced to 839. Actions taken during 2001 included the removal of 37 units from the Laboratory's Hazardous Waste Facility Permit, the addition of two units, and the proposal of 40 PRSs for No Further Action. Seventeen units previously proposed for No Further Action were still pending NMED approval. In 2002, the total number of PRSs stood at 833. No units were removed and one new PRS was added. Forty-eight units proposed for No Further Action before 2002 were still pending and nine new units were proposed to NMED for No Further Action. The total number of PRSs remained unchanged for 2003 as no units were removed. By 2004, the number of PRSs had dropped to 829. The ECR Project received 14 No Further Action approvals from DOE, three from NMED, and one joint approval for a consolidated unit made up of one NMED and four DOE sites. In all, 18 approvals were granted.

5.1.2.3 Trends

The NMED, UC/LANL, and DOE reached agreement on a draft Consent Order in March 2004. The Consent Order replaces the environmental restoration portion of the LANL RCRA Permit and contains detailed investigation requirements for groundwater, canyons, and MDAs as well as cleanup requirements. In concept and practice, the Consent Order is going to establish the future programmatic path forward and operational envelope for the ECR Project. This should address the next five years of operations.

For CY 2004, the Laboratory continued to operate in accordance with the requirements of Module VIII of the Laboratory's Hazardous Waste Facility Permit, which specifies conditions for compliance with the Hazardous and Solid Waste Amendment to RCRA. Additionally, the Laboratory voluntarily operates in accordance with a Compliance Order on Consent (Consent Order) for corrective action entered into by the State of New Mexico, the DOE, and the UC. The Consent Order replaces the corrective action requirements of the Amendment's Module of the Laboratory's Hazardous Waste Facility Permit. The Consent Order contains requirements for investigation and cleanup of SWMUs and AOCs at the Laboratory. The Consent Order includes major activities of investigation of canyon watersheds, investigation of MDAs, completion of ongoing investigations and cleanups begun under Module VIII, and investigation of watershed aggregate areas comprising SWMUs and AOCs. While several areas of the Consent Order may impact biological resources management at LANL, the canyon watershed investigations, especially the biological resources investigations, will most directly relate to biological resources management planning.

The RBES program describes the proposed site-wide goal for environmental remediation at LANL. The proposed goal is described as a "vision" of how the LANL campus will look when the DOE Environmental Management program cleanup mission is complete and the NNSA assumes full responsibility for environmental management at LANL. The vision integrates land-use, program, and facility plans with remediation requirements, establishing a conceptual completion goal (or end state) that is both realistic and protective. The purpose of the vision is to identify where and how potentially harmful exposures to hazardous contaminants might occur under projected future conditions and to determine what actions will be necessary and sufficient to minimize the potential for harm under those condition. Consistent with the objectives of cleanup, the vision conceptualizes specific end-state conditions that will minimize the potential for harm in the future. The RBES program vision describes cleanup goals that would be protective under planned future uses. In addition, the future end-state vision makes use of other LANL programs, including those that forecast the environmental impacts of planned activities, in compliance with the NEPA. Details of LANL's RBES program can be found in "*The Proposed Risk-Based End-State Vision for Completion of the EM Cleanup Mission at Los Alamos National Laboratory*" (LANL 2003c).

5.1.2.4 Results of Ecological Risk Assessments

Cañon de Valle: The ecological risk assessment for the terrestrial system in Cañon de Valle found some elevated metals concentrations in the small mammals relative to the reference site, but no values that were likely to pose adverse effects for the Mexican spotted owl. The numbers of species, population densities, and reproductive classes for those species indicated that the Cañon de Valle small mammal community is not being adversely affected by contaminants. The aquatic system assessment showed some differences between benthic macroinvertebrates in Cañon de Valle and reference canyons. These differences were attributed to relative sizes of the streams, reduced flows caused by the ongoing drought, and the elimination of effluent discharges to the canyon. One of the two rounds of toxicity testing for sediment and water in the canyon identified reduced survival for a site near the 260 outfall and a site below Burning Ground Spring. These results were not replicated in a subsequent toxicity test. The presence of a viable benthic macroinvertebrate community in the canyon indicated that the reduced survival in a 2001 toxicity test for the site near the 260 outfall is not a spatially extensive condition. The lack of difference between that same site and the reference site in 2002 toxicity testing further indicated that large-scale pervasive impacts to the aquatic system were not occurring. The benthic macroinvertebrate community was considered a more meaningful measure of the condition of the aquatic system in the canyon than the toxicity testing results. It was concluded that while toxicity testing identifies potential problems based upon the sampling locations and can be used to associate contaminant concentrations with measured effects for the samples, the endemic community condition gives a much larger scale indication of contaminant impacts that are integrated over long periods.

Los Alamos and Pueblo Canyons: The weight of evidence demonstrated by the various lines of evidence gathered in this effects assessment indicate there are no adverse effects of COPECs on terrestrial and aquatic receptors. The field studies, model calculations, and laboratory toxicity tests all provide a complementary set of results that support this interpretation and indicate that the assessment endpoints are not adversely affected. Thus, no COPECs were retained for any further assessment or mitigation and the lack of effects for various measures used in the baseline ecological risk assessment confirm the protective nature of ESLs (i.e., the overestimation of potential effects using ESLs).

Skinks and Organic Contaminants: In both 2001 and 2002 there were no significant differences between four canyons—two control canyons (canyons located away from LANL influences; Garcia and Chupaderos) and two canyons within LANL (Sandia and DP)—in the overall frequency of appendage loss, tail malformation, and pattern anomaly. There were also no significant differences between the canyons when comparisons were made with combined years data or when the canyons were considered as control and contaminated groups. In both years the highest observed frequency of malformations and anomalies occurred in control canyons.

Fish and Organic Contaminants: Generally there was no LANL effect as there generally were no differences in the gross and histologic pathology of channel catfish collected below LANL compared with the catfish collected above LANL. The gross observations indicated that Abiquiu Reservoir fish, upstream of LANL, generally showed both more variability in response and a greater number of visible pathologic indicators compared to those from Cochiti Reservoir, below LANL. This was also supported by the normality and feeding indices. Results of histopathological investigation of tissues by organ also generally indicated no LANL effect. Where adverse effects were indicated, below-LANL fish often had similar or lower levels of abnormalities as above-LANL fish.

Long-term Avian Nest Box Monitoring Project: The research to date has shown little difference of biological relevance in birds found in contaminated areas at LANL and, now, indicators of stress are established that can be used in the future. Possible locations at LANL that could adversely affect migratory birds have also been pinpointed from this research in order to focus future remediation efforts. Yearly variation in extreme environmental conditions, more than contaminants, impacted the stress response in the birds at LANL.

5.1.3 Air Quality

5.1.3.1 Current

LANL operations can result in the release of nonradiological air pollutants that may affect the air quality of the surrounding area. The area encompassing LANL and Los Alamos County is classified as an attainment area for all six EPA National Ambient Air Quality Standards criteria pollutants. A list of air quality permits, including construction permits and open burn permits, held by LANL through 2003 is shown in Table 5-2.

Criteria pollutants released from LANL operations are emitted primarily from combustion sources such as boilers and emergency generators. Although motor vehicle emissions have an impact on local air quality, no quantitative analysis of vehicle emissions was performed as part of the SWEIS. Instead, vehicle emissions were included in the assumed background concentrations for each of the criteria pollutants in the SWEIS analysis. Table 5-3 presents the sources of regulated air pollutants that are included in LANL's Title V operating permit application along with estimated emissions for 2000 and 2001.

Toxic and hazardous air pollutant emissions from LANL activities are released primarily from laboratory, maintenance, and waste management operations. Unlike a production facility with well-defined operational processes and schedules, LANL is a research and development facility with great fluctuations in both the types of chemicals emitted and their emission rates. LANL has not been required to obtain any permits specifically for toxic air pollutant emissions, and therefore there is no requirement to monitor for toxic air pollutants.

Some LANL operations may result in the release of radioactive materials to the air from point sources such as stacks or vents or from nonpoint (or area) sources such as the radioactive materials in contaminated soils. Radionuclide emissions from LANL point and nonpoint sources include several radioisotopes such as tritium, uranium, strontium-90, and plutonium. Currently, the largest contributors to LANL radiological point-source emissions are LANSCE and the tritium operations. LANL nonpoint sources of radiological emissions include fugitive emissions from the LANSCE, the PHERMEX facility at TA-15, the dynamic testing facility at TA-36, and low-level radioactive waste disposal at MDA G.

As of July 2004, 28 stacks were continuously monitored to measure the air emissions for radioactive materials. DOE also operates an ambient air monitoring program (AIRNET) at LANL to measure the level of radionuclides in the air. In 2004, there were 15 onsite monitoring stations, 24 site-perimeter monitoring stations, and three offsite monitoring stations at the Pueblos of San Ildefonso, Taos, and Jemez.

5.1.3.2 Changes Since the 1999 SWEIS

In the original SWEIS a list of 382 chemicals of interest were selected for evaluation. Estimates for selected toxic and hazardous air pollutant emissions from key LANL facilities were made in the 1999 SWEIS based on chemical use at LANL and assumed stack and building parameters. Chemical purchasing records for these key facilities have been reviewed each year and estimated emissions reported in the annual SWEIS yearbooks (LANL 2000a; 2001a; 2002a; 2003a). Although the amount of individual chemicals purchased varies from year to year, the total amount of the chemicals of interest have stayed relatively constant since the original SWEIS analysis.

Table 5-2. Air Quality Permits Held by LANL

Source	Permit	Date issued	Expiration date
Rock Crusher	Construction Permit #2195	June 16, 1999	None
Beryllium Machining at TA-3-102	Construction Permit #636	March 19, 1986	Withdrawn on February 20, 2004
Beryllium Machining at TA-3-141	Construction Permit #634-M2	October 30, 1998	None
Beryllium Machining at TA-35-213	Construction Permit #632	December 26, 1985	None
Beryllium Machining at TA-55-4	Construction Permit #1081-M1-R3	July 1, 1994. Revised March 11, 1998	None
Operational Burning at TA-16	Open Burning: TA-16-OB-2003	December 27, 2002	December 31, 2007
Operational Burning at TA-11	Open Burning: TA-11-OB-2003	December 27, 2002	December 31, 2007
Operational Burning at TA-14	Open Burning: TA-14-OB-2003	December 27, 2002	December 31, 2007
Operational Burning at TA-36	Open Burning: TA-36-OB-2003	December 27, 2002	December 31, 2007
Air Curtain Destructors	Open Burn Permit	June 20, 2001	September 30, 2003
Flue Gas Recirculation Installation at the Power Plant	Construction Permit #2195-B-R1	September 27, 2000	None
TA-33 Generator	Construction Permit #2195-F	October 10, 2002	None
Asphalt Plant	Construction Permit #GCP-3-2195G	October 29, 2002	None
Data Disintegrator	Construction Permit #2195-H	October 22, 2003	None

Table 5-3. Emissions Sources and Projected Maximum Emissions as Included in LANL's Operating Permit Application (tons/year)

Source Category	NO_x [(a)]	SO_x	CO	VOC	PM	PM_{10}	HAP
Air Curtain Destructors[(b)]	38.2	2.0	23.7	61.3	32.4	24.4	5.6
Asphalt Production*	0.2	0.0	2.6	0.1	0.5	0.5	0.1
Beryllium Machining [(c)]	—	—	—	—	1.09E-05	1.09E-05	7.60E-06
Small Boilers/Heaters*	37.2	0.3	31.9	2.4	3.3	3.3	0.8
Carpenter Shops	—	—	—	—	5.9	5.9	—
Chemical Use [(d)]*	—	—	—	30	—	—	13
Degreasers [(c)]	—	—	—	0.1	—	—	0.1
Internal Combustion*	49.1	5.2	22.0	2.0	2.2	2.2	0.04
Paper Shredder	—	—	—	—	13.0	13.0	—
Power Plant (TA-3)*	99.6	36.9	81.3	11.1	15.7	15.7	3.8
Remediation [(e)]	—	—	—	—	—	—	0.5
Rock Crusher	6.4	0.4	1.4	0.5	1.0	0.7	0.01
Steam Plant (TA-21)*	3.1	0.3	2.5	0.2	0.2	0.2	0.1
Storage Tanks [(f)]	—	—	—	0.8	—	—	0.4
Total	**234**	**45**	**165**	**108**	**74**	**66**	**24**
Total (without air curtain destructors)	**196**	**43**	**142**	**47**	**42**	**41**	**19**

* Included in 1999 SWEIS analysis

(a) NO_x = nitrogen oxides; SO_x = sulfur oxides; CO = carbon monoxide; VOC = volatile organic compounds; PM = particulate matter; PM_{10} = particulate matter equal to or less than 10 micrometers in size; HAP = hazardous air pollutants

(b) The air curtain destructors began operating at LANL in September 2001 as part of fire recovery efforts. They were removed in October 2003.

(c) Emissions from permitted activities. PM and PM_{10} include aluminum.

(d) "Projected" emissions estimated to be approximately double the actual emissions from most recent years.

(e) Only HAP emissions have been projected for future projects.

(f) Worst-case emissions were calculated for one tank, and projected for all tanks subject to Clean Air Act requirements.

After the Cerro Grande Fire in the spring of 2000, there was concern that LANL did not have an adequate baseline of nonradiological ambient air sampling. In 2001, LANL designed and implemented a new air monitoring program, entitled NonRadNET, to provide nonradiological background ambient data under normal conditions. The NonRadNET program included real-time ambient sampling for total suspended particulates and particulate matter less than or equal to 10 and 2.5 micrometers. Additionally, air samples were collected and analyzed for up to 20 inorganic elements and up to 160 volatile organic compounds (VOCs). Results for the inorganic elements and the VOCs were all very low, well below any published ambient or occupational exposure limits.

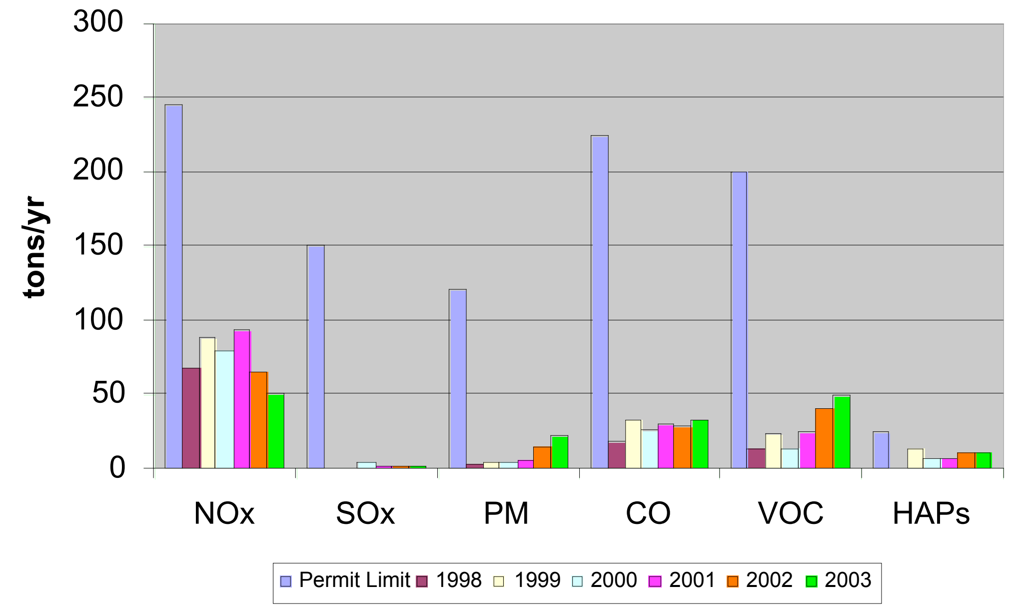
Ambient air monitoring of beryllium was performed at LANL from 1988 to December 1995, and from 1998 through December 2003. All monitored beryllium values were 2 percent or less than the National Emission Standards for Hazardous Air Pollutants.

5.1.3.3 Trends

Figure 5-3 compares LANL's emissions from 1998 through 2003 for criteria air pollutants and VOCs as reported to NMED in the annual emissions inventory. Also shown in the chart is a comparison of actual emissions over the six-year period with the facility-wide permit limits in LANL's Title V Operating Permit. There are some notable differences in the emissions from over the past few years. Emissions of nitrogen oxides have decreased from 2001 levels due to the implementation of the flue gas recirculation pollution control system on the TA-3 Steam Plant boilers. Particulate matter and VOC emissions increased temporarily since 2001 due to the use of the air curtain destructors at the Laboratory for forest thinning and fire mitigation efforts. After completion of projects, the air curtain destructors were taken out of service in late 2003.

Emissions of radioactive material are dependent on the type of operations. Tritium operations will be consolidated at TA-16 facilities over the next several years, so emissions from this area may increase, while emissions from TA-21 facilities will decrease as operations move out. Emissions of radioactive particulate matter and vapors are expected to stay relatively steady over the next several years. Emissions of radioactive gases from LANSCE are strongly dependent on the operations schedule and other beam parameters from that facility. However, emissions are expected to be in amounts that result in offsite doses of 0.5 to 3 millirem per year in the foreseeable future. Total LANL offsite dose from airborne emissions, which are dominated by LANSCE gas emissions, are expected to stay below the 3-millirem level. This is well below the EPA limit of 10 millirem per year for LANL operations.

Ambient air concentrations of longer-lived radionuclides (such as tritium, depleted uranium, plutonium, and americium) are not only influenced by current emissions, but also by resuspension of contamination from past activities. These include activities at waste sites such as MDA G, diffusion from buried tritium contaminated materials, disturbances of PRSs, and environmental remediation activities. Long-term trends are primarily influenced by these episodic events and not easily predictable.



NO_x = nitrogen oxides; SO_x = sulfur oxides; PM = particulate matter; CO = carbon monoxide; VOC = volatile organic compounds; HAP = hazardous air pollutants

Figure 5-3. Six-year comparison of LANL facility-wide emissions as reported in 20.2.73 New Mexico Administrative Code emissions inventory.

5.1.4 Noise and Light

5.1.4.1 Current

Existing LANL-related publicly detectable noise levels are generated by a variety of sources, including truck and automobile movements to, from, and within LANL; high explosives testing; and firearms practice activities. Noise levels within Los Alamos County unrelated to LANL are generated predominantly by traffic movements and, to a much lesser degree, other residential-, commercial-, and industrial-related activities within the county communities and the surrounding areas. Noise, air blasts (also known as air pressure waves or over pressures), and ground vibrations are intermittent aspects of the LANL area environment. Little is known about how different wildlife species may process these sensations or how certain species may react to them. The vigor and well being of area wildlife and sensitive, Federal protected bird populations suggest that these environmental conditions are present at levels within an acceptable tolerance range for most wildlife species and sensitive nesting birds found along the Pajarito Plateau.

The forested condition of much of LANL (especially where explosives testing areas are located), the prevailing area atmospheric conditions, and the regional topography that consists of widely varied elevations and rock formations all influence how noise and vibrations can be both attenuated (lessened) and channeled away from receptors. These regional features are jointly responsible for there being little environmental noise pollution or ground vibration concerns to the area resulting from LANL operations.

Noise generated by traffic has been computer modeled to estimate the impact of incremental traffic for various studies, including recent NEPA analyses, without demonstrating meaningful change from current levels due to any new activities. While very few measurements of nonspecific background ambient noise in the LANL area have been made, two such measurements have been taken at a couple of locations near the LANL boundaries next to public roadways. Background noise levels were found to range from 31 to 35 A-weighted decibels [dB(A)] at the vicinity of the entrance to Bandelier National Monument and SR 4. At White Rock, background noise levels range from 38 to 51 dB(A); this is slightly higher than was found near Bandelier, probably due to higher levels of traffic and the presence of a residential neighborhood (DOE 1995) as well as the different physical setting.

Exterior lighting is used at LANL to improve security and enhance safety. A wide selection of new lamps, ballasts, fixtures, and controls is available to lighting designers to replace traditional inefficient exterior lighting systems. Light pollution can disrupt biological cycles in plants and animals and is of particular concern because of impacts on endangered Mexican spotted owls that inhabit LANL property.

5.1.4.2 Changes Since the 1999 SWEIS

Requirements for controlling noise and lighting within threatened and endangered species habitat are established by ENV-ECO during a formal and established project review process to assure compliance with applicable laws such as the ESA. Many projects have received more detailed evaluation because previous environmental assessments addressed noise as an affected resource.

LANL has adopted the New Mexico Night Sky Protection Act that specifically requires that exterior fixtures greater than 150 watts be shielded or turned off between 11 p.m. and sunrise. The LANL Sustainable Design Guide published in December 2002 addresses exterior lighting and includes a checklist and recommendations for appropriate and environmentally sensitive lighting design.

5.1.4.3 Trends

There will likely be more restrictions on LANL construction and facilities noise and lighting in areas of environmental concern, because of more consistent and rigorous project reviews. LANL will continue to do field monitoring of noise as needed for project reviews and biological assessments.

5.1.5 Trails

The Pajarito Plateau has had human occupation for over 1,000 years and trails have long been part of the plateau. LANL workers, Los Alamos County residents, and visitors have all enjoyed using area trails since the earliest days of the Manhattan Project. Some recreational trails at LANL are culturally important to the neighboring Pueblos. Some LANL trails also link with trails on lands administered by other Federal agencies, the County of Los Alamos, and adjacent Pueblos. Lack of a trails policy at LANL has led to unsanctioned trails use, trespassing, and confusion regarding trails access at LANL. Some trails are listed as State cultural properties and may be eligible for National Register of Historic Places listing. Some trails traverse or are located near PRSs. Some of the trails also cross the health, safety, and security buffer zones around research sites or traverse sensitive habitats for Federally listed threatened and endangered species.

In 2003, an Environmental Assessment (DOE 2003) was written to address the trails issue. The document described three reasonable alternatives—the Proposed Action (Establish a Trails Management Program); Trails Closure; and No Action. The No Action Alternative reflects what is now happening and serves as a baseline with which to compare the consequences of the Proposed Action and the Trails Closure Alternative. The Environmental Assessment advised that no Federally listed threatened or endangered species and critical habitat, or other sensitive species currently present at LANL, would likely be adversely affected by activities associated with implementation of any of the three alternatives.

There are about 57 miles (92 kilometers) of social trails within LANL. A total of 13 major social trails have been identified and are known to be in general use at the LANL facility. An analysis was performed to determine the amount of trails within habitat for Federally listed threatened or endangered species. The total length in miles and kilometers of trails through AEIs on LANL are presented in Table 5-4. Several of the 13 major trails identified by the

Environmental Assessment occur in habitat for the Mexican spotted owl and bald eagle. In 2004 the Sandia-Mortandad Canyons AEI's status was changed to occupied for the first time.

The recommendation to protect the Federally listed threatened or endangered species here at LANL is to post sensitive habitat signs and implement partial closures to the sections of trails that are within sensitive habitat. Closures or other restrictions would occur during the breeding seasons of the affected species. Access and maintenance activities would be affected. All activities are currently being coordinated with the Trails Working Group. This will ensure that all interested parties agree on an access and maintenance strategy.

Table 5-4. Length of Trail Sections within Individual AEIs at LANL

AEI Name	Species	Length (mi)	Length (km)
White Rock Canyon	Bald eagle	2.67	4.30
Pajarito Canyon	Southwestern willow flycatcher	0.00	0.00
Canon de Valle	Mexican spotted owl	0.53	0.85
Los Alamos Canyon	Mexican spotted owl	4.19	6.74
Three Mile Canyon	Mexican spotted owl	0.00	0.00
Pajarito Canyon	Mexican spotted owl	0.00	0.00
Sandia-Mortandad Canyon	Mexican spotted owl	3.18	5.12

5.1.6 Forest Management Activities

5.1.6.1 Current

The LANL 1999 SWEIS identified wildfire as the most credible accident scenario that would result from natural hazards (DOE 1999a). This scenario was realized by several wildfires in the past 30 years that threatened LANL or burned on LANL property. To respond to this continued threat, LANL currently maintains an array of capabilities to reduce the risk of catastrophic wildfire and protect itself in the event that this type of fire should occur in the future. Comprehensive emergency operations and response capabilities are currently in place to suppress wildfire, protect facilities, and implement evacuation procedures. Interagency collaborations and communications have been established to respond efficiently if a wildfire should cross ownership boundaries. Monitoring of fuels and weather conditions and maintenance of predictive modeling capabilities have also been implemented. Thinning and fire hazard reduction activities have been conducted in the ponderosa pine forests and piñon-juniper woodlands on LANL. Additional fire hazard reduction activities have been conducted in approximately 112 acres (45 hectares) of ponderosa pine forest in Rendija Canyon, adjacent to the Los Alamos Medical Center in Los Alamos Canyon, and in other sections of LANL property.

In response to the Cerro Grande Fire, rehabilitation and erosion mitigation activities were conducted in 1,800 acres (728 hectares) of burned forests (Buckley et al., 2002).

5.1.6.2 Changes Since the 1999 SWEIS

During the 1990s, monitoring in forests and woodlands of the Los Alamos region revealed that these forests were overstocked with trees and other hazardous fuels (Balice et al., 1999, 2000). During this time period, a typical ponderosa pine forest supported an overstory density of 381 trees per acre (941 trees per hectare). The threat to the region from catastrophic wildfire was substantiated by the occurrence of the Dome Fire in 1996 and the Oso Fire in 1998.

To respond to this threat, LANL initiated comprehensive wildfire planning and management. Emergency operations capabilities were upgraded and interagency collaborations were formalized. Monitoring of fuels and fire hazards and fire-related weather conditions was also initiated. Fire hazard reduction activities were also completed between 1997 and 1999 in approximately 800 acres (324 hectares) of ponderosa pine forest and piñon-juniper woodlands. This was primarily in the form of thinning from below to a target of 50 to 150 trees per acre (124 to 371 trees per hectare). Most of this thinning was completed along SR 501 on the western boundary of LANL and adjacent to selected firing sites and critical facilities.

After the Cerro Grande Fire burned in May of 2000, LANL expanded its efforts to protect itself from catastrophic wildfires. A new emergency operations center and a fire operations center were constructed, and additional upgrades to emergency response capabilities were implemented. Monitoring of the levels and distributions of fuels and weather conditions were continued, expanded, and incorporated into predictive fire-behavior modeling capabilities. Thinning from below was completed in approximately 2,920 acres (1,222 hectares) of ponderosa pine forest and in approximately 4,363 acres (1,766 hectares) of piñon-juniper woodland (Shannon Smith, 2004, pers. comm.). The goal of this thinning was to create defensible space adjacent to LANL facilities and to reduce the fuels and fire hazards in the outlying forests and woodlands. Extensive rehabilitation work was also completed after the Cerro Grande Fire in approximately 1,800 acres (728 hectares) of burned forests (Buckley et al., 2002). This included 650 acres (263 hectares) of aerial seeding of grasses, 270 acres (109 hectares) of hydromulch applications, and 880 acres (356 hectares) of other rehabilitation treatments.

5.1.6.3 Trends

During the twentieth century, the environments of the Los Alamos region have been characterized by increasing levels of fuels in the forests and woodlands, increasing frequency of catastrophic fire, increasing relative costs of fire suppression, increasing mean annual temperatures, decreasing mean annual precipitation, and increasing construction of new facilities in the wildland-urban interface. The combination of these conditions indicates that the risk of wildfires, and the social and economic costs of wildfires, have both been increasing through time. To address this, LANL has initiated measures to mitigate the fire hazards, upgrade operational and emergency preparedness, and establish models and databases for characterizing the fire hazards and predicting fire behaviors.

All evidence suggests that these trends will continue in the near future. In addition, the large expanse of LANL property, coupled with its topographic and vegetational diversity, results in a complex and daunting situation to forest managers who wish to reduce fire hazards and maintain them at acceptable levels throughout the region. Moreover, the continuation of regional climate change and the growth of new vegetation will tend to increase the fire hazards through time and require additional active management of forests and woodlands to achieve and maintain the desired fire hazard reduction goals.

5.2 Habitat Evaluations

5.2.1 Wetlands

5.2.1.1 Current

The U.S. Army Corps of Engineers completed a wetland inventory of LANL in 2005 (Green et al. 2005). They found 30 wetlands totaling 34 acres (13.8 hectares). By far the largest wetland complexes were in Pajarito, Sandia, and Pueblo canyons. There were also relatively substantial wetlands in Mortandad Canyon. Remaining wetlands were generally relatively small and isolated. Many wetlands are associated with outfall effluents from LANL operations.

While the wetlands in Pajarito Canyon do not appear to be highly supported by anthropogenic water sources, the wetlands in Sandia, Mortandad, and Pueblo canyons are all dependent on outfall effluents and storm water runoff from either LANL (Sandia and Mortandad) or County of Los Alamos (Pueblo) sources.

5.2.1.2 Changes Since the 1999 SWEIS

Wetlands at LANL have undergone extensive environmental changes since 1998. Wetlands at LANL have suffered from siltation and ash buildup after the Cerro Grande Fire, runoff of hydromulch resulting in grass species build up within wet areas (which sometimes competes with the hydric vegetation), and drought. Individually, all three of these types of environmental conditions have the ability to greatly impact wetlands.

The SWEIS identified approximately 50 acres (20.2 hectares) of wetlands within LANL. Thirteen acres (5.3 hectares) of these wetlands were supported in whole or in part by effluent from LANL outfalls. With the reductions in effluent flow, the total area of wetlands is presently less than what it was when the SWEIS was prepared in 1999. The effect of closing or reducing effluent flow on these 13 acres (5.3 hectares) of wetlands was assessed in the *Environmental Assessment for the Outfall Reduction Program* (DOE 1996).

5.2.1.3 Trends

While most of the impacts from the Cerro Grande Fire siltation and ash are in the past, impacts from exotic vegetation species will continue for several more years. The drought is predicted to continue into the near future, impacting the water content and existence of many wetlands at LANL. Impacts of LANL's Outfall Reduction Project are assessed in Section 6.1.1.3.

5.2.2 Field Survey Results

5.2.2.1 Mexican Spotted Owl

From 1999 to the present, the five Mexican spotted owl AEIs currently identified on LANL were surveyed each year a total of four times each. In 2005, Pueblo Canyon and Rendija Canyon AEIs were determined to be no longer suitable nesting habitat and were not retained as AEIs (Consultation #22420-2006-I-0010).

Other owl species detected during surveys included the great horned owl, flammulated owl (*Otus flammeolus*), the northern pygmy-owl (*Glaucidium gnoma*), and the Western screech-owl (*Otus kennicottii*). Of all of the species detected during surveys, the great horned and flammulated owls were the most common. In the future, it is anticipated that the five AEIs will continue to be surveyed each year.

Surveys have confirmed that the delineating of owl habitat at LANL has been successful. The detection of a new Mexican spotted owl in 2004 and 2005 in one of the previously unoccupied AEIs indicates that protection of these areas from disturbance is allowing new spotted owls to colonize suitable habitat. In the future, the two occupied locations at LANL will continue to be monitored. The conditions in the new occupied AEI suggest that available habitat is the most important factor for spotted owls. If the appropriate canyon structure and vegetation are available, the surrounding noise-related disturbances do not provide as large of a deterrent for habitat utilization than previously thought.

5.2.2.2 Southwestern Willow Flycatcher

Between 1999 and 2005 the willow flycatcher habitat has been surveyed for five non-consecutive years depending on the need to survey. One willow flycatcher (subspecies unknown) was detected in the 1999 survey and one in the 2005 survey, both during late migration/early breeding period. These flycatchers were likely using the area during migration. No breeding season activity has been recorded on LANL property.

5.2.2.3 Bald Eagle

Bald eagle surveys are only performed on a per-project basis when a project occurs near eagle habitat. When surveys have been done during the past five years, there have been between 15 and 25 bald eagles using White Rock Canyon north of Cochiti Reservoir. In 1999, biologists surveyed the LANL area of White Rock Canyon and detected five bald eagles and identified several large roost trees. The bald eagle AEI at LANL is based on areas around these identified roost trees. The bald eagles use this area for winter roosting and have not been recorded nesting on LANL. All of the roost locations are along the Rio Grande in large trees or cliffs.

6.0 New Project Assessments
6.1 Site-wide
6.1.1 Outfall Reduction Program
6.1.1.1 Project Description

Since the mid-1990s, LANL has been implementing a policy of reducing and eliminating industrial effluents that are discharged to the environment through National Pollutant Discharge Elimination System (NPDES)-permitted outfalls (DOE 1996). LANL has conducted an Outfall Reduction Program that consists of eliminating wastewater sources; re-piping wastewater drainage systems; recirculation, modification, or installation of equipment; and plugging floor drains. LANL also constructed the Sanitary Wastewater Systems Consolidation plant, which treats wastewater formerly discharged at nine different outfalls. Treated sanitary wastewater is now reused as cooling water at the power plant before discharge at Outfall 01A001. This change has resulted in elimination of eight sanitary outfalls and 32 septic tank systems. Waste minimization efforts have resulted in a significant decrease in the volume of high explosives wastewater discharged. LANL has also constructed a new High Explosive Wastewater Treatment Facility that has facilitated elimination of 19 outfalls that formerly discharged wastewater from high explosives research and development, decontamination and decommissioning, environmental restoration, and waste minimization projects. Through the Outfall Reduction Program, photo waste discharges, asphalt plant discharges, and photo etching discharges from printed circuit board manufacturing have also been eliminated.

As of January 2006, there are 17 NPDES-permitted outfalls at the Laboratory. This is a reduction from 138 outfalls permitted in 1994. Seven additional outfalls are currently targeted for eventual elimination. These include NPDES Outfalls 051, 02A129, 03A027, 03A048, 03A130, 03A158, and 03A028. In addition, reduction or elimination of flow from Outfall 03A181 is being considered as part of the Plutonium Facility Complex Reinvestment Project. Long-term objectives of the NPDES Outfall Reduction Program require that outfall owners evaluate outfalls for continued operation and that new construction designs and modifications to existing facilities provide for reduced or no-flow effluent discharge systems (DOE 1999d).

6.1.1.2 Current Levels of Environmental Influence

NPDES Permit NM0028355 was issued in 1994 with 138 outfalls permitted at LANL. That permit expired in 1998. In 1996, the Effluent Reduction Environmental Assessment (DOE 1996) was published with the proposed action to eliminate industrial effluent from 27 outfalls.

The Effluent Reduction Environmental Assessment estimated a reduction in wetland acreage from about 50 acres (20 hectares) to about 37 acres (15 hectares) from the proposed action (8 acres [3.3 hectares]) and LANL actions already planned (5 acres [2 hectares]). The planned actions included an additional 15 outfalls with high explosives effluents scheduled to close in 1997. One outfall evaluated for closure was known to have created a perennial stream reach greater than 0.5 mile (0.8 kilometer) long. Wetlands associated with 11 outfalls were expected to disappear.

In 2001, NPDES Permit NM0028355 was issued (superceded 1994 permit) permitting 21 outfalls (one added since the 1994 permit; 118 deleted). Some of the outfalls removed from the permit were transferred to Los Alamos County along with the drinking water system. In 2006, NPDES Permit NM0028355 was issued (superceded 2001 permit) with 17 outfalls permitted. Seven of the currently permitted outfalls are targeted for closure: NPDES Outfalls 051, 02A129, 03A027, 03A048, 03A130, 03A158, 031028. Outfall 03A181 is also being considered for closure. Table 6-1 provides details, and Table 6-2 summarizes flow volume changes from 1995 and 2004.

Table 6-1. Number of Permitted Outfalls by Receiving Stream

Receiving Stream	No. of outfalls 1994	No. of outfalls 1999/2001	No. of outfalls 2006	No. of projected outfalls
Los Alamos Canyon	22	4	3	0
Pajarito Canyon	16	0	0	0
Sandia Canyon	20	6	5	4
Water Canyon	19	4	3	1
Cañada del Buey	13	1	0	0
Cañon de Valle	12	1	1	1
Mortandad Canyon	15	4	4	2
Guaje Canyon	6	0	0	0
Two-Mile Canyon	6	0	0	0
Ancho Canyon	2	0	0	0
Chaquehui Canyon	2	0	0	0
Three-Mile Canyon	2	0	0	0
Pueblo Canyon	1	0	0	0
Rendija Canyon	1	0	0	0
Ten-Site Canyon	1	1	1	1
TOTAL	138	21	17	10

Table 6-2. Estimated Flow Volume (million gallons per year [MGY]) Changes from LANL-Permitted Outfalls Between Calendar Years of 1995 (87 active outfalls; 1999 SWEIS) and 2004 (DOE, in prep) and the Projected (maximum) Flow Volume with Implementation of the Expanded Operations Alternative of the SWEIS

Receiving Watershed	Flow Volume MGY 1995	Flow Volume MGY 2004	Projected Flow Volume (Expanded Operations Alternative of 2006 SWEIS)
Los Alamos Canyon	19.7	29.6	33.1
Pajarito Canyon	9.2	0	0
Sandia Canyon	107.9	116.4	131.9
Water Canyon/Cañon de Valle	29.5	0.62	1.3
Cañada del Buey	6.4	0	0
Mortandad Canyon	52.9	15.9	22.9
Guaje Canyon	0.7	0	0
Pueblo Canyon	0.1	0	0
TOTAL	233	162.5	189.2

Outfall by watershed under the current permit:
Mortandad: **051** (TA-50), 03A021 and 03A022 (TA-3), **03A181** (TA-55)
Sandia: 13S (TA-46), 001, **03A027**, and 03A199 (TA-3), 03A113* (TA-53)
Los Alamos: **03A158** and **02A129** (TA-21), **03A048** (TA-53)
Water: **03A130** (TA-11), **03A028** and 03A185 (TA-15)
Cañon de Valle: 05A055
Ten-Site Canyon: 03A160 (TA-35)
Bolded outfalls are targeted for closure.
*Scheduled for construction

6.1.1.3 Potential Effects of the Project

Effects on Wetlands and Watering of Stream Reaches

We compared wetland areas delineated by LANL biologists on the basis of vegetation prior to 1995 to the wetland areas provided by the U.S. Army Corps of Engineers based on fieldwork they conducted at LANL in 2005 (Green et al., 2005). Wetland area decreased from an estimated 57.6 acres (23.3 hectares) in 1995 to 33.6 acres (13.6 hectares) in 2005 (24 acres [9.7 hectares]; a 41.6 percent loss of wetland area). There were two reasons identified for wetland area loss: (1) for some wetlands, the wetland boundaries delineated by the U.S. Army Corps of Engineers in 2005 were smaller than the boundaries delineated in the 1990s and (2) some wetlands completely disappeared. Some of the reduced areas could have resulted from differing methodologies in identifying wetland boundaries between the two surveys.

Of the 24 acres (9.7 hectares) of wetland not documented during the 2005 survey, approximately 6.5 acres (2.6 hectares) were directly associated with outfalls that have closed (wetland was within 1,650 feet [500 meters] downstream of the outfall). Other wetlands farther downstream of outfalls were also lost, but direct connections of wetland loss to outfall closure for wetlands more than 1,650 feet (500 meters) from the outfall could not be quantified. Approximately 65 outfalls contributed to wetlands that were "lost" between 1995 and 2005.

Of the outfalls currently targeted for closure, 03A027 contributes to Sandia wetlands; however, since several other outfalls also contribute to this wetland, closure of 03A027 may not have a substantial negative impact on the wetland. Outfall 03A130 contributes to a wetland that has no perennial streams or other outfalls near by. Outfall 03A181 contributes to a relatively large (1.36 acres [0.55 hectare]) wetland in Effluent Canyon, a tributary of Mortandad Canyon.

We have no historical documentation on the length or frequency of watering of stream reaches by LANL outfalls, and therefore we have no way of determining the effects of outfall closures on the amount or condition of perennial or intermittent stream reaches at LANL. Presumably, conditions of stream reaches previously influenced by outfalls are more xeric now than they were before outfall closures.

Effects on Threatened and Endangered Species: Small Mammal Prey Base

We analyzed small mammal trapping data collected at LANL between 1992 and 2003 (Table 6-3). Because trapping methods varied, and density estimates were not available for all trapping data sets, we used number of new captures per 100 trap nights as our response variable. Data were not included in this analysis if we did not have information on the number of trap nights or number of traps for the trapping array. We examined total number of new captures per 100 trap nights, number of new captures of each species per 100 trap nights, and number of species captured per 100 trap nights (an index of species richness). Species data were transformed using a $\log_{10}$ (x+1) transformation before analyses, and number of species and total number of new captures were transformed using a $\log_{10}$ (x*10) transformation before analyses (Sokal and Roalf 1981). We initially examined main effects of year, stream type (none, intermittent, perennial, wetland), and habitat type (human-disturbed, mixed conifer, piñon-juniper, ponderosa pine, and wetland). The "none" stream type indicated mesa-top habitats, and the "intermittent" and "perennial" stream types indicated canyon habitats. Wetlands frequently occurred in canyons, but could occur on mesa tops if associated with a mesa-top effluent outfall. "Human-disturbed" habitats referred to mesa-top grasslands associated with disturbed areas around buildings or structures. Other habitat types are as the names state. Parametric analysis of variance and Tukey's HSD multiple comparisons were used to analyze these data.

Not all stream types were found within each habitat type. For example, wetland habitat types had only wetland stream types, but not all areas with wetland stream types were classified as wetland habitat. A small wetland associated with an effluent outfall might be surrounded by piñon-juniper habitat. Only if the entire trapping array was located within wetland habitat would the habitat type be called wetland. Deer mice were the most common species trapped and were trapped in all locations.

Table 6-3. Number of Trapping Arrays for Each Category of Year, Habitat Type, and Stream Type

	Stream Type*				Habitat Type*				
	None	Int	Per	Wet	HD	MC	PJ	PP	Wet
1992	1	2	1	4	1	3	4	5	2
1993	0	2	3	2	0	2	0	2	0
1994	2	4	3	2	2	4	0	3	2
1995	3	0	1	2	0	0	2	1	2
1996	3	0	1	2	2	0	1	1	2
1997	2	0	0	0	2	0	0	0	0
1998	2	0	0	0	2	0	0	0	0
2001	3	4	4	0	0	8	0	3	0
2002	5	17	2	0	1	7	4	12	0
2003	8	0	0	0	4	0	0	3	0

* Int = intermittent; Per = perennial; Wet = wetland; HD = human-disturbed; MC = mixed conifer; PJ = piñon-juniper; PP = ponderosa pine

A preliminary analysis was conducted looking at each main effect alone. Year, stream type, and habitat type were all significant predictors for total number of new captures and number of species captured. Year was not a significant predictor for total number of new deer mice captured.

The data were then reanalyzed using groups of years that were not significantly different in small mammal abundance or species richness. For species-specific data, all years were considered together, as year did not have a significant effect of captures of deer mice, and most species did not have a sufficient number of captures for a robust test of year effects. For total number of new captures per 100 trap nights, the years considered were high abundance (1992), moderate abundance (1994, 1995, 1996, 1997, 1998, 2002), and low abundance (1993, 2001, 2003). For total number of species capture per 100 trap nights, the years considered were high species richness (1992), moderate species richness (1994, 1995, 1996, 1997, 1998, 2002, 2003) and low species richness (1993, 2001) (Figure 6-1). During the low years for both total number of species captured and total number of new captures, there were no wetland habitat types or wetland stream types sampled, so wetlands were not included in the analyses for low years.

For total number of new captures, both habitat type and stream type significantly affected capture rates at low small mammal abundance levels, habitat type alone was significant at moderate small mammal abundance levels, and neither factor was significant at high small mammal abundance levels. Under low abundance conditions, human-disturbed habitats had more captures than mixed conifer and ponderosa pine habitats, and piñon-juniper habitats also had more captures than ponderosa pine habitats. Areas with perennial streams had more captures than areas with intermittent streams. Under moderate abundance conditions, wetlands had more captures than ponderosa pine, mixed conifer, or piñon-juniper habitat types. Human-disturbed habitats had more captures than mixed conifer or piñon-juniper habitats.

For number of species captured, stream type and habitat type did not significantly affect species richness at low or high levels of small mammal species richness. At moderate levels of small mammal species richness, effects of both stream type and habitat type were significant. Areas with wetland streams had greater numbers of species than areas with intermittent streams or no streams, and intermittent streams had greater numbers of species than areas with no streams. Piñon-juniper habitats had greater numbers of species than mixed conifer or ponderosa pine habitats.

Since we did not have an equal amount of effort at low, moderate, and high levels of small mammal abundance or small mammal species richness, the differences in significance of stream type or habitat type effects among levels may reflect real effects, or may reflect the lower power of statistical tests at low and high levels relative to the more heavily sampled moderate levels.

We examined associations of specific species with habitat types and stream types by combining all years. Results of the analysis are presented in Table 6-4. Higher captures rates were associated with wetlands or mesic habitats (wetland or perennial stream types) for seven out of 13 taxa.

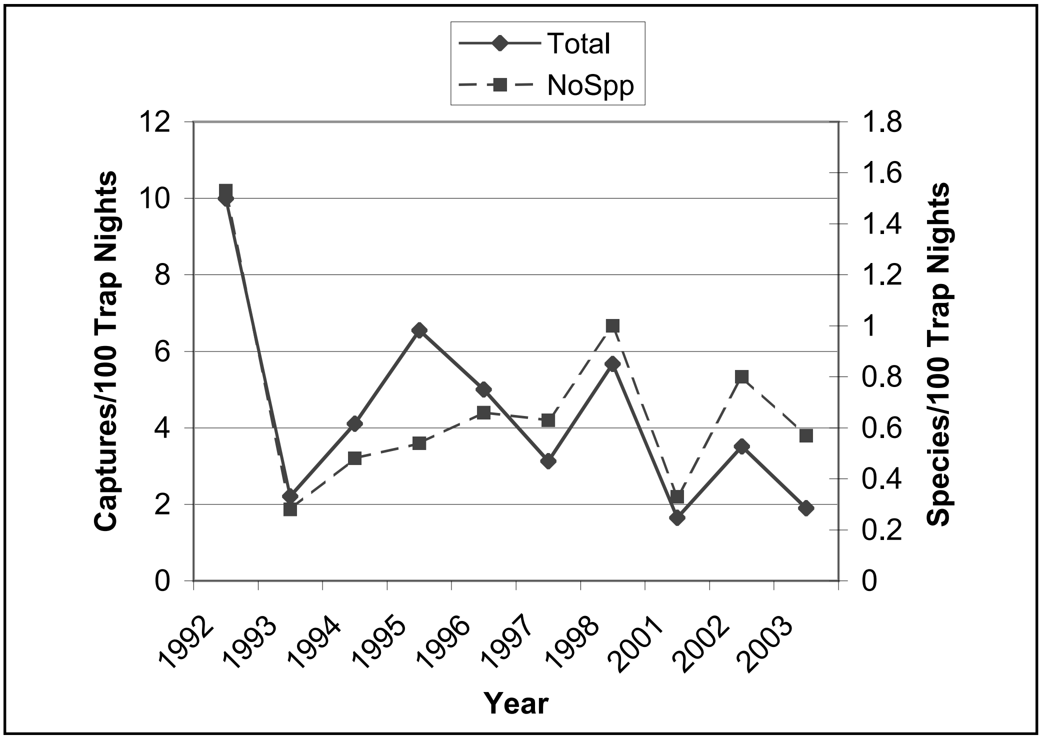


Figure 6-1. Number of unique captures per 100 trap nights and number of species captured per 100 trap nights for trapping arrays at LANL, 1992–2003.

Based on our results, under conditions of moderate small mammal abundance, total new captures of small mammals are 2.5 times greater in wetlands than in the next highest habitat category, human-disturbed. Species richness of small mammals within a habitat type increases with the presence of a wetland stream type. Seven out of 13 taxa of small mammals could decline in overall abundance at LANL with decreases in the area and distribution of wetlands and perennial stream reaches.

Table 6-4. Small Mammal Habitat Type and Stream Type Affinities at LANL, 1992–2003*

Scientific Name	Habitat Type**	Stream Type**	Habitat Affiliations
Peromyscus maniculatus	HD PP Wet MC PJ	Wet Per Int None	Human-disturbed and mesic habitats
Peromyscus boylii	PJ HD PP Wet MC	Int Wet Per None	Generalist
Microtus longicaudus	Wet MC HD PP PJ	Wet Per None Int	Mesic habitats
Reithrodontomys megalotis	Wet HD MC PP PJ	Wet None Per Int	Wetlands
Microtus montanus	Wet MC PP PJ	Wet Per None	Wetlands
Sorix spp.	Wet MC PP PJ	Wet Per Int	Wetlands
Peromyscus truei	PJ PP MC Wet HD	None Int Per Wet	Ponderosa pine and piñon-juniper habitats
Neotoma spp.	PJ PP MC Wet	Wet Per Int None	Mesic habitats, rocky areas, shrub cover
Eutamias quadrivittatus	PJ MC PP Wet	Wet Per Int None	Generalist
Perognathus flavus	PJ PP	Int None	Xeric piñon-juniper and ponderosa pine
Eutamias minimus	PJ Wet MC PP	Wet Per None Int	Generalist
Peromyscus leucopus	PP	Wet Int	Mesic ponderosa pine habitats
Peromyscus nastutus	PJ	Wet	Mesic piñon-juniper habitats

* Based on number of unique captures per 100 trap nights from 89 trapping arrays. Mammals are listed from most frequently captured to least frequently captured. Habitat types and stream types in each row are listed from greatest least squares mean to lowest least squares mean for each factor. Habitat types or stream types in which no animals of a species were captured are not listed within the row. Bars indicate habitat and stream types that are not significantly different from one another. Habitat affiliation descriptions are based on our results and on Block et al. (2005).

** Int = intermittent; Per = perennial; Wet = wetland; HD = human-disturbed; MC = mixed conifer; PJ = piñon-juniper; PP = ponderosa pine

6.1.1.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: Most bald eagle foraging and use of LANL takes place along the Rio Grande. Bald eagles feed upon medium-sized mammals, carrion, and fish. Other than the Rio Grande, LANL does not have any bodies of water or wetland areas supporting fish or large enough to attract bald eagles. Closure of outfalls at LANL will not impact the foraging opportunities for bald eagles on LANL property.

Reasonable and Prudent Alternatives: No reasonable and prudent alternatives are required.

Assessment Decision: There is no foraging habitat loss and no disturbance associated with the Outfall Reduction Project. Therefore, this project will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is located on and adjacent to the largest wetland complex at the Laboratory, Pajarito wetlands. The U.S. Army Corps of Engineers wetland inventory delineated 15.2 acres (6.2 hectares) of wetlands in lower Pajarito Canyon in 2005, despite the fact that there have been no outfall releases to Pajarito Canyon since at least 1999 (See Table 6-2) and Los Alamos County is in an extensive drought. We find no evidence that the hydrological characteristics of Pajarito wetlands are related to releases of water from LANL operations, and therefore we do not anticipate that further outfall closures will impact this wetland complex.

Reasonable and Prudent Alternatives: No reasonable and prudent alternatives are required.

Assessment Decision: There is no nesting or foraging habitat loss and no disturbance associated with the Outfall Reduction Project. Therefore, this project will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: In order to more accurately assess the impact of outfall closures on currently occupied Mexican spotted owl AEIs at LANL, we defined 640 acres (259 hectares) around the sites where Mexican spotted owls have been observed during the breeding season as protected activity centers (PACs). We then assessed what water resources were available in these

PACs, including active outfalls, wetland areas, natural springs, and perennial and intermittent stream reaches.

In FY 2002, 2.8 million gallons per year (MGY) was released from Outfall 03A181, and 2.9 MGY was released from Outfall 051. Under current pollution prevention goals, outfall volume at Outfall 051 is expected to drop to 2.5 MGY by the end of FY 2006. Outfall volume at 051 may drop to zero if zero liquid discharge options are pursued at RLWTF (see Section 6.3.6). Under most conditions, outfall discharge from 051 travels approximately 0.4 mile (0.64 kilometer) above ground below the outfall. This area in Mortandad Canyon currently contains riparian vegetation. Outfall volume at 03A181 may decline or drop to zero under water efficiency proposals being considered for the Plutonium Facility Complex Reinvestment Project. This would have detrimental effects, up to total loss, of the wetland in Effluent Canyon.

Reasonable and Prudent Alternatives:

- LANL should support or encourage the presence of water resources that are supported or supplemented by outfalls or storm water runoff, including wetlands, intermittent stream reaches, and perennial stream reaches, in or adjacent to Mexican spotted owl habitats, where such resources do not hinder water quality protection goals or other compliance requirements.
- LANL should inventory, monitor, and protect water supplies for natural springs within canyon systems.
- LANL should inventory, monitor, and protect riparian areas within canyon systems.
- LANL should develop and implement a wetlands/floodplains management plan that will address protection of natural springs, wetlands, and riparian areas.
- All further actions affecting water flow volumes in Mortandad and Sandia canyons should be carefully assessed for positive and negative impacts.

Assessment Decision: Because of water quality requirements, the Consent Order, and detections of contaminants in regional aquifers, there are some extremely strong compliance and human health risk drivers at LANL to reduce or eliminate both storm water and operational outfall contributions to LANL canyon systems. We do not expect the Outfall Reduction Program to have adverse effects in the Cañon de Valle AEI. However, the Outfall Reduction Program is likely to reduce the extent of wetland and riparian habitats, and of perennial and intermittent stream reaches, and thereby reduce the abundance and diversity of prey species, within the

Mortandad-Sandia Canyon Mexican spotted owl AEI. Therefore, this project may affect, and is likely to adversely affect, the Mexican spotted owl.

6.2 Core Area Projects

6.2.1 Science Complex

6.2.1.1 Project Description

LANL is proposing to build a Science Complex at TA-62 (Figure 6-2). This facility will be located directly west of the Los Alamos Research Park along the southern edge of Los Alamos Canyon. This action will involve the permanent disturbance in undisturbed habitat and the loss of surface vegetation will be lost to the new buildings and roads associated with the complex. The siting of this Complex on Figure 6-2 represents a worst-case scenario; the Complex may be sited further to the west, which would reduce impacts.

The complex would be composed of two buildings providing approximately 402,000 gross square feet (36,180 square meters) office and light laboratory space along with the necessary supporting infrastructure and an auditorium. The complex would provide space for about 1,400 staff members including scientific staff involved in research in biosciences, computer and computational sciences, earth and environmental sciences, theoretical research, nonlinear studies, and geophysics and planetary physics. Two four-story buildings and a six-story parking structure on the north side of West Jemez Road are planned. In addition a currently unused two-lane road to the north of the proposed facility would be improved to allow entrance from both the north and south of the complex. Improvement of this road was also discussed in consultation #2-22-02-I-0553R, the Security Perimeter Project.

It is anticipated that construction of the Science Complex would take about 18 months from groundbreaking. NNSA's goal would be to retain as much of the natural setting, vegetation, and overall environmental integrity of the site as practical. A maximum area of 24 acres (9.7 hectares) would be disturbed or impacted by the project, which includes areas for new construction and staging. This area currently consists of ponderosa pine woodland.

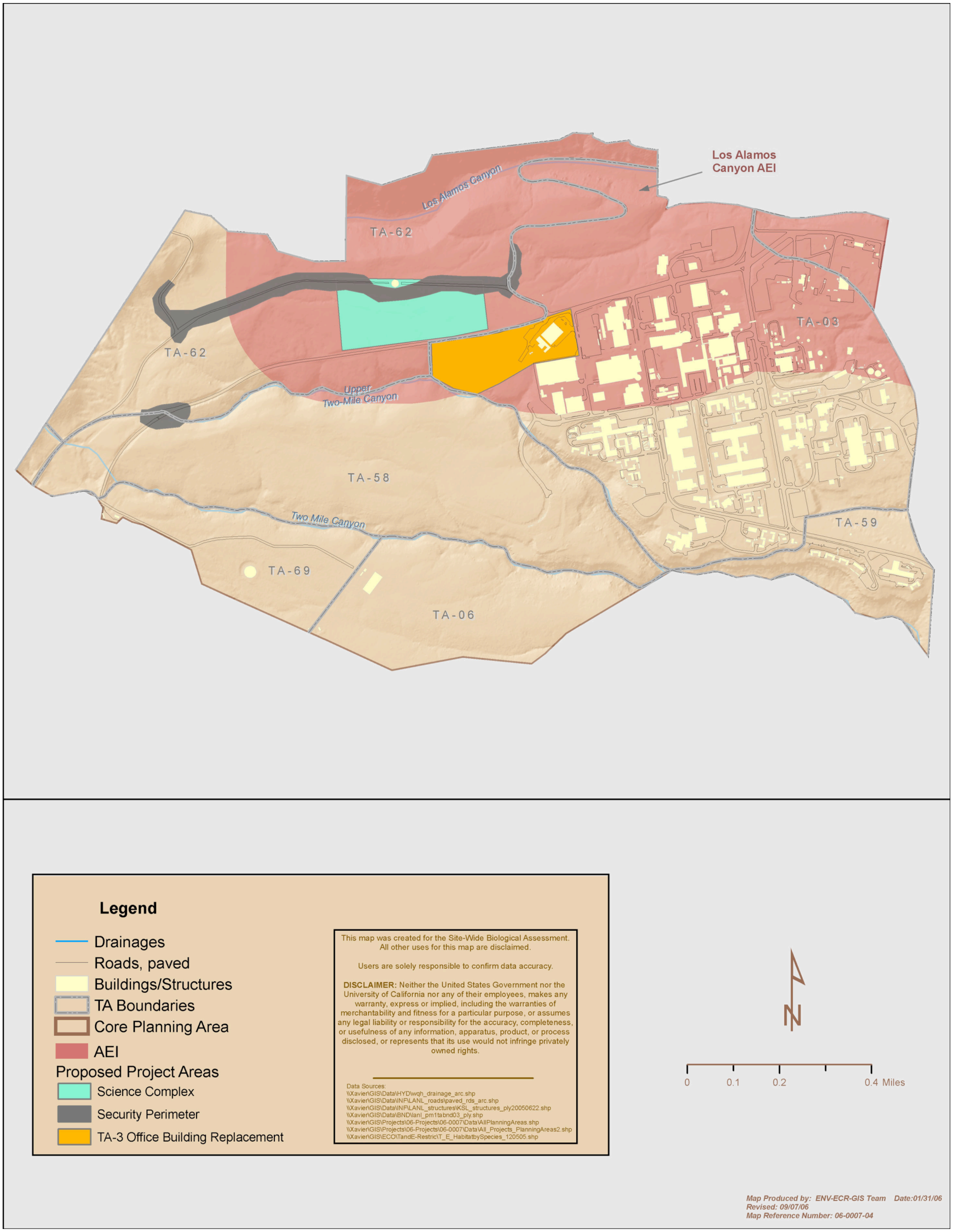


Figure 6-2. Proposed project areas in core area.

6.2.1.2 Current Levels of Environmental Influence

The Science Complex will be constructed on undeveloped land in TA-62 at LANL just to the northwest of the main administrative complex at TA-3 and just to the west of the Research Park. Current disturbances associated with the site include SR 502 to the south of the site and the extensive industrial and office facilities to the east and south of the proposed location. A paved road crosses Los Alamos Canyon in this general area. General traffic volumes are expected to increase during construction and following these upgrades. Heavy equipment will be used during the construction for this proposed action. There is also extensive trail use in the project area. The Cerro Grande Fire did not burn the project area, however, the canyon to the north and west of the site had all of the trees lost during the fire. There are several existing paved and dirt roads surrounding the project area as well as utility corridors.

There are no PRSs within the project boundary. Should any unknown PRSs be found during construction, the site would be cleaned up or capped to prevent spread of contamination. The project location is within Mexican spotted owl habitat. Preliminary risk assessments of potential contaminant impacts to the Mexican spotted owl have been completed (Gallegos et al., 1997). In general, results indicate no appreciable impact to the Mexican spotted owl (Gonzales et al., 1997). No significant air quality problems are known for the proposed project area.

There are not any known surface water/soil erosion problems associated with the proposed project site. However, significant and permanent storm water protection measures will be put in place to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is riparian vegetation along the streambeds of the adjacent canyon but not areas of wetlands. There are areas of floodplain along the canyon bottom adjacent to the project area.

For all of the Los Alamos Canyon AEI, the mean background noise level was 57 dB(A), ranging from 38.9 to 67.2 dB(A) (Vrooman et al., 2000). Current noise levels are associated with vehicular traffic on SR 4, West Road, and the Camp May Road and activity at TA-3 and the Research Park. Current lighting on the site is associated with existing buildings at LANL technical areas and passing vehicles.

6.2.1.3 Potential Effects of Project

The proposed project will result in the development of 24 acres (9.7 hectares) of currently undeveloped areas. There will be an increase in traffic volume as a result of project activities and overall operational traffic volume will increase following the upgrades. Heavy equipment use normally not associated with commercial activity is expected to increase during construction.

No contaminant problems should result from the proposed Science Complex Project. Any contamination sources in these areas should not be more accessible to wildlife and groundwater following this action. All areas of contamination will be avoided or cleaned up during the project activities.

There will be a temporary increase in emissions and dust from the use of heavy equipment in the project activities. No long-term reduction in air quality will result from the project. Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices (LANL 2004e). Disturbed soils will be stabilized during and after construction to prevent erosion.

The LANL HMP restricts noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitat. This project will not be able to operate under these timing restrictions and an assessment of background noise and potential noise generated during similar construction activities suggests that noise levels would exceed the HMP limits.

Lights used during construction of the proposed project will be directed away from canyons. However, the final facility will be lighted with Los Alamos Canyon having more illumination than current conditions. Changes in traffic routing proposed in the project will increase the incidence of artificial light in some portions of the project area.

6.2.1.4 Threatened and Endangered Species Assessments

<u>Bald Eagle</u>

Project Impacts: The bald eagle AEI is not near the proposed project site. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. Reasonable and prudent alternatives should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the Science Complex Project may affect, but is not likely to adversely affect, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The proposed Science Complex Project is not within or upstream of the southwestern willow flycatcher AEI, consequently, the proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting habitat loss and no potential for habitat degradation associated with the Science Complex Project. Therefore, this project will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The proposed Science Complex Project is within the Los Alamos Canyon Mexican spotted owl AEI zones (see Figure 6-2). The proposed project will remove up to 24.1 acres (9.9 hectares) of undeveloped habitat. The project will potentially exceed the HMP restriction on construction noise of greater than 6 dB(A) above background in AEIs in the breeding season (March 1 to August 31).

To more accurately assess the impact of the proposed project on the Mexican spotted owl, we modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area.

Areas adjacent to developed areas are likely to have daytime average background noise levels between 40 and 63 dB(A). For all of the Los Alamos Canyon AEI, the mean background noise level was 57 dB(A), ranging from 38.9 to 67.2 dB(A) (Vrooman et al., 2000). Estimates of sound levels from construction equipment range from 82 dB(A) to 91 dB(A) at 15 m (50 ft) (Knight and Vrooman 1999).

Assuming a maximum of 91 dB(A) at 50 feet (15 meters), other estimates of sound levels are 81 dB(A) at 100 feet (30 meters) and 74 dB(A) at 200 feet (60 meters). Estimates based on this information indicate that sound levels would be equal to or less than 6 dB(A) above background levels at approximately 450 feet (135 meters) from the source.

We estimate that noise effects of construction activities will be within 6 dB(A) of background within 450 feet (135 meters) of the project boundaries, and noise from operational activities will be less than noise from construction. Development in this location extends the boundaries of an already heavily developed area. Another proposed project that has already undergone informal consultation, the Security Perimeter Project, is planned for the same area and is located between the proposed project and habitat in Los Alamos Canyon. It is unlikely that Mexican spotted owls will be denied access to adequate nesting and foraging habitat as a result of this project.

Reasonable and Prudent Alternatives: See Appendix B.

Assessment Decision: Suitable foraging habitat will be lost or compromised as a result of the proposed action. However, no suitable nesting habitat will be removed during the proposed action; the entire site is mesa-top ponderosa pine woodland. Predicted noise levels from the proposed project may exceed 6 dB(A) above background. Noise generated from construction activities should attenuate to below HMP limits within 450 feet (135 meters) of the construction site. Current levels of disturbance are extensive and reduce the overall quality of the habitat in this area. Mexican spotted owls have not been recorded in Los Alamos Canyon for 11 years of surveys (1994 to 2005). If an owl is found before construction begins, the USFWS will be contacted and consultation reinitiated. If all reasonable and prudent alternatives are implemented, the Science Complex Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.2.2 TA-3 Replacement Office Buildings

6.2.2.1 Project Description

The proposed action would be located partially on undeveloped land south of West Jemez Road and partially in the area of the existing LANL Wellness Center and would consist of 12 new buildings (one would be available to house DOE's Los Alamos Site Office) and two new parking structures, one north of Mercury Road and one to the south of West Jemez Road (see Figure 6-2). The Wellness Center and a warehouse would be demolished to accommodate this project. The complex would provide new, modern structures and would consolidate staff primarily located throughout TA-3 in temporary structures or aging permanent buildings in failing and poor condition. LANL staff located in other technical areas may also be housed in the new Replacement Office Buildings. The surface parking area near Mercury Road would become a parking structure in the distant future.

Construction on the first three buildings is scheduled to begin in FY 2006. Construction on the remaining nine Replacement Office Buildings would be phased beginning in FY 2008. The proposed office buildings would accommodate various types of vehicular and pedestrian traffic.

The Replacement Office Buildings would include the construction of a three-story, 45,000-square-foot (4,181-square-meter) Los Alamos Site Office building, which would house approximately 150 staff. The remaining office buildings would consist of two-story structures, each with a footprint of about 70 by 100 feet (21 by 30 meters). These new buildings would provide approximately 15,000 to 17,500 gross square feet (1,394 to 1,626 square meters) of office space and house approximately 50 to 70 staff each. The number of administrative staff housed in the overall Replacement Office Buildings would total approximately 900.

6.2.2.2 Current Levels of Environmental Influence

The land to be used for the new office buildings is partially developed and is adjacent to the heavily developed areas of TA-3. The site is approximately 0.5 miles (0.8 kilometers) west from Diamond Drive on the south side of West Jemez Road. The undeveloped portion of the site is ponderosa pine woodland, with blue grama (*Bouteloua gracilis* [Willd. ex Kunth] Lag. ex Griffiths) and little bluestem (*Schizachyrium scoparium* [Michx.] Nash).

There are 20 PRSs in or within 500 feet (150 meters) of the proposed project site. The 20 PRSs are 03-010(a), 03-014(v), 03-003(p), 03-040(a), 03-056(n), 03-047(k), 03-035(b), 03-027, 03-055(b), 03-035(a), 03-043(e), 03-001(e), 03-013(b), 03-001(p), 03-009(j), 03-013(e), 03-013(c), 03-013(d), C-03-015, and 03-013(i).

There are no adverse air quality impacts in this project area. There are no surface water or wetlands in this project area. There is a consistent level of road noise from traffic on West Jemez Road and TA-3. There are light emissions from the developed areas in TA-3 and from vehicles on West Jemez Road.

6.2.2.3 Potential Effects of the Project

Approximately 13 acres (5.2 hectares) of undisturbed land will be developed for this project. The habitat is made up of primarily ponderosa pine woodland. During and after construction, the traffic volumes will increase. There are only two PRSs within the project site boundary that will be potentially impacted. These are PRS 03-003(p) and 03-009(j). All areas of contamination will be avoided or cleaned up during the project activities.

There will be a slight increase in air emissions during the construction phase. There will be more traffic in the area during the operational phase of this project and air emissions will be elevated.

There are no surface water or wetlands in this project area. Storm water will be controlled under the best management practices specified by the storm water pollution prevention permit for this project.

There will be a temporary increase in noise levels during the construction phase. There will be more traffic in the area during the operational phase of this project and noise levels will be elevated.

There will be temporary increases in artificial lighting during the construction phase. There will be permanent increases in artificial lighting during the operational phase.

6.2.2.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 8.1 miles (13 kilometers) from the proposed project sites. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. Reasonable and prudent alternatives should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: The proposed actions <u>may affect, but are not likely to adversely affect,</u> the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 4.6 miles (7.4 kilometers) from the project site. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: This project will remove 11.2 acres (4.5 hectares) of buffer habitat for the Mexican spotted owl in the Los Alamos Canyon Mexican spotted owl AEI. West Jemez Road is located north of the project site and between the project site and habitat in Los Alamos Canyon. Because of the presence of West Jemez Road, and proposed and current projects located on the north side of West Jemez Road (the Research Park and the Science Complex), noise levels from this project are not likely to raise noise levels in the Los Alamos Canyon habitat more than 6 dB(A) above background.

Reasonable and Prudent Alternatives:

- All new lighting must be in compliance with the New Mexico Night Sky Protection Act, which states, light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, must be projected below a horizontal plane running through the lowest point on the fixture where light is emitted.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Avoid unnecessary disturbance to vegetation. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- All exposed soils must be revegetated as soon as feasible after remediation to minimize erosion. All trees and other plant species that are used for revegetation purposes will be native species appropriate for the natural vegetation conditions of the surrounding area.

Assessment Decision: Some suitable foraging habitat may be lost or compromised as a result of the proposed action. However, current levels of disturbance are extensive and reduce the overall quality of the habitat in this area. No Mexican spotted owls have been recorded in Los Alamos Canyon during 11 years of surveys (1994 to 2005). If all reasonable and prudent alternatives are implemented, the TA-3 Replacement Office Buildings may affect, but are not likely to adversely affect, the Mexican spotted owl.

6.3 Pajarito West Corridor/Sigma Mesa

6.3.1 Nuclear Materials Safeguards and Security Upgrade Project

6.3.1.1 Project Description

All of the project areas proposed for the Pajarito West Corridor and Sigma Mesa Planning Areas are shown in Figure 6-3. LANL is proposing to upgrade the facilities and security at TA-55 with the NMSSUP (Figure 6-4). New perimeter fencing would be developed that extends to the edge of the TA-55 boundaries. The north side of TA-55 is bounded by Effluent Canyon, a branch of Mortandad Canyon. Effluent Canyon contains wetlands along its drainage.

Relatively level portions of the area inside the fence would be clear-cut, lit with security lighting, and covered with a riprap rock field. A new double-fenced perimeter intrusion, detection, assessment, and delay system (PIDADS) would be installed around the TA-55 facility that is slightly larger than the PIDADS currently in place. Additional utility services infrastructure would be installed.

6.3.1.2 Current Levels of Environmental Influence

The proposed NMSSUP is within developed and undeveloped land in the congested area along Pajarito Road at LANL. Current disturbances associated with the site include Pajarito Road and associated roads and parking areas at LANL facilities. The Chemistry and Metallurgy Research Facility Replacement (CMRR) Project (Consultation #2-22-03-1-0302) is located at and adjacent to this site. Two-mile and Mortandad canyons, bounding the site, are relatively undeveloped. There is also some trail use in the project area. There are several existing paved and dirt roads throughout the project area as well as utility corridors. General traffic volumes are expected to increase during construction.

There are known surface water/soil erosion problems associated with the proposed project site. However, significant and permanent storm water protection measures will be put in place to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is riparian vegetation along the streambeds of the adjacent canyons with areas of wetlands. There are areas of floodplain along the canyon bottoms adjacent to the project area in the canyons.

For all of the Mortandad Canyon AEI the mean background noise level was 51 dB(A) (Vrooman et al., 2000). Current noise levels are associated with vehicular traffic on Pajarito Road and the industrial LANL activities at the TA-55 area. Current lighting on the site is

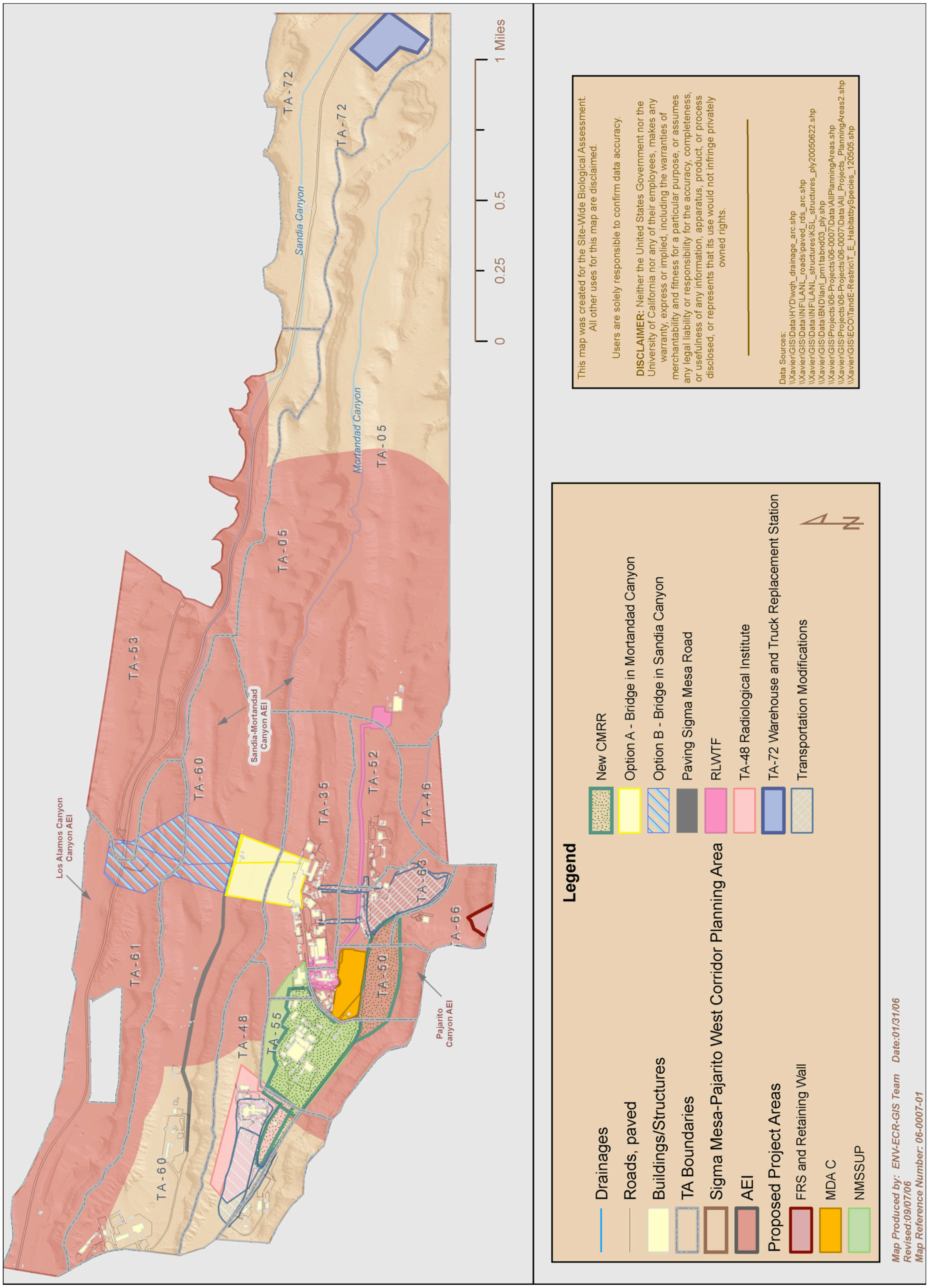


Figure 6-3. Proposed project areas in Pajarito West and Sigma Mesa.

Figure 6-4. The extent of the work to be done at TA-55. The blue line represents the outermost fence perimeter. The orange layer represents the riprap rock field, and the green layer is the new PIDADS.

associated with existing buildings at LANL technical areas and passing vehicles. TA-55 is a high-security area and is currently extensively lit.

6.3.1.3 Potential Effects of Project

The proposed project is within developed and undeveloped areas. There will be an increase in traffic volume during construction. Other projects in the Pajarito West Corridor are expected to result in an increase in the overall workforce in the area. However, since Pajarito Road between TA-48 and TA-63 will eventually be closed to all personal vehicles, overall vehicular traffic may not increase at the TA-55 site. Heavy equipment use normally not associated with commercial activity is expected to increase. There will be a temporary increase in emissions and dust from the use of heavy equipment in the project activities. No long-term reduction in air quality will result from the project.

Approximately 7.9 acres (3.2 hectares) of ponderosa pine woodland will be clear-cut, and the area covered with riprap rock. Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices (LANL 1998). Disturbed soils will be stabilized, during and after construction, to prevent erosion. There is riparian and wetland vegetation associated with the stream channels north and south of the proposed project site. The riparian and wetland areas adjacent to the project area will need to be protected during and following the action. Outer perimeter fencing will be placed south of identified wetlands in Effluent Canyon. Protective measures for these wetlands will be identified in a floodplain/wetland assessment for this project.

The LANL HMP restricts noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitats. The closest approach of this project will be located approximately 250 feet (75 meters) from the Mortandad Canyon Mexican spotted owl AEI boundary, and noise levels may approximate or exceed 6 dB(A) above background levels during the breeding season.

Lights used during construction of the proposed project will be directed away from canyons. However, the final facility will be extremely well lit with Effluent Canyon having much more illumination than current conditions. Installed security lighting will comply with the New Mexico Night Sky Protection Act.

6.3.1.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is 6.6 miles (10.6 kilometers) from the proposed project site. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. The standard LANL reasonable and prudent alternatives for bald eagle foraging habitat should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the NMSSUP may affect, but is not likely to adversely affect, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The proposed NMSSUP is not within or upstream of the southwestern willow flycatcher AEI.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting habitat loss and no potential for habitat degradation associated with the NMSSUP. Therefore the proposed action will have no effect on this species.

Mexican Spotted Owl

Project Impacts: Part of this project is in an area already identified for development in the CMRR Biological Assessment (Consultation #2-22-03-1-0302). The additional area proposed for disturbance is within the Mortandad-Sandia Canyon and the Pajarito Canyon Mexican spotted owl AEIs buffer zones and will develop approximately 7.2 acres (2.9 hectares) of buffer habitat. In addition, the project will potentially exceed the HMP restriction on construction noise of greater than 6 dB(A) above background in habitat in the breeding season (March 1 to August 31).

The area to be clear-cut consists of previously thinned ponderosa pine woodland located adjacent to developed areas. Mixed conifer forest located on the north-facing slope of Effluent Canyon will not be cut.

In order to more accurately assess the impact of the proposed project on the Mexican spotted owl, we have modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area. For all of the Mortandad-Sandia Canyon AEI, the mean background noise level was 51 dB(A), ranging from 59 to 34 dB(A) (Vrooman et al., 2000). Estimates of sound levels from construction equipment range from 82 dB(A) to 91 dB(A) at 50 feet (15 meters) (Knight and Vrooman 1999).

Assuming a maximum of 91 dB(A) at 50 feet (15 meters), other estimates of sound levels are 81 dB(A) at 100 feet (30 meters) and 74 dB(A) at 200 feet (60 meters). Estimates based on this information indicate that sound levels would be equal to or less than 6 dB(A) above background levels at approximately 750 feet (225 meters) from the source. This calculation indicates that operation of motorized equipment within Effluent Canyon could increase noise levels in the Mortandad-Sandia Canyon Mexican spotted owl AEI habitat more than 6 dB(A) above background.

Reasonable and Prudent Alternatives: See Appendix B with the following additions and qualifications.

- There will be no trees with a diameter at breast height (DBH) greater than 8 inches (20 centimeters) removed from the project area other than in the immediate project footprint south of the rim of Effluent Canyon without ENV-ECO evaluation. Mixed conifer forest on the north-facing slope of Effluent Canyon will not be cut except for a minimum number of trees necessary to install fencing. If any areas of potential Mexican spotted owl activity are found in the project area, USFWS will be consulted before the start of the action.
- Operation of motorized equipment in Effluent Canyon for the installation of fencing will not begin in any given year between March 1 and May 15 or until the completion of surveys, whichever comes first. If the habitat is determined to be occupied during surveys, restrictions on beginning work in Effluent Canyon may be extended until August 31. Once work is begun, it will continue until completed. Work in other project areas will not have timing restrictions.
- Areas that are disturbed within 100 feet of a wetland will be revegetated according to a plan approved by ENV-ECO and DOE in the floodplains/wetland assessment for this project. The restoration plan will be designed to minimize negative impacts to the wetlands.

Assessment Decision: Approximately 7.2 acres (2.9 hectares) of buffer habitat adjacent to currently developed areas will be developed as a result of the proposed action. Predicted noise levels from the proposed project will exceed the limits set in the HMP [greater than 6 dB(A) above background] during construction. Noise generated from construction activities should attenuate to below HMP limits within 750 feet (225 meters) of the site. Mixed conifer and wetland habitat within Effluent Canyon will be protected from impacts. No habitat for Mexican spotted owl will be developed. If all reasonable and prudent alternatives are implemented, the NMSSUP may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.3.2 Construction of Security-Driven Transportation Modifications

6.3.2.1 Project Description

Under the proposed action, a comprehensive planned approach would be implemented to upgrade and enhance security in the Pajarito Corridor West area. This would include closing Pajarito Road to private through traffic at and between TA-48 and TA-63. The project would create two large park-and-ride locations, one at TA-48 and the other at TA-63, with a shuttle transit system running between transporting people to all the facility areas in TA-35, -48, -50, and -55 (see Figure 6-3). During peak transit hours in the morning and afternoon, the shuttles would operate on intervals of two to five minutes. During non-peak hours of operation in the area, the shuttle intervals would be 15 to 30 minutes. At each of the proposed TA-48 and TA-63 parking areas, transfer locations to local and regional buses would be provided to encourage and make practical the use of public transportation as a method of arriving to the site for employees and visitors.

The shuttle bus system would necessitate the modification of some existing roads as well as the construction of some new roads. Retaining walls and security barriers would be constructed, as needed, to provide physical separation of the security-controlled portion of the Pajarito Corridor West from the parking areas and other roadways. A pedestrian and bicycle pathway system also would be provided in this secure area. Shelters and related amenities (e.g., benches, bike racks, lighting, landscaping, etc.) would be provided at various locations within the project area. Finally, both an all-weather pedestrian crossing and a vehicular crossing would be constructed between the TA-63 parking area and the west end of TA-35 across Ten-Site Canyon.

Figure 6-5 shows the conceptual plan for the proposed modifications around TA-48.

- A new intersection would be built west of the current guard gate creating the entrance to the TA-48 parking lot and TA-64. The total area to be covered by this new intersection would be approximately 0.5 acre (approximately 0.2 hectare). A standard signalized intersection or a roundabout would be used to control traffic. Vehicle types traveling through this intersection generally would be cars, light- and medium-duty trucks, vans, tank trucks, dump trucks, and, sometimes, forklifts and cranes. The existing guard gate would remain unchanged.
- A new paved, one-way route through TA-64 would be established. The route would go east from the new intersection, run parallel and adjacent to Pajarito Road, and enter TA-

64 at its current entrance. The route would circle through the TA-64 parking lot and head west back to the new intersection on a new road constructed on an existing dirt road. Much of the land for the new route is currently used as roadway. These new sections of this road would be approximately 20 feet (6 meters) wide; retaining walls and side safety barriers would be installed as needed, such as to separate this route from Pajarito Road.

- A new paved, two-way road going north from the new intersection would be constructed to provide access to the expanded parking lots in TA-48. This road would be approximately 26 feet (7.9 meters) wide and approximately 400 feet (122 meters) long.
- Retaining walls and side safety barriers would be built, as needed. The retaining walls may be substantial at the initial turn.
- New surface parking additions would be constructed at TA-48 to provide parking for approximately 700 cars. Grading and construction of the parking area would disturb approximately 11 acres (4.5 hectares) of land, some of which is currently undisturbed.
- A transit stop would be built at the edge of the TA-48 parking lot where commuters would catch the shuttles to the technical areas in the secure area or transfer between buses and shuttles. Amenities would include shade and wind shelters, landscaping, benches, bike racks, lighting, phones, and emergency access. Approximately 0.5 acre (0.2 hectare) of land would be utilized for the transit stop, shuttles transfer, and associated amenities.
- New short connecting roads would be constructed between the transit stop and the existing road in the TA-48 area.
- An improved walkway would be built to connect the parking lot to the TA-48 complex. This walkway would be at least 10 feet (3 meters) wide (to also accommodate bikes) and would incorporate rest locations along its length.

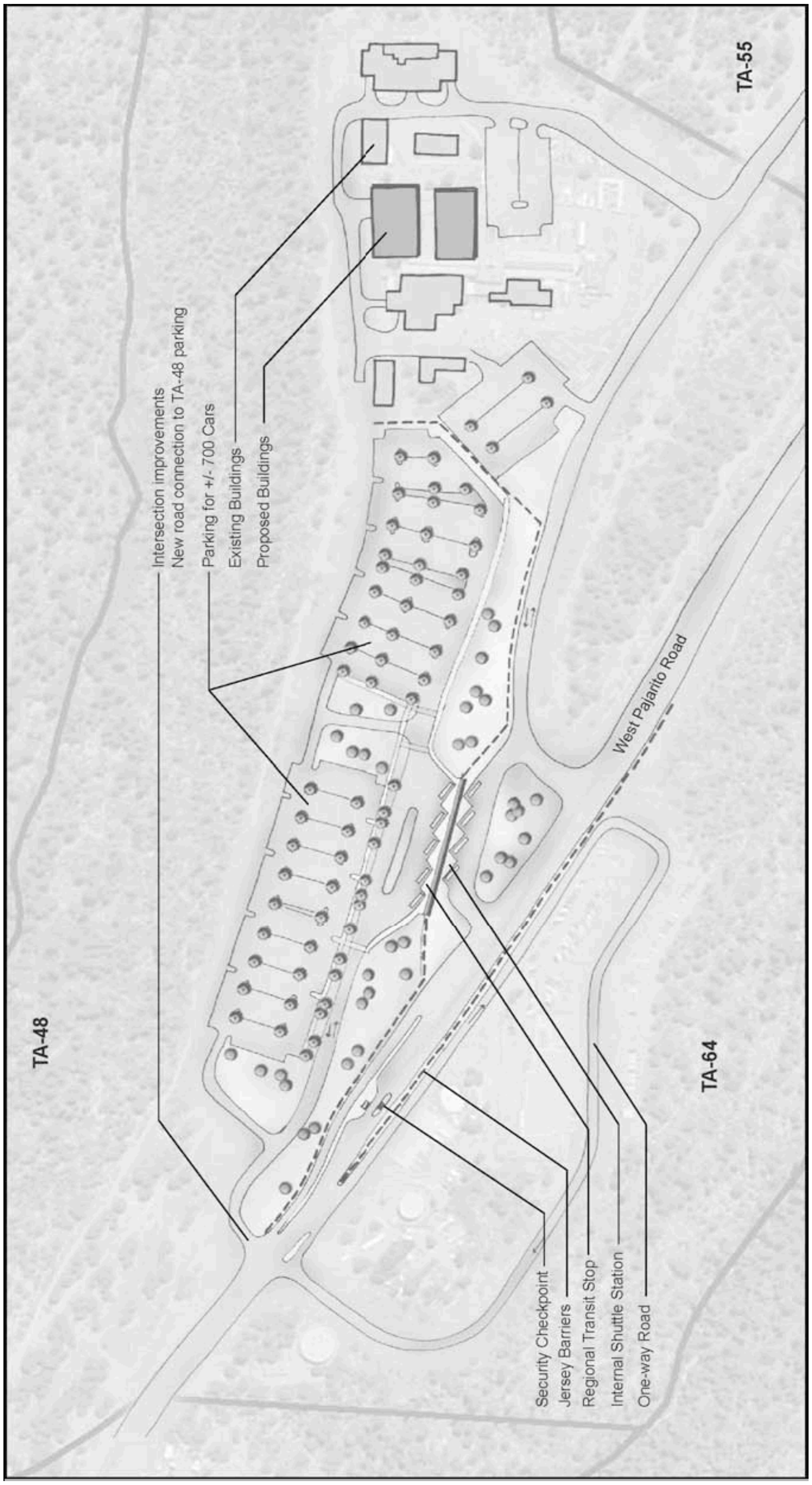


Figure 6-5. Conceptual plan for proposed modifications around TA-48.

Figure 6-6 shows the conceptual plan for the proposed transportation improvements around TA-35 and TA-63.

- A new intersection east of TA-63 would be constructed to provide access to the proposed parking lot and other areas outside the secure area. The new intersection would cover approximately 0.5 acre (approximately 0.2 hectare), a portion of which is undisturbed land. Vehicle types traveling through this intersection generally would be cars, light- and medium-duty trucks, vans, tank trucks, dump trucks, and, sometimes, forklifts and cranes.
- A new paved, two-lane road heading north from the new intersection on Pajarito Road would be constructed. The road would skirt the east edge of TA-63 going northward. This new road would be 26 feet (7.9 meters) wide and 1,250 feet (380 meters) long.
  A new vehicle crossing would be constructed between TA-63 and TA-35 over Ten-Site Canyon, a tributary to Mortandad Canyon. This crossing would align with the new road leading north from TA-63. The new vehicle crossing would be four lanes wide (48 feet [7.3 meters]), approximately 600 to 800 feet (183 to 247 meters) long, and would be about 100 feet (30 meters) above the canyon bottom. The bridge would have dividers down the center; the two west lanes would be for secured traffic traveling among TA-35, -48, -50, and -55 and two east lanes for limited secured traffic that would include personally owned vehicles. A variety of design alternatives would be investigated, including a land bridge and a span bridge.
- A redesigned road would be built from the end of the vehicle crossing to the north edge of TA-35. The total length of this redesigned road would be approximately 800 feet (240 meters). The routing of this road would likely require the removal of transportables, transportainers, and permanent structures.
- New surface parking additions or modification of the existing parking would be constructed to accommodate approximately 1,100 cars at TA-63. The parking would be built in two phases with approximately 450 parking spaces built in the first phase (Q Consulting 2005). A 126-foot (38-meter) by 78-foot (24-meter) detention pond would be built immediately south of the parking lot to serve as a catchment for parking lot runoff. Grading and construction would result in a ground disturbance of about 19 acres (7.7

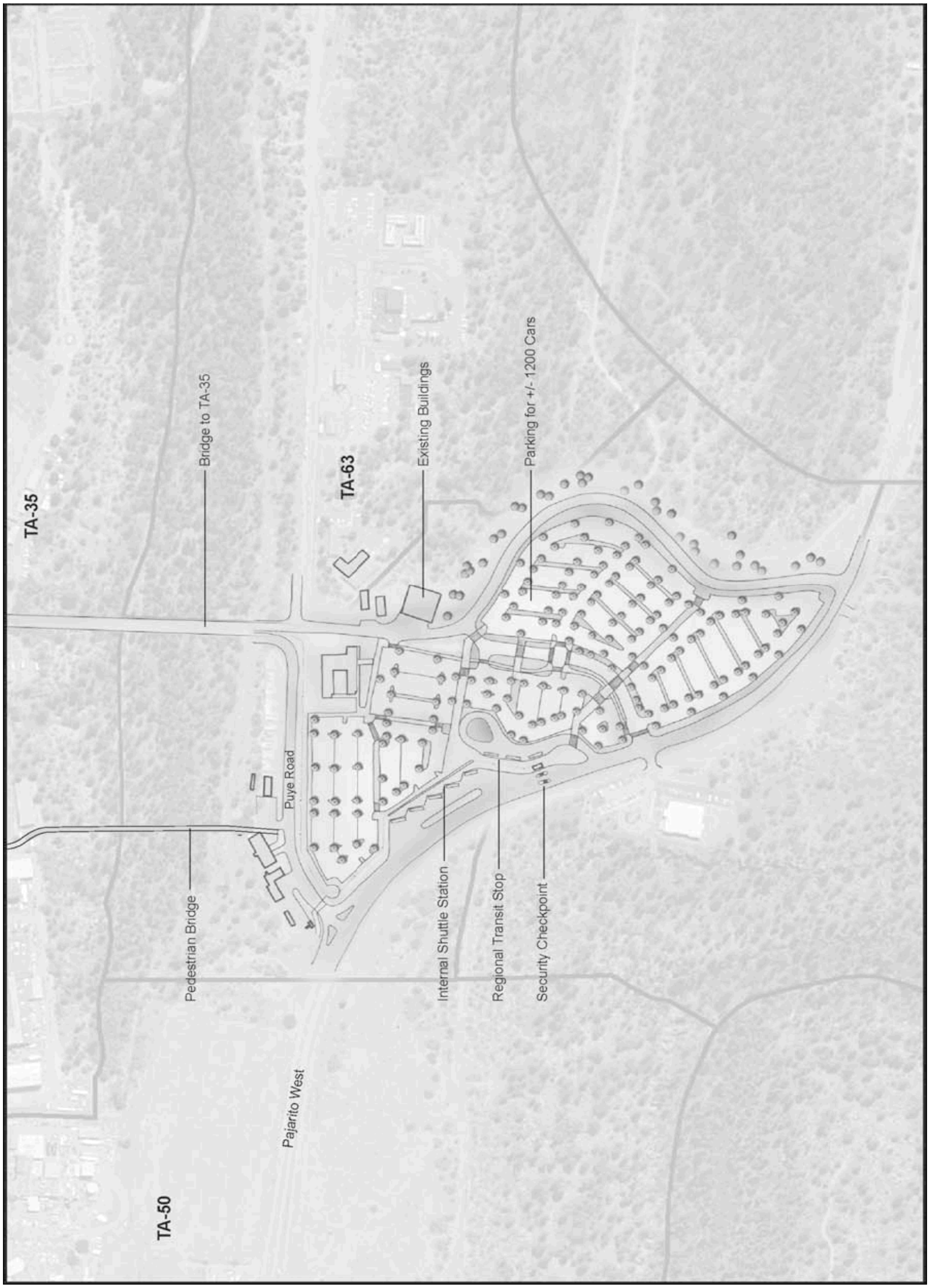


Figure 6-6. Conceptual plan for proposed transportation improvements around TA-35 and -63.

hectares). The northern portion of the site contains 200 existing parking spaces and two office trailers while the southern portion is not developed. A new transit stop similar to the one described above for TA-48 would be constructed.

- A new access control station would be built on Pajarito Road east of the new intersection for TA-63.
- Puye Road would be rerouted in the area where it would meet the new road that goes around the east side of TA-63. From the Pajarito Road side, Puye Road would be routed to run parallel to, but not intersect, the new road around TA-63 as the two go across the new bridge.
- A permanent barrier system separating Puye Road from the new road along the east side of TA-63 and the TA-63 parking areas would be installed.
- A new pedestrian bridge connecting the TA-63 parking lot to the west portion of TA-35 would be constructed. This new pedestrian crossing would consist of an 8-foot- (2.4-meter-) wide lane, would be approximately 200 feet (61 meters) long, and could be as much as 100 feet (30 meters) above the canyon bottom. A variety of design alternatives would need to be investigated including a land bridge and a span bridge.
- New walkways would be constructed to connect the TA-63 parking lot to TA-55 and the new pedestrian bridge. These improved pedestrian walkways would be a minimum of 10 feet (3 meters) wide and would incorporate rest locations as well as providing for bike use.
- The existing TA-55 footprint would be expanded into the middle of the adjacent section of Pecos Drive, with a corresponding relocation of the TA-50 fence eastward to accommodate a new section of bicycle and walking path.
- New shuttle stops would be built at TA-35, -48, -50, and -55. The size of these stops would be scaled according to the expected populations at each area and some technical areas may require multiple stops. The largest shuttle stop would be at TA-55 and would be as large as or larger than the current shuttle shelter on site. Each shuttle stop would have shelters, benches, bike racks, lighting, landscape, and other amenities.
- Various walkway improvements would be made as needed within TA-35, -48, -50, and -55 to create safe walking systems from the transit stops to the individual facilities.

6.3.2.2 Current Levels of Environmental Influence

Activities carried out within the Pajarito West Corridor include nuclear safeguards and chemical processes research and development, theoretical and computational programs related to nuclear reactor performance, research and applications in chemical and metallurgical processes relating to plutonium, and industrial partnership activities. Among the goals for the Pajarito Corridor West are a number related to transportation flow along the mesa and developing a pedestrian campus environment (LANL 2001a).

The Pajarito Corridor West includes TA-35, -48, -50, -52, -55, -63, -64, and -66 (LANL 2001a). The entire Corridor falls within the ponderosa pine forest vegetation zone. Thus, vegetation present within the area is dominated by ponderosa pine, Gambel oak, kinnikinnik (*Arctostaphylos uva-ursi* [L.] Spreng), New Mexico locust (*Robinia neomexicana* Gray), pine dropseed (*Blephaloneuron tricholepsis* [Torr.] Nash), mountain muhly (*Muhlenbergia montana* [Nutt.] A.S. Hitchc.), and little bluestem. However, much of the Pajarito Corridor West is a fenced, highly developed industrial area that is devoid of natural habitat and the wildlife that it typically supports.

Ephemeral streams flow in Ten-Site Canyon north of TA-63. Intermittent reaches flow in Mortandad Canyon, particularly below outfalls, and support riparian vegetation. A perennial stream reach flows in Sandia Canyon. Potential contamination of those streams is minimized by the LANL NPDES Industrial Storm Water Permit Program and the LANL NPDES Storm Water Construction Program.

TA-48 and TA-63 do not currently have any NPDES outfalls into Mortandad Canyon or its ancillary canyons. TA-48 and TA-63 are both located on mesa tops and are not within the 100-year or 500-year floodplain boundaries. Storm water flow from the buildings and parking lots in these technical areas drain into the Mortandad Canyon system, with some runoff from TA-63 possibly entering Cañada del Buey or Pajarito Canyon.

Several wetlands occur within the Pajarito Corridor West, the largest of which is located in Mortandad Canyon along the boundary of TA-48 and TA-60. This wetland extends somewhat over 2,100 feet (640 meters) along the canyon and is generally south of the developed portion of TA-60. Other wetlands are smaller and may be associated with drainages. An example of such a wetland exists at the northern edge of the developed portion of TA-48. Cattails (*Typha* spp.) are a common plant in site wetlands.

6.3.2.3 Potential Effects of Project

Construction of the two parking lots would disturb a total of approximately 30 acres (12.2 hectares). The parking lot at TA-48 would total approximately 11 acres (4.5 hectares) and the area consists of open field and ponderosa pine forest. The parking lot at TA-63 would total approximately 19 acres (7.7 hectares); the area currently consists of open field, junipers, and ponderosa pine woodland. Both habitats would be lost due to construction of the parking lots as well as a portion of the road around the eastern edge of TA-63. The pedestrian and vehicle bridges connecting TA-63 with TA-35 would involve some loss of habitat for approaches and pier foundations.

There are a number of PRSs in the project area. Grading and embankment excavation work, as well as establishing construction lay-down pads, would directly impact sediments, soils, and tuff on the mesa and possibly near and in Mortandad Canyon. While no provisions for wet or flooded soils would likely be required, the potential exists for some contaminated sediments to be disturbed within the canyon areas. Before commencing any ground disturbance, potentially affected contaminated areas would be surveyed to determine the extent and nature of any contamination and required remediation in accordance with procedures established under the LANL ECR Project. Proposed parking lots, roadways, walkways, shuttle bus structures, and security facilities would be designed, constructed, and operated in compliance with the applicable DOE Orders, requirements, and governing standards that have been established to protect public and worker health and the environment.

Construction of parking lots, pedestrian walkways, roads, and bridges associated with this alternative would result in temporary increases in nonradiological air quality impacts from construction equipment, trucks, and worker vehicles. There would also be particulate emissions from wind and equipment disturbance of soil. Operation of these facilities would result in emissions of criteria and toxic air pollutants from vehicles, including employee vehicles and shuttle buses. Since the number of employee vehicles is not expected to change as a result of this alternative, the change in emissions may be small except for the addition of emissions from shuttle buses.

Construction of parking lots, pedestrian walkways, roads, and bridges associated with this alternative would result in some temporary increase in noise levels near the new roads from construction equipment and activities and permanent increases in noise levels from vehicular and pedestrian traffic. There would be permanent light sources associated with all the parking lots, walkways, and roads.

Minimal impacts to surface water should occur during the construction associated with the proposed action. Adverse impacts from constructing the additional parking lots, intersections, and roads required for this proposed action would be minimized by the implementation of best management practices described in construction storm water pollution prevention plans. Construction of the pedestrian/vehicular crossings between TA-63 and TA-35 would require bridge(s) over Ten-Site Canyon, an ancillary branch of Mortandad Canyon. This bridge construction would require a general or individual 404 permit from the U.S. Army Corps of Engineers for linear transportation projects, as the effluent flows and ephemeral streams in the Mortandad Canyon system are considered "waters of the United States." Construction impacts to these canyon surface water flows and the canyon-bottom floodplains would be mitigated by the provisions provided in the permit.

6.3.2.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is more than 5.5 miles (9 kilometers) from the proposed activities. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. The standard LANL reasonable and prudent alternatives for bald eagle foraging habitat should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the transportation modification project <u>may affect, but is not likely to adversely affect</u>, the bald eagle. All reasonable and prudent alternatives should be implemented to reduce the potential disturbance.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI is more than 2 miles (3.3 kilometers) from the proposed activities. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The parking lot and associated activities in TA-48 (the western end of the project) are not located in threatened or endangered species habitat. The parking lot and associated roads, bridges, and structures in TA-63 (the eastern end of the project) are located in the Pajarito Canyon Mexican spotted owl AEI and the Mortandad-Sandia Canyon Mexican spotted owl AEI. Approximately 19.8 acres (8.0 hectares) of habitat will be removed by this project. The habitat that will be removed is disturbed grassland and ponderosa pine woodland.

In order to more accurately assess the impact of the proposed project on the Mexican spotted owl, we have modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area.

The estimated noise level at the Mortandad-Sandia Canyon Mexican spotted owl AEI boundary in Ten-Site Canyon from construction [noise level estimated at 91 dB(A) at 50 feet (15 meters)] and use [noise level estimated at 65 dB(A) at 50 feet (15 meters)] were 66 dB(A) for construction and 40 dB(A) for use. The mean noise level for the Mortandad-Sandia Canyon Mexican spotted owl AEI is 51 dB(A) (Vrooman et al., 2000). The project area is directly adjacent to undeveloped habitat in the Pajarito Canyon AEI and the Mortandad-Sandia Canyon AEI (for work planned in TA-35). Noise and perhaps light generated during construction and use will be above limits set in the LANL HMP for the habitat. Mexican spotted owls have not been found in the Pajarito Canyon Mexican spotted owl AEI during nine years of surveys (1995–1996 and 1999–2005). Part of the area directly across Pajarito Road west of the proposed TA-63 parking lot is scheduled for disturbance and development as part of the CMRR Project (Consultation #2-22-03-1-0302).

Reasonable and Prudent Alternatives: See Appendix B with the following addition.

- Span bridges rather than land bridges will be used to cross Ten-Site Canyon. If land bridges are needed, consultation with the USFWS will be reinitiated.

Assessment Decision: Proposed activities will impact foraging and nesting habitat for spotted owls. Noise and perhaps light restrictions could be above limits set in the LANL HMP.

All reasonable and prudent alternatives should be implemented. This project adds significantly to cumulative effects of development in this area. Proposed actions for the Security-Driven Transportation Modifications Project may affect, are likely to adversely affect, the Mexican spotted owl.

6.3.3 Security Transportation Modifications (Optional Actions)
Option A: Paving Sigma Mesa Road With A Bridge Over Mortandad Canyon
Option B: Bridge Over Sandia Canyon

6.3.3.1 Project Description

Paving Sigma Mesa Road With A Bridge Over Mortandad Canyon

Option A would involve a new road from TA-35 across Mortandad Canyon to a roadway that would traverse the spine of TA-60 westward to TA-3 (see Figure 6-3). A two-lane bridge would be constructed within a 1,000-foot- (300-meter-) wide zone across Mortandad Canyon from TA-35 to TA-60. The bridge would be 600 to 800 feet (183 to 247 meters) long; each lane would be 12 feet (3.6 meters) wide. At this early stage in the planning for this project, the specific location of the crossing has not been determined, so for purposes of analysis a 1,000-foot- (300-meter-) wide zone across Mortandad Canyon in which the bridge would be built has been identified. The bridge would be 24 feet (7.3 meters) wide and approximately 600 to 800 feet (180 to 240 meters) long; the bridge elevation would be approximately 100 feet (30 meters) above the canyon bottom. The design of the bridge is yet to be determined, however, regardless of the design there would be construction along the mesa edges and in canyons for pier foundations. A new two-lane paved road approximately 3,750 feet (1,143 meters) long proceeding westward through TA-60 would be constructed approximately along the alignment of an existing unpaved road that runs through TA-60. The new paved road would meet with an existing paved road located in the western portion of TA-60.

Bridge Over Sandia Canyon

Option B would involve continuing from TA-60 across Sandia Canyon to TA-61 where a new road would connect with the existing East Jemez Road (see Figure 6-3). A two-lane bridge would be constructed across Sandia Canyon from TA-60 to TA-61. As stated above for Option A, in this early stage of the project, the specific location of the crossing has not been determined, so for purposes of analysis a 1,000-foot- (300-meter-) wide zone across Sandia Canyon in which the bridge would be built has been identified. The bridge would be 600 to 800 feet (183 to 247 meter) long; each lane would be 12 feet (3.6 meters); and the bridge elevation would be approximately 100 feet (30 meters) above the canyon bottom. The design of the bridge is yet to be determined, however, regardless of the design there would be construction along the mesa edges and in canyons for pier foundations. A new two-lane paved road 24 feet (7.3 meters) wide and approximately 750 to 1,000 feet (228 to 305 meter) long would be constructed northward from this bridge's northern terminus and proceed generally northward to meet East Jemez Road.

6.3.3.2 Current Levels of Environmental Influence

Paving Sigma Mesa Road With A Bridge Over Mortandad Canyon

The Sigma Mesa road in TA-60 is currently not paved and is used intermittently for access to the storage sites on Sigma Mesa and for access to the asphalt batch plant and associated facilities. The proposed site for the bridge over Mortandad Canyon is currently undeveloped, only seeing activity from a few hiking trails in the canyon. There are numerous PRSs in and around TA-55, -35, and -60.

Nonradiological air pollutant emissions sources at TA-48, west of the proposed action, include three natural gas fired boilers and emissions from the use of various toxic chemicals. Emissions of toxic pollutants are based on chemical usage in the key areas. The toxic emissions reported in the table for TA-48 are for the Radiochemistry Site key area as summarized in the SWEIS Yearbook–2002 (LANL 2003a). These emissions vary by year with the amounts of chemical being used. There are permitted emissions from the asphalt batch plant at TA-60 as well as from current operations at TA-35 and -55.

There are extensive wetlands to the north of TA-55 in a small tributary to Mortandad Canyon. There are also areas of floodplain and riparian vegetation along the bottom of Mortandad Canyon and short reaches of intermittent stream flow from outfall releases and storm water runoff.

The current noise levels in this area are associated with existing buildings and ongoing construction activity at TA-35 and -55, and the operation of the asphalt batch plant on Sigma Mesa. Areas adjacent to developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). For all of the Mortandad-Sandia Canyon AEI, the mean background noise level was 51 dB(A) (Vrooman et al., 2000).

Current lighting in this area is associated with existing buildings at TA-35 and -55. TA-55 is a high-security area and is extensively lit.

Bridge Over Sandia Canyon

The proposed site for the bridge over Sandia Canyon and connector road is currently undeveloped, only seeing activity from a few hiking trails. There are numerous PRSs in and around TA-60.

Nonradiological air pollutant emissions sources at TA-48, west of the proposed action, include three natural gas fired boilers and emissions from the use of various toxic chemicals. Emissions of toxic pollutants are based on chemical usage in the key areas. The toxic emissions reported in the table for TA-48 are for the Radiochemistry Site key area as summarized in the SWEIS Yearbook–2002 (LANL 2003a). These emissions vary by year with the amounts of chemical being used. There are permitted emissions from the asphalt batch plant at TA-60.

There are extensive wetlands to the west of the project site in Sandia Canyon. There is perennial streamflow and riparian vegetation in Sandia Canyon through the project site.

Sandia Canyon is north of Sigma Mesa. It is not as developed and has lower noise levels and less artificial light. For all of the Mortandad-Sandia Canyon AEI, the mean background noise level was 51 dB(A) (Vrooman et al., 2000).

6.3.3.3 Potential Effects of Paving Sigma Mesa Road, Construction of a Bridge Over Mortandad Canyon, and Construction of a Bridge Over Sandia Canyon

Widening and paving of the Sigma Mesa road will affect upwards of 10 acres (4 hectares) of land. Areas east of the Roads and Grounds Facility are in the Mortandad-Sandia Canyon AEI for the Mexican spotted owl. The proposed bridge over Mortandad Canyon will disturb upwards of 32 acres (13 hectares) of previously undisturbed habitat. This site is in the Mortandad-Sandia Canyon AEI for the Mexican spotted owl. The proposed bridge over Sandia Canyon will disturb upwards of 58 acres (23.5 hectares) of previously undisturbed habitat. This site is in the Mortandad-Sandia Canyon AEI for the Mexican spotted owl.

There are several PRSs within the proposed location for the Mortandad bridge as well as along the Sigma Mesa road. There are not any PRSs associated with the project location for the Sandia Canyon bridge. All areas of contamination will be avoided or cleaned up during the project activities. Air emissions will be elevated permanently due to construction and increased traffic after construction.

There are extensive wetlands in Sandia Canyon to the north and Mortandad Canyon to the south of Sigma Mesa Road, a perennial stream in Sandia Canyon, and intermittent stream reaches in Mortandad Canyon that support riparian vegetation. All road work will have the potential to impact these areas with disturbance, elevated storm water runoff, and soil erosion. Additionally, floodplains are in the bottom of both canyons.

The LANL HMP prohibits noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitats. This project will not be able to operate under these timing restrictions and an assessment of background noise and potential noise generated during similar construction activities suggests that noise levels would exceed the HMP limits. Noise levels would be permanently elevated in currently undisturbed areas by traffic on the new paved roads. Light emissions will be elevated permanently due to construction and increased traffic after construction.

6.3.3.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 5.9 miles (9.5 kilometers) from the proposed project sites. Although the project site is not within the bald eagle AEI, since all of LANL is considered potential foraging habitat for the bald eagle, there is the potential for the loss of foraging habitat. All reasonable and prudent alternatives should be implemented to reduce the potential disturbance.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: The roads and bridges over Mortandad Canyon, Sigma Mesa, and Sandia Canyon may affect, but are not likely to adversely affect, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 2.3 miles (3.7 kilometers) from the nearest construction. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: Paving Sigma Mesa Road With A Bridge Over Mortandad Canyon

This action occurs in habitat for the Mexican spotted owl. The proposed paved road east of the new Roads and Grounds Complex is in the Mortandad-Sandia Canyon AEI for the Mexican spotted owl. Approximately 25.4 acres (10.24 hectares) of habitat will be removed in this action. Noise and light levels will be permanently increased in this AEI.

Bridge Over Sandia Canyon

This action occurs in undeveloped habitat for the Mexican spotted owl. Approximately 65.8 acres (26.6 hectares) of habitat will be removed in this action. Noise and light levels will be permanently increased in the AEI.

Reasonable and Prudent Alternatives: See Appendix B with the following additions.

- The bridges should be moved as far as possible to the west.
- Bridges will be built as span bridges and not land bridges.
- New roads into the canyons should not be built.
- Hiking trails in the canyons should be signed as permanently closed to pedestrians and enforced by PTLA.
- Back-up indicators on all trucks and heavy equipment operating at TA-35 and on Sigma Mesa will be muted as much as possible consistent with the safety of human workers.

Assessment Decision: Although applying the reasonable and prudent alternatives described above, these projects <u>may affect, and are likely to adversely affect,</u> the Mexican spotted owl.

6.3.4 TA-48 Radiological Science Institute

6.3.4.1 Project Description

The primary project site is located in TA-48, approximately 1 mile (1.6 kilometers) southeast of TA-3 along Pajarito Road (see Figure 6-3). A small area of the project site extends onto TA-55. The Radiological Science Institute would provide state-of-the-art facilities for wet chemistry, metallurgy, safeguards (domestic and international), material protection control and accountability, machining and manufacturing, training schools, and underground storage of special nuclear material (LANL 2004a). This project would also involve the DD&D of 52 deteriorating structures (80 percent of LANL's radiological facilities), accounting for approximately 636,000 gross square feet (57,240 square meters) of building space located in six technical areas (TA-3, -18, -35, -46, -48, and -59) (RFPG 2004). The project would consolidate radiological laboratories and working spaces to a significantly smaller footprint of modern, flexible facilities in up to 13 new buildings located at TA-48. Phase I of the Radiological Science Institute, the Institute for Nuclear Nonproliferation Science and Technology (consisting of five buildings), would occupy approximately 145,000 net square feet (13,471 square meters), a reduction of about 50,000 net square feet (4,645 square meters) relative to the facilities to be replaced, and would house approximately 450 to 500 technical and support staff.

While a number of existing buildings at TA-48 would remain, most structures would be removed to accommodate the more modern facilities planned for the site. Construction of the Radiological Science Institute, including parking lots and construction lay-down areas, would require 33.6 acres (13.6 hectares) of land (SAIC 2005), of which about 18.2 acres (7.4 hectares) are currently disturbed (LANL 2005b). Upon completion, 31.9 acres (12.9 hectares) would be occupied by permanent facilities.

6.3.4.2 Current Levels of Environmental Influence

The proposed Radiological Science Institute is within developed and undeveloped land in a congested area along Pajarito Road at LANL. Current disturbances associated with the site include Pajarito Road and associated roads and parking areas at LANL facilities. General traffic volumes are expected to increase during construction and following these upgrades. Heavy equipment will be used during the construction of this proposed action. Mortandad, Two-Mile, and Pajarito canyons are relatively undeveloped. There is some trail use in the project area. There are several existing paved and dirt roads throughout the project area as well as utility corridors.

Although there are many PRSs in the area, based on a review by LANL’s ECR Project, there is only one major PRS (48-001) of concern at TA-48. This area involves possible surface soil contamination from TA-48 stack emissions. Nonradiological air pollutant emissions sources at TA-48 include three natural gas fired boilers and emissions from the use of various toxic chemicals. Emissions of toxic pollutants are based on chemical usage in the key areas. The toxic emissions reported in the table for TA-48 are for the Radiochemistry Site key area as summarized in the SWEIS Yearbook–2002 (LANL 2003a). These emissions vary by year with the amounts of chemical being used.

There are extensive wetlands to the north of the proposed Radiological Science Institute site in the drainage of Mortandad Canyon. There are also areas of floodplain along the canyon bottoms adjacent to the project area in the canyons.

For all of the Mortandad Canyon AEI, the mean background noise level was 51 dB(A) (Vrooman et al., 2000). Current noise levels are associated with vehicular traffic on Pajarito Road and activities at the LANL facilities. Current lighting on the site is associated with existing buildings at LANL technical areas and passing vehicles. TA-55 is a high-security area and is currently extensively lit.

6.3.4.3 Potential Effects of the Project

Construction of the Radiological Science Institute

There will be an increase in traffic volume as a result of project activities, and overall operational traffic volume will increase following the upgrades because of a larger workforce permanently working at the site. Heavy equipment use normally not associated with commercial activity is expected to increase. Following the construction, the majority of increases will come from personal vehicles and normal industrial vehicles at the site.

Further investigation and any necessary remediation of PRS 48-001 would be completed under LANL's ECR Program (DOE 2002) and in accordance with LANL's Hazardous Waste Facility Permit.

Emissions from three facilities that are projected to be consolidated in the proposed Radiological Science Institute are, or have been, monitored for radiological air emissions. Both the Machine Shops at TA-3 and Radiochemistry Complex at TA-48 have monitored point sources. Monitoring at Sigma Complex (TA-3) was discontinued in 2000. It was determined that because of sufficiently low emissions, stack monitoring was no longer necessary for compliance. The estimated emission rates for toxic air pollutants emitted at TA-48 were compared to screening level emission values for the 1999 SWEIS. A screening level emission value was developed for each chemical. A screening level emission value is a theoretical maximum emission rate that, if emitted at that technical area over a short-term (8-hour) or long-term (1-year) period, would not exceed a health-based guideline value. This screening level emission value was compared to the emission rate that would result if all the chemicals purchased for use in the facilities at a technical area over the course of one year were available to become airborne. At TA-48, chemicals have been emitted at levels below the screening levels identified.

Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices. Disturbed soils will be stabilized, during and after construction, to prevent erosion into the wetlands north of the project site in Mortandad Canyon.

LANL buildings, security lighting, and vehicle traffic on adjacent roads and highways are the primary sources of artificial light. Lights used during construction of the proposed project will be directed away from canyons.

DD&D of Obsolete Radiological Facilities

Pajarito Road is the main access route for TA-18, -35, -46, and -48. The building at TA-59 is serviced via the Truck Route and the buildings at TA-3 can be accessed from various routes. DD&D activities will cause a temporary increase in traffic volumes. The DD&D of buildings in TA-18 are not considered as part of the impacts evaluation for the Radiological Science Institute, but rather are included as part of the relocation of remaining TA-18 operations and DD&D of TA-18 buildings impacts assessment (see Section 6.4.2.4).

No contaminant problems should result from the proposed DD&D projects. Any contamination sources in these areas should not be more accessible to wildlife and groundwater following this action. All areas of contamination will be avoided or cleaned up during the project activities.

There will be temporary increases in air emissions from DD&D activities. Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices. Disturbed soils will be stabilized, during and after construction, to prevent erosion around the various DD&D sites. LANL buildings and vehicle traffic on adjacent roads and highways are the primary sources of artificial light. Lights used during the proposed projects will be directed away from canyons.

The LANL HMP restricts noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitats. Some buildings to be DD&D are located within developed habitat of Mexican spotted owl AEIs. Noise levels may approximate or exceed 6 dB(A) above background levels during the breeding season.

6.3.4.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 4 miles (6.4 kilometers) from the proposed construction and DD&D project sites. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. The standard LANL reasonable and prudent alternatives for bald eagle foraging habitat will be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the TA-48 Radiological Science Institute Project may affect, but is not likely to adversely affect, the bald eagle. All reasonable and prudent alternatives should be implemented to reduce the potential disturbance.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 2 miles (3.2 kilometers) from the nearest site to be removed. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: Construction of the Radiological Science Institute

Some small sections of the Radiological Science Institute may occur in already-developed buffer habitat for the Mexican spotted owl, however, most of the new structures will not be in habitat for any Mexican spotted owl AEI.

DD&D of Obsolete Radiological Facilities

The buildings in TA-35 occur in developed habitat for the Mexican spotted owl. The removal of these buildings could produce noise greater than 6 dB(A) above the background in the undeveloped habitat to the north in Mortandad Canyon. The buildings at TA-46, -48, and -3 are not in Mexican spotted owl habitat.

Reasonable and Prudent Alternatives:

Construction of the Radiological Science Institute

- Reseeding and erosion protection will be needed following the action to stabilize the soils to protect the wetlands to the north of the project site.

DD&D of Obsolete Radiological Facilities

- Back-up indicators on all trucks and heavy equipment operating at TA-35 will be muted as much as possible consistent with the safety of human workers.
- Activities involving heavy machinery for demolition of buildings at TA-35 will not be permitted between March 1 and May 15 or until the completion of surveys, whichever comes first. If the habitat is determined to be occupied during surveys, restrictions may be extended until August 31. If the action is ongoing on February 28, the work must stop until the completion of surveys.
- Reseeding and erosion protection will be needed following the action to stabilize the soils

Assessment Decision: Applying the reasonable and prudent alternatives described above, these projects may affect, but are not likely to adversely affect, the Mexican spotted owl.

6.3.5 Characterization and Remediation of MDA C

6.3.5.1 Project Description

In accordance with statutes such as RCRA and the Atomic Energy Act, ECR Project personnel identify locations where hazardous constituents may have been released into the environment and to carry out corrective measures. MDAs are areas where radioactive or hazardous constituents have been disposed, generally by burial within soil or underlying tuff.

MDAs are characterized by extensive sampling, potentially including excavations and boreholes. For remediation of MDAs, the two bracketing alternatives are 1) stabilization in place and 2) removal of contaminated soils and materials. For the former alternative, the MDAs are capped in place, and other remediation activities occur such as construction of barrier walls against lateral movement of groundwater and extraction and treatment of VOC plumes. The alternative leaves the contamination in the MDAs in place. For the latter alternative, the MDAs are all exhumed, backfilled with clean soil and soil that meets screening action levels (SALs), and vegetated. SALs were established by LANL's ER Project and now utilized by the ECR Project to identify the presence of contaminants at levels of concern. SAL values are derived from toxicity values and exposure parameters using data from the EPA.

The corrective measures to be implemented for these MDAs and PRSs are generally not currently known. A combination of corrective measures may be chosen for any specific MDA or PRS, or a portion thereof. Even within a specific MDA or PRS, there may be a hybrid decision: for example, portions may be removed (as in removal of "hot spots") and portions may be stabilized in place.

MDA C (SWMU 50-009) was originally developed because of limitations in disposal capacity in other areas, because of a plan to develop LANL to the south, and because of a 1948 fire in MDA B. Access is via Pajarito Road, which passes through TA-50 and intersects with West Jemez Road (SR 501) to the east and SR 4 to the west (see Figure 6-3). Drainage is to Ten-Site Canyon (LANL 1992).

MDA C was used from 1948 to 1965. MDA C comprises seven pits, including one chemical pit, having depths ranging from 12 to 25 feet (3.7 to 7.6 meters) below the original ground surface, and 108 shafts having depths ranging from 10 to 25 feet (3.0 to 7.6 meters) below the original ground surface. The disposal units are within a site covering 12.3 acres (9.0 hectares) (LANL 1999b). All pits and shafts were dug into the overlying soil and the Tshirege Member of the Bandelier Tuff (LANL 2003d). Except for 10 shafts, all disposal units are unlined. The pits were used from 1948 to 1964, and the shafts from 1959 to 1966. Limited disposals may have been made following 1966. The last mention of MDA C in quarterly and annual waste disposal reports was in 1968. The last shaft (Shaft 89) was plugged on April 8, 1974 (Rogers 1977).

The pits were filled with wastes arriving in a variety of containers (Rogers 1977). Routine radioactive trash consisted of cardboard boxes, 5-mil plastic bags from the Los Alamos Scientific Laboratory chemistry labs, and 55-gallon barrels of sludge from wastewater treatment plants in TA-21 and TA-45 (LANL 2003d). Nonroutine waste included debris from the demolition of the Bayo Site and TA-1, classified materials, and tuballoy chips (LANL 2003d). Hazardous constituents and uncontaminated classified material were buried with radioactive waste. A 1959 memo complains that much waste in one of the pits (probably Pit 6) was outdated technical badges and safety film (Rogers 1977). Chemicals were commonly burned in the chemical pit. A fence was constructed separating the western area of MDA C, where the chemical pit is located, from the eastern end (Rogers 1977). At first, the waste was covered once a week to reduce the danger of fire, but operating practices were changed in 1957. Wastes were then backfilled when a single layer of waste covered about half the width of the pit, reducing the risk of fire as well as the amount of waste that could be placed in a pit (Rogers 1977). The MDA C Integrated Work Plan references a 1959 memorandum stating that Pit 6 received 10,000 cubic yards (7,645 cubic meters) of waste and 24,000 cubic yards (18,300 cubic meters) of fill, for an approximate ratio of 2.5 cubic yards (1.9 cubic meters) of fill to 1 cubic yard (0.76 cubic meters) of waste (LANL 2003d). The shafts were used for disposal of "beta-gamma waste," mostly from the Chemical Metallurgy Research Building at TA-35 (Rogers 1977, LANL 2003a).

In 1974, most of the MDA C surface was covered with crushed tuff and fill, and the new surface was recontoured and seeded with grass. Localized surface subsidence on the north boundary of Pit 6 was seen in 2002. The subsidence produced a hole along an asphalt drainage carrying runoff to Ten-Site Canyon, and may have promoted infiltration of storm water into Pit 6. The subsidence was mitigated (LANL 2003d).

The topography slopes from west to northeast, becoming steeper across the northeast quadrant of the site toward Ten-Site Canyon. The site is vegetated by a native grass mixture that was established after the 1984 addition of fill and topsoil over the disposal pits and shafts (LANL 2003d). The area south of Pit 6 and west of Pits 1 through 6 is covered with asphalt, as is much of the ground north of the MDA not occupied by buildings. The MDA is fenced. Many of the buildings and structures north of MDA C are SWMUs. Underground utilities run along and outside the fence line (LANL 2003d), including a water line along Pajarito Road and a radioactive liquid waste line along the west half of the northern site boundary. Radiation surveys of site soils and vegetation occurred from 1976 through 1984. Additional field surveys and laboratory analyses followed the 1984 placement of crushed tuff and cover material (LANL 1992, LANL 2003d). Several conclusions were derived from the Phase I site investigations (LANL 2003d):

- Historical releases of radionuclides to surface soils had been largely covered with crushed tuff. Elevated concentrations of americium-241 and isotopic plutonium in surface soils in the northeast area of MDA C were likely from releases from MDA C before placement of the crushed tuff in 1984.
- The only metals detected in concentrations above their respective background values in surface soil were lead and silver. There were sporadic detects of semivolatile organic

compounds and Aroclor-1254 and Aroclor-1260, but no defined pattern was found nor evidence for widespread release of organic chemicals.

- Specific metals (including barium, copper, and lead) and radionuclides (strontium-90 and americium-241) were found in tuff beneath the disposal pits. The extent of this subsurface contamination was not sufficiently defined.
- Subsurface pore gas contains tritium and VOCs (mainly trichloroethylene, tetrachloroethene, and 1,1,1-trichloroethane). The vertical and horizontal extent of contamination was not sufficiently defined.
- Surface flux of VOCs and near-surface tritium soil gas concentrations indicated localized areas where releases to the atmosphere were occurring.

6.3.5.2 Current Levels of Environmental Influence

MDA C is bordered by Pajarito Road to the south, Pecos Drive to the west, TA-50 waste management facilities to the north, and Ten-Site Canyon to the northeast, and covers 12.8 acres (5.2 hectares). MDA C is directly north of the CMRR project (Consultation #2-22-05-I-0113). The MDA is located in a heavily developed area surrounded by TA-50. The area is not open to public access.

No significant air quality problems are known for these project sites. There are no known wetlands or surface water associated with this project site. Areas adjacent to developed areas are likely to have daytime average background noise levels between 40 and 63 dB(A). The average daytime background noise level at the edge of the boundary of the Mortandad-Sandia Mexican Canyon spotted owl AEI was approximately 51 dB(A), with background levels ranging from 33.9 dB(A) to 58.5 dB(A) measured at 58 different points along the AEI boundary (Vrooman et al., 2000). There is extensive existing lighting associated with the buildings in the vicinity of MDA C.

6.3.5.3 Potential Effects of the Project

There will be temporary increases in traffic with the characterization and remediation of MDA C. Land use will not be significantly affected, as the area is considered developed. There will be temporary increases in air emissions from equipment and vehicle operations. Disturbed soils will be stabilized, during and after construction, to prevent erosion around the remediation sites.

LANL buildings and vehicle traffic on adjacent roads and highways are the primary sources of artificial light. Lights used during the proposed projects will be directed away from canyons. There will be temporary increases in noise levels from the equipment to be used at MDA C.

6.3.5.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: MDA C is located approximately 6 miles (9.6 kilometers) from the bald eagle AEI. No undeveloped habitat will be disturbed by the proposed activities. The proposed actions will not remove any bald eagle roosting or foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: The proposed actions will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 2.4 miles (3.8 kilometers) from the proposed project sites. The proposed actions will not remove any southwestern willow flycatcher nesting or foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: MDA C is located in developed buffer habitat for the Pajarito Canyon Mexican spotted owl AEI and the Mortandad-Sandia Canyon Mexican spotted owl AEI. The area south of MDA C, between MDA C and the Pajarito Canyon AEI, is scheduled to be developed into a building and parking complex (and electrical substation) for the CMRR (Consultation #2-22-03-I-0302). The highly developed core of TA-50 and -35 are directly north of MDA C, between MDA C and the Mortandad-Sandia Canyon AEI. Noise generated in characterization and remediation of MDA C is not likely to raise background noise levels in undeveloped habitat. Characterization and remediation of MDA C will not remove any suitable roosting or nesting habitat for Mexican spotted owl.

Reasonable and Prudent Alternatives: See Appendix B, except there will be no timing restrictions on beginning work with heavy equipment.

Assessment Decision: The proposed actions may affect, but are not likely to adversely affect, the Mexican spotted owl**.**

6.3.6 Radioactive Liquid Waste Treatment Facility Replacement

6.3.6.1 Project Description

LANL is proposing to build a replacement for the RLWTF at the TA-55/50 area (Figure 6-7 and see Figure 6-3). In addition, a powered evaporator or evaporation ponds may in the future be incorporated into the project. The current RLWTF would be removed or refurbished and the site cleaned up. During this action mostly disturbed areas along the southern edge of Mortandad Canyon would be used for this new facility.

Under the different options available in this action the project will have either two new buildings with separated transuranic and low-level radioactive liquid waste treatment or all wastes will be in one building. Both the two and one building option would be in the same location with little difference between the two alternatives with regard to land disturbance. The new buildings would have a combined area of between 25,000 and 50,000 square feet (2,300 to 4,600 square meters). In addition, two covered evaporation ponds could be located approximately 1 mile (1.6 kilometers) east of the facility. The trenching between the facility and the covered ponds would use an existing disturbed utility corridor. Portions of the existing RLWTF would be demolished. The existing facility would not be renovated but would continue to be used for offices and chemical analyses.

In the current process, treated wastewater is discharged to Mortandad Canyon at a permitted outfall. Two options to reduce or eliminate this discharge are proposed. The first option consists of constructing evaporation basins and allowing the wastewater to evaporate using passive solar energy. The evaporation basins would be constructed about a mile east of the RLWTF. The second option consists of active thermal evaporation. Evaporative equipment would be purchased and installed at or near the proposed low-level radioactive waste treatment building.

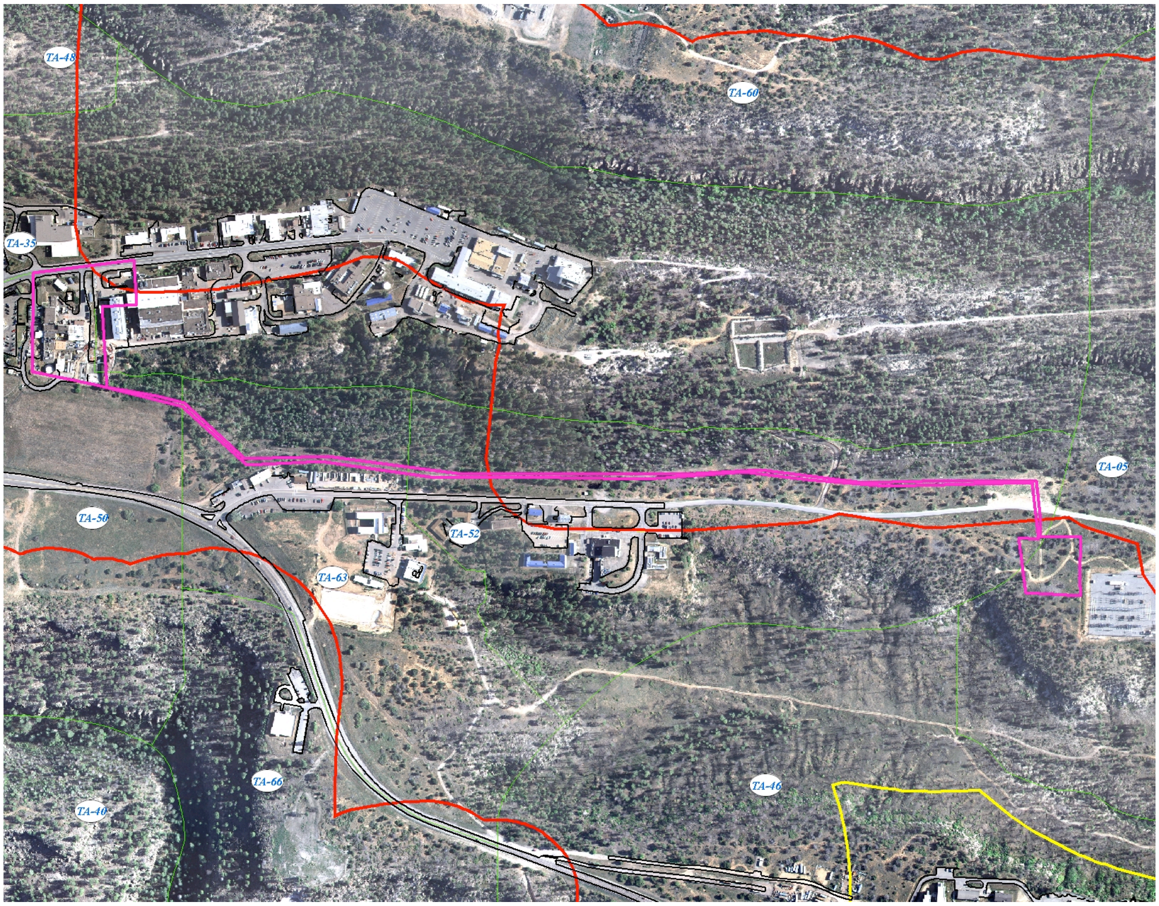


Figure 6-7. The area proposed for the RLWTF replacement.

6.3.6.2 Current Levels of Environmental Influence

The proposed RLWTF Project is within developed and undeveloped land in the congested area along Pajarito Road at LANL. Current disturbances associated with the site include Pajarito Road and associated roads and parking areas at LANL facilities. Mortandad, Two-Mile, and Ten-Site canyons are relatively undeveloped. There is also some trail use in the project area. There are several existing paved and dirt roads throughout the project area as well as utility corridors.

There are PRSs within the project boundary. Plans for this action include the following: adjacent PRSs will be avoided where possible; those that cannot be avoided will be cleaned up or paved/covered over, or the soil will be put back in place following the trenching operation. Contamination control measures will be employed during all of the phases of the activities. This should prevent any release or exposure of contaminants during or after the construction period. The project location is within Mexican spotted owl potential nesting and foraging areas.

Preliminary risk assessments of potential contaminant impacts to the Mexican spotted owl have been completed (Gallegos et al., 1997). In general, results indicate no appreciable impact to the Mexican spotted owl (Gonzales et al., 1997).

No significant air quality problems are known for the proposed project area. There are known surface water/soil erosion problems associated with the proposed project site. However, significant and permanent storm water protection measures will be put in place to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is riparian vegetation along the streambeds of the adjacent canyons with small areas of wetlands. There are areas of floodplain along the canyon bottoms adjacent to the project area in the canyons.

Areas adjacent to developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). For all of the Mortandad-Sandia Canyon AEI, the mean background noise level was 51 dB(A) (Vrooman et al., 2000). Current noise levels are associated with vehicular traffic on Pajarito Road and the industrial LANL activities at the TA-55 area. Current lighting on the site is associated with existing buildings at LANL technical areas and passing vehicles. The lighting should not change significantly following the construction of this facility.

6.3.6.3 Potential Effects of the Project

The proposed project is within developed and undeveloped areas. There will be an increase in traffic volume during construction as a result of project activities. Heavy equipment use normally not associated with commercial activity is expected to increase.

No contaminant problems should result from the proposed RLWTF Project. Any contamination sources in these areas should not be more accessible to wildlife and groundwater following this action. All areas of contamination will be avoided or cleaned up during the project activities.

There will be a temporary increase in emissions and dust from the use of heavy equipment in the project activities. No long-term reduction in air quality will result from the project. Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices (LANL 1998a). Disturbed soils will be stabilized, during and after construction, to prevent erosion.

There is riparian vegetation associated with the stream channels north and south of the proposed project site. The riparian and floodplain areas adjacent to the project area will need to be protected during and following the action. Effects of eliminating outfall discharges to Mortandad Canyon are discussed under the Outfall Reduction Project assessment (Section 6.1.1).

The LANL HMP prohibits noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitats. This project will not be able to operate under these timing restrictions, and an assessment of background noise and potential noise generated during similar construction activities suggests that noise levels would exceed the HMP limits.

6.3.6.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is not near the proposed project site. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. Reasonable and prudent alternatives should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the RLWTF Project may affect, but is not likely to adversely affect, the bald eagle. All reasonable and prudent alternatives should be implemented to reduce the potential disturbance.

Southwestern Willow Flycatcher

Project Impacts: The proposed RLWTF Project is not within or upstream of the southwestern willow flycatcher AEI, consequently, the proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting habitat loss and no potential for habitat degradation associated with the RLWTF Project. Therefore, this project will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The proposed RLWTF Project is within the Mortandad-Sandia Canyon Mexican spotted owl AEI. The proposed project will remove 5.4 acres (2.2 hectares) of habitat. Approximately 75 percent of the project area has been previously disturbed. The project will potentially exceed the HMP restriction on construction noise of greater than 6 dB(A) above background in habitiat in the breeding season (March 1 to August 31).

In order to more accurately assess the impact of the proposed project on the Mexican spotted owl, we have modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area. Although the proposed project could affect habitat suitability in the AEI, the AEI is not composed entirely of nesting habitat, but is a mixture of nesting, roosting, foraging, and unused habitat. If the habitat within the impact area of the RLWTF Project is of lower or equal nesting quality relative to other habitat within the AEI, it is unlikely that the owls would be denied access to adequate nesting habitat.

For all of the Mortandad-Sandia Canyon AEI, the mean background noise level was 51 dB(A), ranging from 59 to 34 dB(A) (Vrooman et al., 2000).

Estimates of sound levels from construction equipment range from 82 dB(A) to 91 dB(A) at 50 feet (15 meters) (Knight and Vrooman 1999). Estimates based on this information indicate that sound levels would be equal to or less than 6 dB(A) above background at approximately 0.25 mile (0.40 kilometer) from the source.

Reasonable and Prudent Alternatives: See Appendix B.

Assessment Decision: Some suitable habitat will be lost or compromised as a result of the proposed action. Predicted noise levels from the proposed project will exceed the limits set in the HMP [greater than 6 dB(A) above background]. Noise generated from construction activities should attenuate to below HMP limits within 0.25 mile (0.40 kilometer) of the construction site. Project activities will take place within or directly adjacent to develop areas. Work will not be allowed to start between March 1 and the completion of surveys in any given year to avoid a sudden increase in noise levels during the breeding season. If all reasonable and prudent alternatives are implemented, the RLWTF Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.3.7 TA-72 Warehouse and Truck Inspection Station

6.3.7.1 Project Description

The current LANL warehouse facility at TA-3 is not properly equipped or constructed to meet the post-9/11 security requirements. Furthermore, the location of the current TA-3 warehouse facility requires offsite vehicles to travel through the densely populated TA-3 areas. The relocation and construction of a consolidated Warehouse Replacement Facility and Truck Inspection Complex would solve existing operational problems and provide many long-term benefits.

The Warehouse Replacement Facility Project would relocate functions from TA-3 to a site in TA-72 on the south side of East Jemez Road about 1 mile (1.6 kilometers) west of SR 4 (see Figure 6-3). In addition, the truck inspection station would be relocated from its current location, on the northwest corner of SR 4 and East Jemez Road, to the new Warehouse Replacement Facility site. The site is approximately 0.5 mile (0.8 kilometer) east of the PTLA shooting range that is located north of East Jemez Road, and is in Santa Fe County not far from lands belonging to San lldefonso Pueblo.

There would be an 85,000-square-foot (7,650-square-meter) warehouse, a 12,000-square-foot (1,080-square-meter) office building, a 400-square-foot (36-square-meter) truckers' rest lounge, a dog kennel, and a 600-square-foot (54-square-meter) guardhouse. The truck inspection station would entail approximately 50,000 square feet (4,500 square meters) of paved area. Upon completion of the proposed project, the location of the current truck inspection station on East Jemez Road would be returned to natural condition. The area affected by construction of the Warehouse Replacement Facility Project and truck inspection station could comprise up to 16 acres (6.5 hectares) and include the actual facilities, parking, staging areas, and perimeter fencing. There would also be modifications made along East Jemez Road to accommodate safety and access improvements. Construction would take between 18 and 24 months.

6.3.7.2 Current Levels of Environmental Influence

The land to be used for the new warehouse and truck inspection station is currently undeveloped. The site is situated on gently sloping terrain in Sandia Canyon and covered with piñon-juniper and some ponderosa pine. The site is about 1 mile (1.6 kilometers) west from SR 4 on the south side of East Jemez Road. The closest PRS, 20-001[a], is about 0.5 mile (0.8 kilometer) to the west of the proposed site. There are no adverse air quality impacts in this area.

The stream channel and floodplain in Sandia Canyon are both to the north side of East Jemez Road. There is a consistent level of road noise from traffic on East Jemez Road. There are intermittent bursts of noise during training exercises at the PTLA firing range that is 0.5 mile (0.8 kilometer) west of this site. The nearest artificial light source is about 0.25 mile (0.4 kilometer) to the west from facilities on the east end of TA-53.

6.3.7.3 Potential Effects of Project

During and after construction, the traffic volumes will increase. There will not be any impacts to existing PRSs for this project. There will be a slight increase in air emissions during the construction phase. There will be more traffic in the area during the operational phase of this project and air emissions will be elevated.

The stream channel and floodplain in Sandia Canyon are both to the north side of East Jemez Road. No construction for this project will occur on the north side of the road. Removal of the current truck inspection station will have appropriate storm water prevention measures to mitigate potential impacts. There will be a temporary increase in noise levels during the construction and demolition projects. There will be more traffic in the area during the operational phase of this project and noise levels will be elevated. There will be temporary increases in artificial lighting during the construction phase. There will be permanent increases in artificial lighting during the operational phase. Some currently developed habitat will be returned to native vegetation following removal of the current truck inspection station.

6.3.7.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 4.3 miles (6.9 kilometers) from the proposed project sites. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. The standard LANL reasonable and prudent alternatives for bald eagle foraging habitat should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the TA-74 Warehouse and Truck Inspection Station Project <u>may affect, but is not likely to adversely affect</u>, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 1.75 miles (2.8 kilometers) from the project site. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The nearest Mexican spotted owl AEI at LANL is more than 1.2 miles (1.9 kilometers) west of the proposed project site. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the Mexican spotted owl.

6.4 Pajarito East Corridor

6.4.1 Disposition of the Flood Retention Structure and Steel Diversion Wall in Pajarito Canyon

6.4.1.1 Project Description

The proposed projects areas for Pajarito East are presented in Figure 6-8. We considered the disposition of the flood retention structure and steel retaining wall as one project and included the project assessment in the text for the Pajarito East Corridor even though the flood retention structure is physically located in the Pajariot West Planning Area. Flood and sediment retention structures were constructed as part of NNSA emergency response actions for the Cerro Grande Fire of 2000 (NNSA 2002). These structures were built to address the changes in local watershed conditions that resulted from the fire. Watershed conditions are expected to return to a prefire status or approximate the prefire condition within three to eight years following the fire.

NNSA staff needs to take action regarding the disposition of these structures when they are no longer necessary to protect LANL facilities and the businesses and homes located downstream.

The flood retention structure (Figure 6-9) is located 800 feet (240 meters) downstream of the confluence of Two-Mile and Pajarito canyons. It rises 72 feet (21.6 meters) above the natural ground surface and stretches 390 feet (117 meters) across Pajarito Canyon. The flood retention structure is composed of roller compacted concrete.

Steel panels attached to large metal beams were installed to form a 760-foot- (228-meter-) long steel diversion wall in Pajarito Canyon (Figure 6-10) directly upstream of TA-18 facilities. The beams were driven vertically into the ground to a depth of 30 to 40 feet (9 to 12 meters). The metal sheets extend approximately 5 to 6 feet (1.5 to 1.8 meters) above ground. This project would remove part of the aboveground portion of the flood retention structure, including gabions installed along the downstream channel. Further, the streambed would be graded, the remaining sides of the flood retention structure would be stabilized, and the banks would be reseeded. The area would be monitored and maintained to prevent erosion of the slopes and damage to the floodplain and downstream wetlands. This project would also include removal of the aboveground portions of the steel diversion wall at TA-18. Any removal of the two identified structures would not occur until after the Pajarito watershed has returned to prefire conditions, or the local ecosystem has recovered enough to approximate a prefire condition.

Removal activities for the flood retention structure and steel diversion wall would require the exercise of best management practices involving storm water controls in accordance with the storm water pollution prevention plan, as required by the LANL NPDES permit.

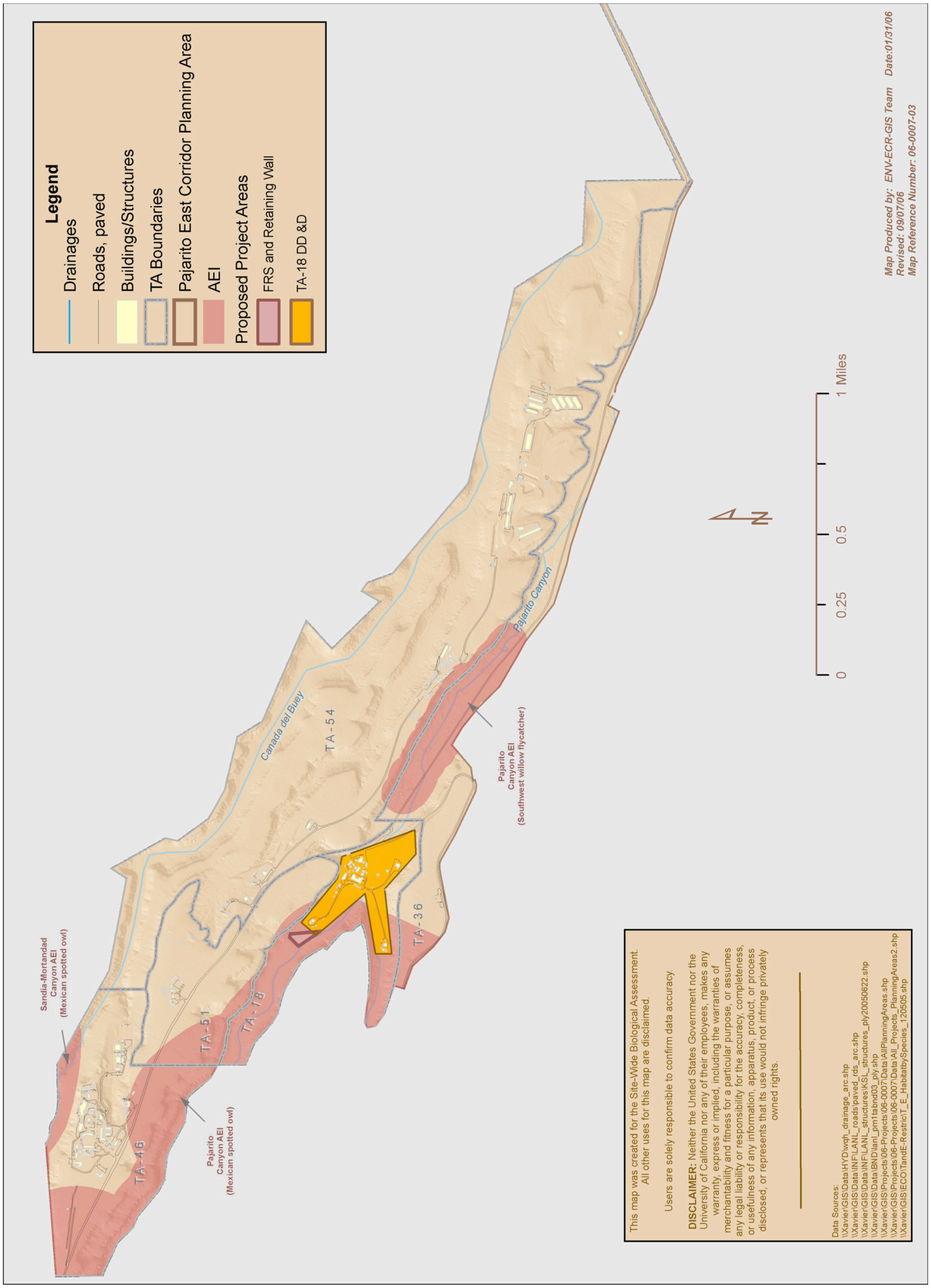


Figure 6-8. Proposed project areas in Pajarito East.

Figure 6-9. Flood retention structure, looking east.

Figure 6-10. Steel diversion wall under construction.

6.4.1.2 Current Levels of Environmental Influence

Pajarito Road runs past the access roads and lay-down areas for the flood retention structure and TA-18. There are numerous facilities and parking lots at TA-18. PRSs located upstream of the flood retention structure in Two-Mile Canyon and Pajarito Canyon have been stabilized. In addition, PRSs that formerly discharged into Pajarito Canyon have been stabilized. These include outfalls, surface runoff, and dispersion from firing sites. No significant air quality problems are known for these project sites. There are no known wetlands associated with these project sites. The stream channel in Pajarito Canyon occasionally flows during storm events.

Areas adjacent to developed areas are likely to have daytime average background noise levels between 40 and 63 dB(A). The average daytime background noise level at the edge of the Three-Mile Canyon Mexican spotted owl AEI was approximately 36.6 dB(A), with background levels ranging from 31.2 dB(A) to 42.1 dB(A) (Vrooman et al., 2000). The average daytime background noise level at the edge of the habitat boundary of the Pajarito Canyon Mexican spotted owl AEI was approximately 41.6 dB(A), with background levels ranging from 34.6 dB(A) to 58.9 dB(A) measured at 10 different points along the AEI boundary (Vrooman et al., 2000). There are no artificial light sources associated with these project sites.

6.4.1.3 Potential Effects of Project

There will be temporary increases in traffic with the removal of the structures. Land use should revert back to a more natural setting after the removal of the structures. There will be temporary increases in air emissions from demolition equipment for the removal of these structures. There will be temporary increases in noise levels from the demolition equipment for the removal of these structures. The flood retention structure is on the boundary of the Pajarito Canyon AEI for the Mexican spotted owl. The removal of the flood retention structure will produce noise greater than 6 dB(A) above the background in the undeveloped habitat to the west.

The steel diversion wall is in the Three-Mile Canyon AEI for the Mexican spotted owl. The removal of this diversion wall will produce elevated noise levels, though not likely more than 6 dB(A) above the background in the undeveloped habitat to the south in Three-Mile Canyon. Sound and visual disturbance in this habitat will be shielded by a mesa that separates Pajarito and Three-Mile canyons. There will not be any increased light emissions at these sites.

6.4.1.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 4 miles (6.4 kilometers) from the proposed project sites. The proposed actions will not remove any bald eagle foraging habitat. The proposed actions should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is 0.75 mile (1.2 kilometers) downstream from the nearest site to be removed, the diversion wall at TA-18. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. Storm water protection plan measures will mitigate downsteam impacts from the actions. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Ensure implementation of storm water protection plan measures.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions may affect, are not likely to adversely affect the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The flood retention structure is on the boundary of the Pajarito Canyon AEI for the Mexican spotted owl. The removal of the flood retention structure will produce noise greater than 6 dB(A) above the background in the undeveloped habitat to the west. However, Mexican spotted owls have not been found in either the Pajarito Canyon AEI or the Three-Mile Canyon AEI during any surveys. Surveys were conducted in 1995, 1996, and 1999–2005. Delaney et al. (1999) found that Mexican spotted owls in south-central New Mexico did not flush when mechanical noise stimuli (helicopters and chain saws) were greater than 345 feet (105 meters) away, although the boundary is closer than 345 feet (105 meters) to the flood retention structure. No trees greater than 8 inches (20 centimeters) DBH will be removed by the proposed activities.

The steel diversion wall is in the Three-Mile Canyon AEI for the Mexican spotted owl. The removal of this diversion wall will produce elevated noise levels, though not likely more than 6 dB(A) above the background in the undeveloped habitat to the south in Three-Mile Canyon. This habitat is protected from disturbance by the mesa that separates Pajarito and Three-Mile canyons.

Reasonable and Prudent Alternatives:

- Back-up indicators on all trucks and heavy equipment for work on the flood retention structure will be muted as much as possible consistent with the safety of human workers.
- Onsite activities for the flood retention structure demolition in any given year will not begin between March 1 and May 15 or until the completion of surveys, whichever comes first. If the habitat is determined to be occupied during surveys, restrictions on beginning work may be extended through August 31. Once begun, work will continue until it is completed, but every effort will be made to complete work prior to the beginning of the next breeding season.
- Reseeding and erosion protection will be implemented following the action to stabilize the soils.

Assessment Decision: Applying the reasonable and prudent alternatives described above, these projects may affect, but are not likely to adversely affect, the Mexican spotted owl.

6.4.2 DD&D of TA-18

6.4.2.1 Project Description

The principal TA-18 operations have been research in the design, development, construction, and application of nuclear criticality experiments. The TA-18 buildings and infrastructure, some of which have been operational since 1946, range from 30 to more than 50 years of age and are increasingly expensive to maintain and operate. The Defense Nuclear Facilities Safety Board has recommended, in 1993 and 1997, that DOE continue to maintain the capability to support the only remaining criticality safety program in the Nation (DNFSB 1993 and 1997). Consistent with this, and to reduce the long-term costs for safeguards and security, on April 11, 2000, the Secretary of Energy announced the proposal to relocate the TA-18 operational capabilities and materials by the end of 2004. TA-18 operations will cease at the end of September 2008 and the facility will be turned over for disposition.

TA-18 contains about 60 structures totaling about 80,000 gross square feet (7,432 square meters). The main facilities consist of three remote-controlled Critical Assembly Storage Areas, or CASAs (Buildings 23, 32, and 116), and a separate weatherproof shelter near Building 23 that houses the SHEBA (Building 168). These facilities are located some distance from the main laboratory (Building 30) that houses individual control rooms for these remote-controlled critical assemblies. Other important facilities include the Pulsed Accelerator Building, (or high bay 384 building) (Building 127), Hillside Vault (Building 26), Reactor Subassembly Building 385 (Building 129), Accelerator Development Laboratory (Building 227), and various storage and office buildings supporting the activities within the TA-18.

NNSA is evaluating various options for disposition of TA-18 facilities once the materials and equipments are relocated. They include (1) DD&D of all buildings and structures; (2) continue to use some of the buildings and structures; and (3) no action, that is, DD&D would not occur and TA-18 buildings and structures would be maintained for other uses. This assessment is of option 1, the DD&D of all the buildings at TA-18. Activities planned under options 2 and 3 would result in smaller impacts than option 1, so this assessment represents the worst-case scenario, and will cover DD&D actions taken under any of the options.

6.4.2.2 Current Levels of Environmental Influence

Facilities at TA-18 are located on a 131-acre (53-hectare) site that is situated 3 miles (4.8 kilometers) from the nearest residential area, White Rock. Approximately 20 percent of the site has been developed. Site facilities are located in Pajarito Canyon near its confluence with Three-Mile Canyon. A security fence to aid in physical safeguarding of special nuclear materials bounds the entire site.

There are no identified PRSs at TA-18. Nonradiological air pollutant emissions from TA-18 include criteria pollutants from various small fuel-burning sources and various toxic chemicals. Use of toxic pollutants has been reduced in recent years and in 2003 chemical use was limited to the use of propane (LANL 2004f). Actual emissions vary by year with the amounts of chemicals being used. The use of toxic chemicals at TA-18 has not been shown to have an adverse air quality impact under LANL’s air quality permit and air quality monitoring program.

There are no aquatic resources or wetlands located within TA-18 but there are extensive wetlands downstream of TA-18 in Pajarito Canyon. Operational noise sources from TA-18 include heat, ventilation, and air conditioning equipment and vehicles. Areas adjacent to developed areas are likely to have daytime average background noise levels between 40 and 63 dB(A). The average daytime background noise level at the edge of the Three-Mile Canyon Mexican spotted owl AEI ranged from 31.2 dB(A) to 42.1 dB(A) (Vrooman et al., 2000). There are permanent light sources outside all the buildings at TA-18 and their associated parking lots, including intensive nighttime security lighting.

6.4.2.3 Potential Effects of Project

There will be temporary increases in traffic with the DD&D of TA-18 structures. No PRSs will be impacted by this action. There will be temporary increases in air emissions from demolition equipment for the removal of these structures. The only radiological effect on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminant containment coupled with high-efficiency particulate air filters. Contaminant releases of radioactive particulate from disposition activities are expected to be lower than releases from past TA-18 operations. Removal of asbestos-contaminated material would be conducted according to existing asbestos management programs at LANL in compliance with strict asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls, and no asbestos would likely be released that could be inhaled by members of the public.

6.4.2.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: The bald eagle AEI at LANL is more than 3.75 miles (6 kilometers) from the proposed project sites. The proposed actions will not remove any bald eagle foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is 890 feet (267 meters) from the nearest building to be removed at TA-18. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives:

- Use appropriate soil erosion best management practices to ensure that erosion does not occur into the wetlands downstream of TA-18.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions may affect, are not likely to adversely affect, the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: TA-18 is located in and adjacent to buffer habitat for Mexican spotted owl. The proposed actions in this assessment will produce noise in or near suitable Mexican spotted owl habitat in the Three-Mile Canyon AEI greater than 6 dB(A) of background. Disturbed soils will be stabilized where needed to prevent erosion into the Pajarito Canyon stream channel and prevent impacts to the wetlands downstream of TA-18. There will be temporary increases in noise levels from the demolition equipment for the removal of these structures. A typical piece of equipment at a DD&D site is a front-end loader. An estimated noise level for operation of a front-end loader is 80 dB(A) at 50 ft (15 meters).

The estimated noise level at the boundary at three set distances from the front-end loader across flat ground on a soft site were calculated. The CASA 2 complex is the closest to the boundary at 680 feet (204 meters) and the estimated noise level was 49.7 dB(A). The CASA 1 complex is the next closest to the boundary at 980 feet (294 meters) and the estimated noise level was 45.7 dB(A). The main structure complex around building 30 is 1,700 feet (510 meters) from the boundary and the estimated noise level was 39.7 dB(A). The nighttime lighting levels at TA-18 will decrease after structures are removed.

Delaney et al. (1999) found that Mexican spotted owls in south-central New Mexico did not flush when mechanical noise stimuli (helicopters and chain saws) were greater than 345 feet (105 meters) away. Swarthout and Steidl (2001) examined the response of Mexican spotted owl to recreational hikers, and found that juveniles and adults were unlikely to flush at distances greater than or equal to 40 feet (12 meters) and 80 feet (24 meters), respectively. At distances greater than or equal to 180 feet (55 meters), neither age class was likely to alter its behavior in response to the presence of a hiker.

The noise calculations in this assessment show that noise levels in the habitat will be elevated somewhat more than 6 dB(A) of background from both CASA 1 and 2 complexes, although not above an absolute value of 50 dB(A). The rest of the DD&D activities will not raise noise levels in the habitat more than 6 dB(A) of background.

Reasonable and Prudent Alternatives:

- Back-up indicators on all trucks and heavy equipment will be muted as much as possible for work at CASA 1 and 2 consistent with the safety of human workers.
- Reseeding and erosion protection will be used following the action to stabilize the soils.
- No trees greater than 8 inches (20 centimeters) DBH will be removed from Mexican spotted owl habitat without ENV-ECO approval.

Assessment Decision: Applying the reasonable and prudent alternatives described above, these projects <u>may affect, but are not likely to adversely affect,</u> the Mexican spotted owl.

6.4.3 Remediation of MDAs G, H, and L at TA- 54

6.4.3.1 Project Description

For remediation of MDAs, the two bracketing alternatives are 1) stabilization in place and 2) removal of contaminated soils and materials. TA-54 is on Mesita del Buey. The northern border is the boundary between LANL and the San Ildefonso Pueblo; its southeastern boundary borders White Rock (LANL 1999b). The primary function of TA-54 is management of radioactive and hazardous chemical wastes. It contains more than 100 structures (DOE 1999a). The facilities at TA-54 are grouped in different areas according to the types of waste managed. These areas include the following:

- *Area G.* Area G is a 65-acre (26-hectare) site used since 1957. It includes MDA G, a site having numerous disposal pits and shafts that are the subject of Consent Order investigations, as well as active low-level radioactive waste disposal operations. It includes above- and belowground transuranic waste storage areas; a facility for decontaminating radioactive waste containers; compactors for transuranic and low-level radioactive waste; an administrative support building; and numerous other structures.

- *TA-54 West*. TA-54-West is the site of the Radioactive Assay and Nondestructive Test Facility, used to determine the characteristics of containerized transuranic waste and to prepare the containers for shipment to the Waste Isolation Pilot Plant (WIPP).
- *Area L*. This 2.6-acre (1.1-hectare) area is LANL's chemical waste management area. Area L includes MDA L, a facility formerly used for disposal of chemical wastes.
- *Area H*. This area consists of nine inactive shafts used until 1986 for disposal of classified radioactive wastes. The area is being remediated under the Consent Order.
- *Area J*. This 2.65-acre (1.1-hectare) area was used from 1961 until 2001 for disposal of solid wastes. The six pits at Area J are covered with clean fill and all four shafts are capped. An asbestos transfer station has been removed. Area J is undergoing closure under the New Mexico Solid Waste Act.

The MDAs in TA-54 are shown in Figure 6-11. MDA G is comprised of older waste disposal units, potentially containing radionuclides and hazardous constituents under RCRA, as well as some subsurface storage units for transuranic waste. The work plan for MDA G identified 32 pits, 4 trenches, and 194 shafts having depths ranging from 10 to 65 feet (3.0 to 20 meters) below the ground surface (LANL 2004d).

The configuration of MDA G is complex. MDA G is within Area G, which, in addition to being the only active low-level radioactive waste disposal facility at LANL, is the focus of several other operations involving radioactive waste; including storage, characterization, and processing by compaction or repackaging of transuranic waste destined for disposal at WIPP, characterization and compaction of low-level radioactive waste before disposal, and storage of mixed low-level radioactive waste destined for offsite treatment or disposal.

Area G will be closed to meet the August 31, 2015 deadline in the Consent Order for Closure of MDA G. Closure must be in accordance with several regulatory requirements. All of the storage and disposal units are subject to DOE requirements under the Atomic Energy Act, including DOE Order 435.1. Many of the disposal units in Area G are SWMUs and AOCs that comprise MDA G and are also subject to corrective action under the Consent Order. Other disposal units are RCRA-regulated disposal units also subject to RCRA closure and post-closure care requirements. However, the approach used to close Area G must integrate and accommodate all applicable regulatory requirements.

To close Area G, wastes that are currently stored within Area G must be removed. These wastes include transuranic wastes stored both above and below ground, and some low-level radioactive waste and mixed low-level radioactive waste. The transuranic waste will be sent to WIPP. The structures currently existing at Area G must be removed and important waste management operations, such as transuranic and low-level radioactive waste characterization and compaction, must be relocated.

MDA H (PRS 54-004) is within a fenced 0.3-acre (0.1-ha) rectangular area measuring 200 feet by 70 feet (60 meters by 21 meters) inside the western boundary of TA-54. Storm water runoff enters the Pajarito Canyon watershed. Nine shafts were used for disposal of classified wastes from 1960 to 1986. Eight of the nine shafts are capped by a 3-foot (1-meter) layer of concrete and a 3-foot (1-meter) layer of soil. A locked steel plate covers shaft nine. The first eight shafts are 6 feet (1.8 meters) in diameter and have depths of 60 feet (18 meters). The ninth shaft contains 990 cubic feet (30 cubic meters) of waste. The shafts received weapons components, classified documents and paper, aluminum, plastic, stainless steel, rubber, graphite shapes, weapon mockups, depleted uranium scraps and classified shapes, and other materials (LANL 2005b).

MDA L (PRS 54-006) is within a 2.58-acre (1.0 hectare) site (Area L) north of Mesita del Buey Road between MDA G and MDAs H and J. The land north of MDA L drops steeply away to Cañada del Buey. Pajarito Canyon is to the south. Runoff enters Cañada del Buey (LANL 1999b). Between about 1959 and 1985, chemical wastes were disposed within unlined pits and shafts. Since 1986, Area L has stored RCRA waste, PCB waste, and mixed waste such as contaminated lead (LANL 1999b).

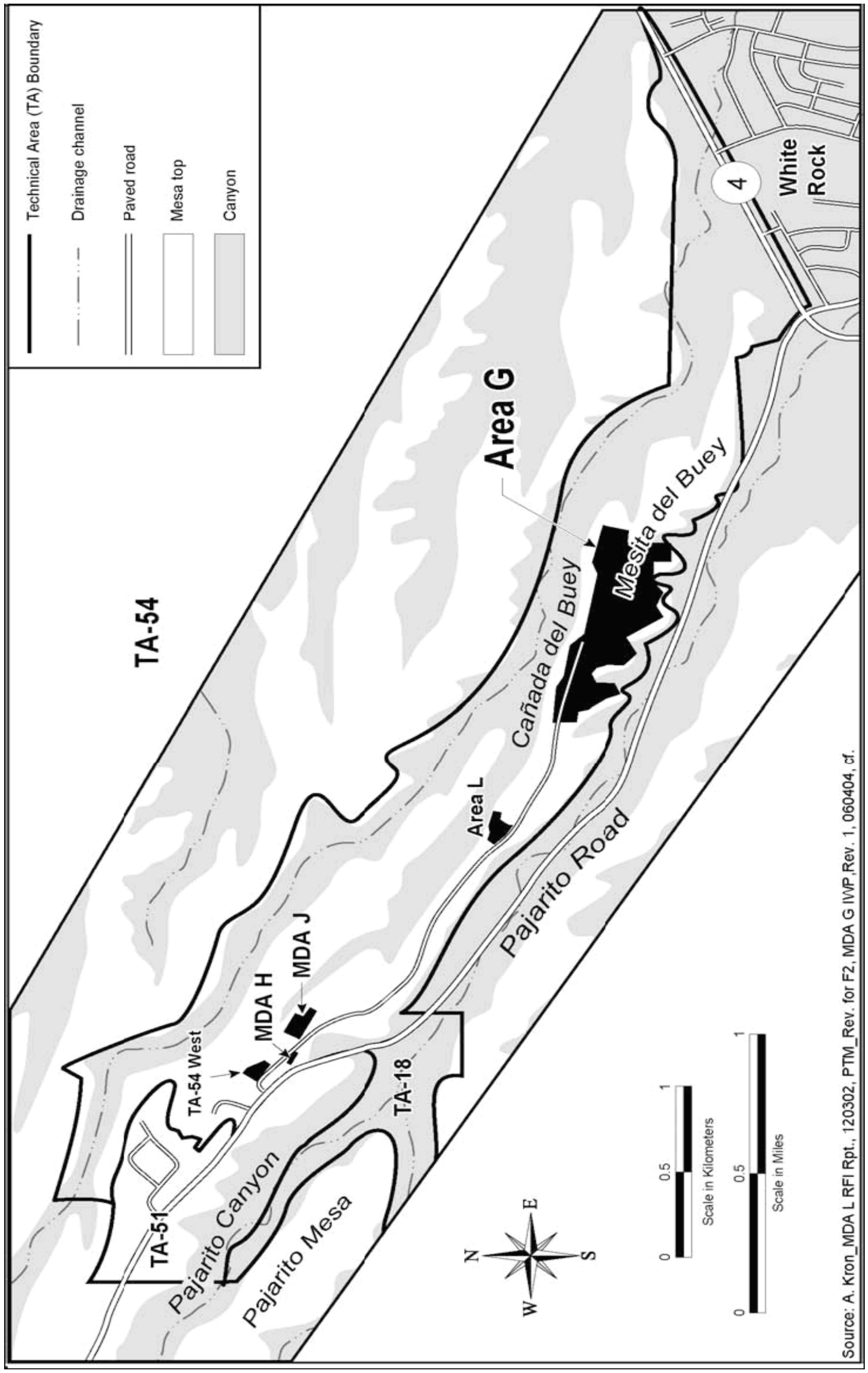


Figure 6-11. Location of MDAs within TA-54.

6.4.3.2 Current Levels of Environmental Influence

TA-54 covers 943 acres (382 hectares) (DOE 1999a). MDAs G, H, and L encompass 68 acres (28 hectares), or 7.2 percent of the technical area. The 3-mile (4.8-kilometer) northern border of the site forms the boundary between LANL and San Ildefonso Pueblo lands. The residential area of White Rock borders the site at its eastern boundary. Traffic is associated with Pajarito Road and the TA-54 facilities. Heavy equipment and trucks for moving wastes and soil operate at TA-54 on a regular basis, and noise levels reflect the operation of heavy equipment. Area G has nighttime lighting for security and operations.

Air quality considerations include nonradiological air quality in terms of criteria pollutants such as nitrogen dioxide, sulfur dioxide, particulates, radiological air quality, and visibility. Los Alamos County, including LANL, is in attainment with all State ambient air quality standards and with the National Ambient Air Quality Standards. LANL has a long-standing and extensive program to ensure that possible radiological exposures of members of the public from air emissions are maintained to levels as low as reasonably achievable below all applicable standards. Periodic environmental surveillance and compliance reports for LANL document compliance with State, EPA, and DOE air quality standards in and around LANL for protecting the public and workers (LANL 2004b).

There are known surface water/soil erosion problems associated with the project site. However, significant and permanent storm water protection measures have been put in place and continue to be maintained to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is a large wetland complex in the bottom of Pajarito Canyon adjacent to the project area.

6.4.3.3 Potential Effects of Remediation of MDAs G, H, and L at TA-54

There will be temporary increases in traffic during remediation of TA-54 MDAs. The Capping and Removal Alternatives may have small impacts on air quality. Compared to the No Action Alternative, the Capping Alternative would require use of additional heavy equipment that would result in additional air emissions. In addition, dust and particulates would be dispersed into the air from grading, earthmoving, and compaction. This could occur at the MDAs being remediated and at locations where sources of capping and fill materials (tuff, rock, etc.) would be excavated.

Removal of the waste and contamination at the MDAs would entail small short-term risks to surface waters but long-term improvement of ground and surface water quality. Industrial equipment would disturb land, disrupting existing covers and causing opportunities for runoff and erosion to transport soil offsite to canyons. Removal of the MDAs would require the import of very large quantities of tuff and surface amendment, some of which could be eroded into canyons. These risks would be reduced and mitigated using storm water best management practices under a storm water pollution prevention plan.

The Capping and Removal Alternatives would have increased noise impacts as compared to the No Action Alternative. Heavy equipment would be used during site preparation and for earthmoving. The noise would depend on the equipment design and its quantity—that is, the scale of operation would depend on the size of the work site. Heavy equipment such as front-end loaders and backhoes would produce intermittent noise levels at 73 to 94 dB(A) at 50 feet (15 meters) from the work site under normal working conditions. Considering physical features, noise levels from this equipment could return to background levels within several hundred feet of the noise source (DOE 2004).

6.4.3.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is more than 2 miles (3.2 kilometers) from TA-54. The proposed actions will not remove any bald eagle foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: Part of the southwestern willow flycatcher AEI is located in Pajarito Canyon below the mesa containing TA-54. The closest MDA, MDA L, is approximately 450 feet (137 meters) from the AEI. The proposed actions will not remove any southwestern willow flycatcher foraging habitat but heavy equipment will produce noise levels around 80 dB(A). The maximum recorded background noise level for the southwestern willow flycatcher AEI is 62.4 dB(A) and the mean is 49.7 dB(A) (Vrooman et al., 2000). The proposed actions in this assessment will produce noise in or near the AEI at an estimated 52 dB(A), less than 6 dB(A) above background.

Reasonable and Prudent Alternatives:

- LANL will continue to perform annual presence/absence surveys adjacent to the project area before and during the action.
- All lighting will be designed in such a way that it will be confined to the site.
- Disturbance and noise would be kept to a minimum during project activities.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Unnecessary disturbance to vegetation will be avoided. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- No wetland vegetation will be disturbed.
- All exposed soils must be re-vegetated as soon as feasible after remediation to minimize erosion. All trees and other plant species that are used for re-vegetation purposes will be native species appropriate for the natural vegetation conditions of the surrounding area.

Assessment Decision: No suitable foraging or nesting habitat will be lost or compromised as a result of the proposed action. Predicted noise levels from the proposed project are not likely to exceed 6 dB(A) above background in the AEI. If a southwestern willow flycatcher is found before or during the project, the USFWS will be contacted and consultation reinitiated if needed. In the long term, remediation of these MDAs should maintain or increase water quality in storm water runoff into Pajarito Canyon. If all reasonable and prudent alternatives are implemented, the TA-54 MDA Remediation Project may affect, but is not likely to adversely affect, the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The closest Mexican spotted owl AEI is approximately 1,000 feet (305 meters) from MDA J and H. Project-related activities will not result in noise levels 6 dB(A) above background. The proposed actions will not remove any spotted owl foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have no effect on the Mexican spotted owl.

6.5 Omega West

6.5.1 Remediation of TA-21 MDAs A, T, U

6.5.1.1 Project Description

In accordance with statutes such as RCRA and the Atomic Energy Act, ECR Project personnel identify locations where hazardous constituents may have been released into the environment and to carry out corrective measures. MDAs are areas where radioactive or hazardous constituents have been disposed, generally by burial within soil or underlying tuff.

For remediation of MDAs, the two bracketing alternatives are 1) stabilization in place and 2) removal. For the former alternative, the MDAs are capped in place, and other remediation activities occur such as construction of barrier walls against lateral movement of groundwater and extraction and treatment of VOC plumes. The alternative leaves the contamination in the MDAs in place. For the latter alternative, the MDAs are all exhumed, backfilled with clean soil and soil that meets SALs, and vegetated.

The corrective measures to be implemented for these MDAs and PRSs are generally not currently known. A combination of corrective measures may be chosen for any specific MDA or PRS, or a portion thereof. Even within a specific MDA or PRS, there may be a hybrid decision: for example, portions may be removed (as in removal of "hot spots") and portions may be stabilized in place.

This project-specific analysis is being prepared in advance of all the information to be collected as part of the LANL corrective measures investigations programs. The work being performed to characterize, assess, and provide recommendations for corrective measures at all the PRSs at LANL will take several years to complete. After a decision is reached on an alternative for any particular MDA PRS, implementing that decision may require detailed engineering and safety assessments. Therefore, the alternatives in this project-specific analysis are meant to bracket the possible environmental benefits and detriments that could be expected. The analysis is intended to provide information that can be used to develop mitigation measures, if needed, if a particular alternative is implemented.

Also known as the DP Site, TA-21 is on DP Mesa (Figure 6-12), east-southeast of the Los Alamos township at an elevation of 7,140 feet (2,142 meters). Access is by DP Road, which intersects to the west with SR 502 in the Los Alamos township. Runoff drains south into Los

Alamos Canyon and north into DP Canyon. The depth to the regional aquifer is 1,150 feet (345 meters). From 1945 to 1978, TA-21 was used for chemical research and for plutonium and uranium metal production (LANL 1999b; 2002a). TA-21 contained two primary research areas—DP West and DP East. DP West was used for radioactive materials processing. After operations ceased in the 1980s, process buildings remained until decommissioning began in the 1990s. Inorganic and biochemistry activities were relocated during 1997 and 1998. DP East includes the Tritium Science and Fabrication Facility and the Tritium Systems Test Assembly. TA-21 contains five MDAs. From west to east, they are MDAs B, V, T, A, and U. MDA V has been removed. Actions for the remediation of MDA B have already received USFWS concurrence (Consultation #2-22-04-I-0730).

MDA A

MDA A (SWMU 21-014) is on a site covering 1.25 acres (0.5 hectares) between DP West and DP East. Runoff drains north into DP Canyon (LANL 1991)(Figure 6-13). In 1945, two disposal pits were dug at the east end of the MDA, and two underground tanks (“General’s Tanks”) for liquid waste storage were emplaced at the west end. During 1969, a large pit in the center of the MDA was dug for demolition debris (see Figure 6-13) (LANL 1991). Contemporary engineering drawings depict four pits having dimensions of 125 feet (38 meters) by 18 feet (5.5 meters) with rounded corners. Yet only two pits were built, based on later engineering drawings showing pits roughly 15 feet wide at the top and 12 feet deep, as well as statements in subsequent memoranda (Rogers 1977, LANL 1991). The MDA Core Document states that the pits were 13 feet (4 meters) deep and received 36,000 cubic feet (1,020 cubic meters) of “solid wastes with alpha contamination accompanied by small amounts of beta and gamma” (LANL 1999b). The Work Plan for TA-21 states that the pits received “laboratory equipment, building construction material, paper, rubber gloves, filters from air cleaning systems, and contaminated or toxic chemicals.” The possibility exists that “plutonium, polonium, uranium, americium, curium, Radium-Lanthanum (sic), actinium, and waste products from the Water Boiler” were present in the waste. “Polonium and plutonium-239 and plutonium-240 were also thought to be the major contaminants in the waste” (LANL 1991).

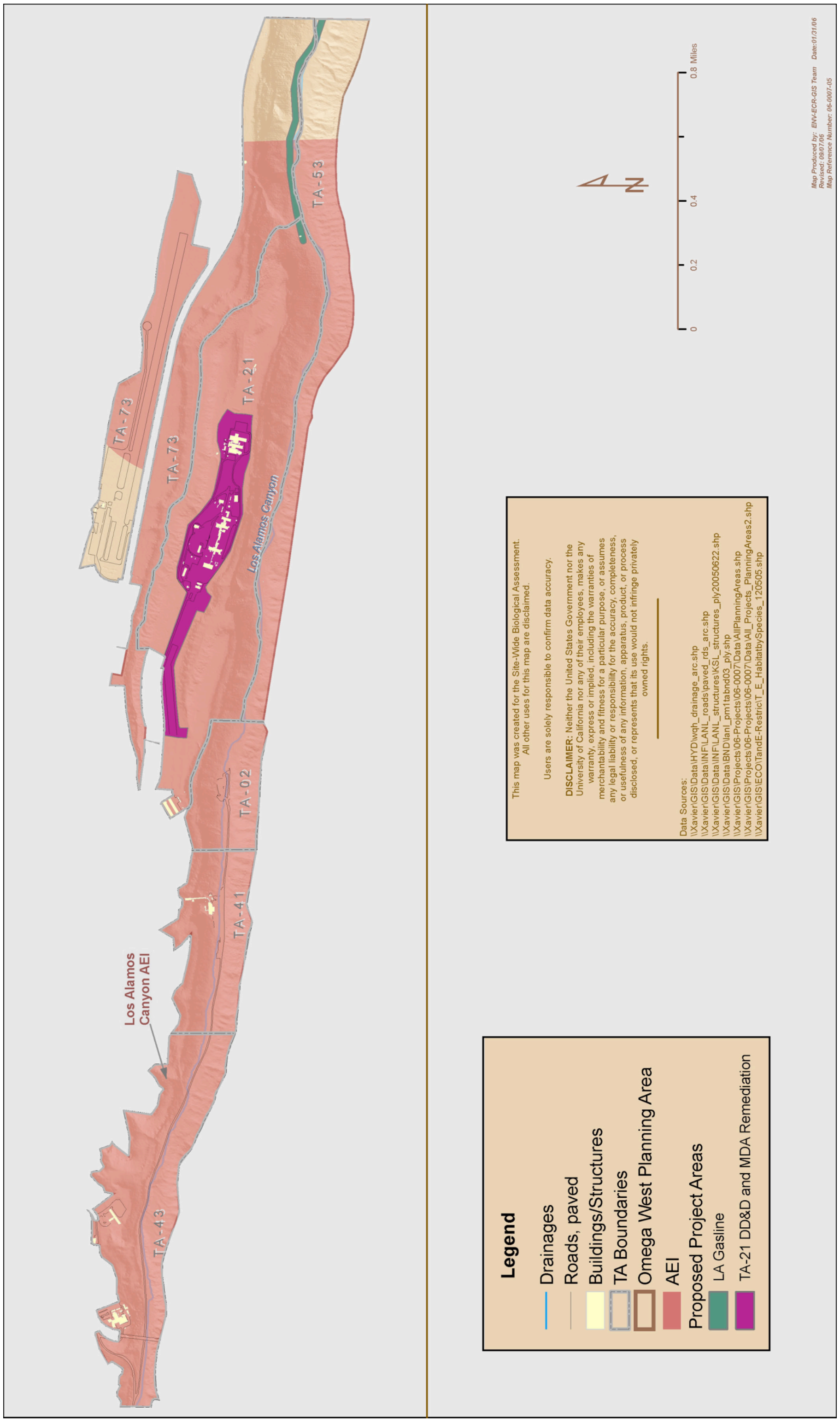


Figure 6-12. Proposed project areas in Omega West.

During the early 1950s several 55-gallon drums containing “iodide wastes” were stored at the east end of the MDA. The drums contained a solution of sodium hydroxide and stable iodine used to scrub ventilation air containing plutonium and possibly uranium. The liquid volume and its chemical content are unknown. Corrosion of the drums released some of the solution to surface soil. The drums were removed in 1960 and the storage area paved (LANL 1999b).

In 1945, two 50,000-gallon steel tanks (named after General Leslie Groves) were buried on the west end of the MDA to store solutions containing plutonium-239 and plutonium-240 (LANL 1999b). The tanks are shown in Figure 6-20 and described below (Rogers 1977):

> The tanks are 12 feet (3.7 meters) in diameter and 62 feet-10 inches (19.1 meters) long. They were placed 20 feet (6.1 meters) apart in pits 12 feet (3.7 meters) deep, 15 feet (4.6 meters) wide, and probably 86 feet 10 inches (21.0 meters) long on four concrete piers. Each pier was 4 feet 10 inches (1.5 meters) high with the bottom 2 feet (0.6 meters) below the bottom of the pit. Each tank rested on piers 1 feet (0.3 meters) above the bottom of the pit. Sand was placed in the bottom of the pit up to the top of the piers – a depth of 1 feet- 10 inches (0.5 meters). Thoroughly packed earth filled the area between the tank and most of the rest of the pit. Directly above the tanks loose dirt fill was specified. A concrete slab 8 inches (20.3 centimeters) thick, 56 feet (17.1 meters) wide and 68 feet 10 inches (21 meters) long was poured 1.5 feet (0.5 meters) above the tanks. Approximately 5 feet (1.5 meters) of earth fill was placed above the concrete slab. This final earth fill formed a mound 2.25-5.75 feet (0.7-1.8 meters) above grade. On the north end of each tank a vent extended 15 feet (4.6 meters) above the mound. On the south end of each tank the fill pipe is enclosed in a concrete box with outside dimensions 2 feet-10 inches (0.9 meters) high, 2 feet-10 inches (0.9 meters) wide, and 4 feet-4 inches (1.3 meters) long. The box extended 1 foot (0.3 meters) above the mound.

Solutions containing 334 grams of plutonium-239 and plutonium-240 in sodium hydroxide were to be stored until the plutonium could be extracted (LANL 1991; 1999b). But in 1975, the solution was removed, solidified in cement, and buried in MDA A, leaving a residual sludge. In the late-1980s the solidified waste was moved to Pit 29 in MDA G (LANL 1999b). Tank openings were sealed in 1985 (LANL 1991).

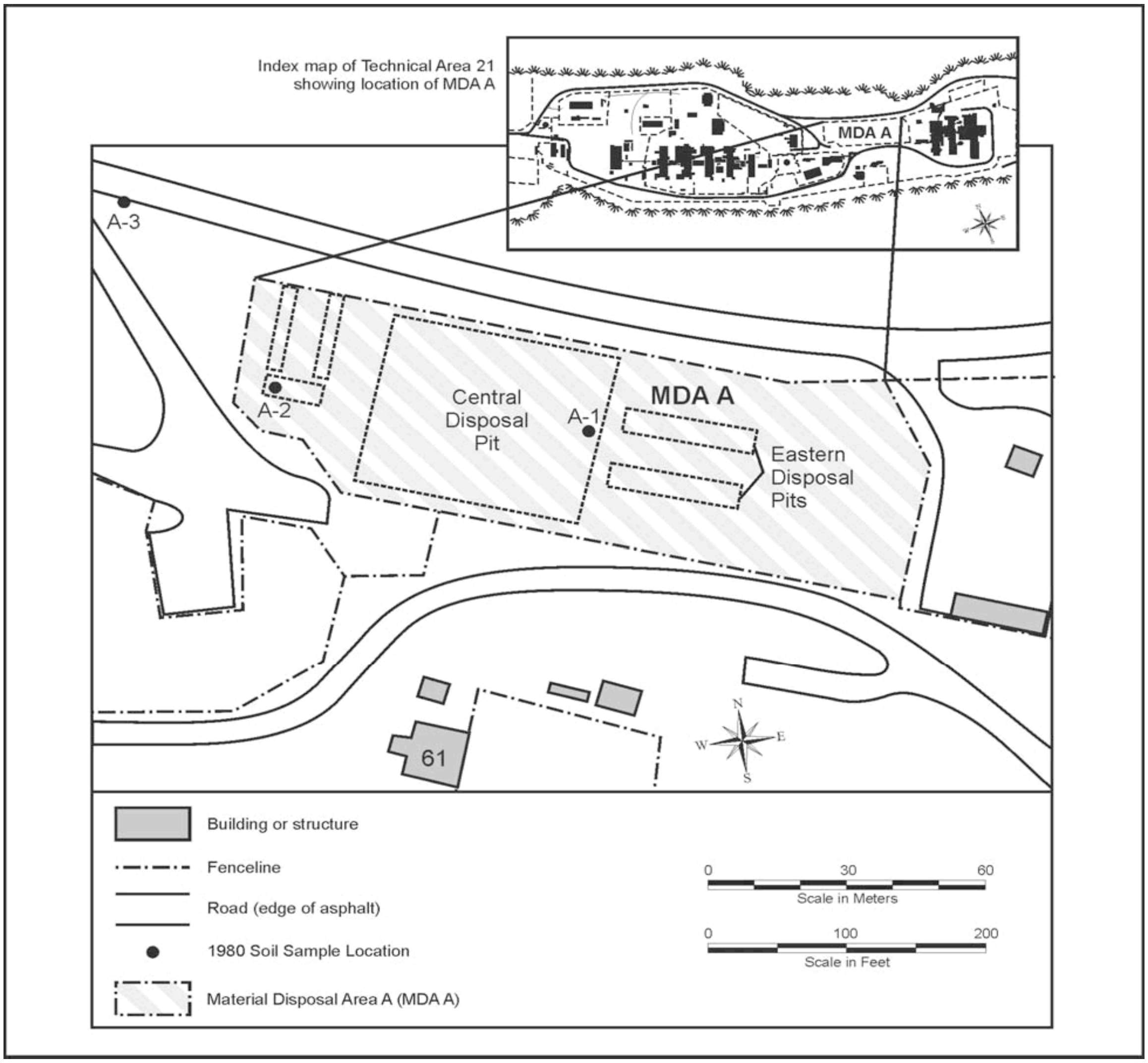


Figure 6-13. TA-21 (inset) and MDA A.

In 1969, a pit was dug in the center of MDA A to receive debris from demolition work at TA-21. Although the plan was to excavate to a depth of 30 feet (9.1 meters), leading to a capacity of 7,000 cubic yards (5,352 cubic meters) assuming a 5-foot (1.5-meter) cover of earth, the pit was dug to a depth of 22 feet (6.7 meters), leading to a waste capacity of 4,885 cubic yards (3,735 cubic meters). In 1972, the pit was enlarged (but not deepened) to a total capacity of 18,736 cubic yards (14,325 cubic meters). Demolition was finished in 1974, after which unspecified waste filled the remaining portions of the pit. A soil cover was emplaced in May 1978. Wastes included asphalt. Radionuclides included plutonium-239, plutonium-240, plutonium-238, uranium-235, depleted uranium, and other isotopes (LANL 1991).

MDA T

MDA T is on a site covering 2.2 acres (0.9 hectares) in the northeast corner of DP West (Figure 6-14). MDA T includes four absorption beds, 62 shafts, and an area once used for solidified waste storage. Drainage flows to DP Canyon (LANL 1999b).

From 1945 to 1952, the absorption beds received liquids from the TA-21 plutonium laboratories. After 1952, when a liquid waste treatment plant was installed, the beds were used only occasionally, receiving small quantities of liquid effluent until 1967 when a new liquid waste treatment process began operation. The shafts were used between 1968 and 1983 for disposal of liquids combined into a cement paste as well as some solid wastes (LANL 1991, LANL 2004a).

The four absorption beds were built "about 1945" (LANL 1991). The four absorption beds were each 120 feet (36.6 meters) by 20 feet (6.1 meters) by 6 feet (1.8 meters) deep. The distance between the centers of Beds 1 and 3, and Beds 2 and 4, is 80 feet (24.4 meters) (Rogers 1977). The bottom 24 inches (61 centimeters) of fill is stone ranging in size from 3 to 10 inches (7.6 to 25.4 centimeters). The stone was graded from large on the bottom to small at the top to form a deck for the overlying 6 inches (15.2 centimeters) of gravel beneath 6 inches (15.2 centimeters) of sand. The top layer of fill was 12 inches (30.5 centimeters) of soil (Rogers 1977).

The absorption beds and shafts are enclosed by a chain-link fence (except the southwest corner of Absorption Bed 1). Within the fenced area, the surface is vegetated with weeds, grasses, chamisa bushes, and two young ponderosa trees (LANL 2004a). MDA T has a downward slope from south to north. Backfilling and grading have added 5 to 6 feet (1.5 to 1.8 meters) of soil to the original surface of the beds, shafts, and the RWSA. The bottoms of the absorption beds are about 9 feet (2.7 meters) below current ground surface (LANL 2004a).

MDA U

MDA U is within a fenced, 0.20-acre (0.08-hectare) site north of Buildings 21-152 and 21-153 in DP East (Figure 6-15). It contains two absorption beds [SWMUs 21-017(a) and (b)], each with a footprint of 1,800 square feet (162 square meters) and a volume of 9,600 cubic feet (272 cubic meters) (LANL 2004a).

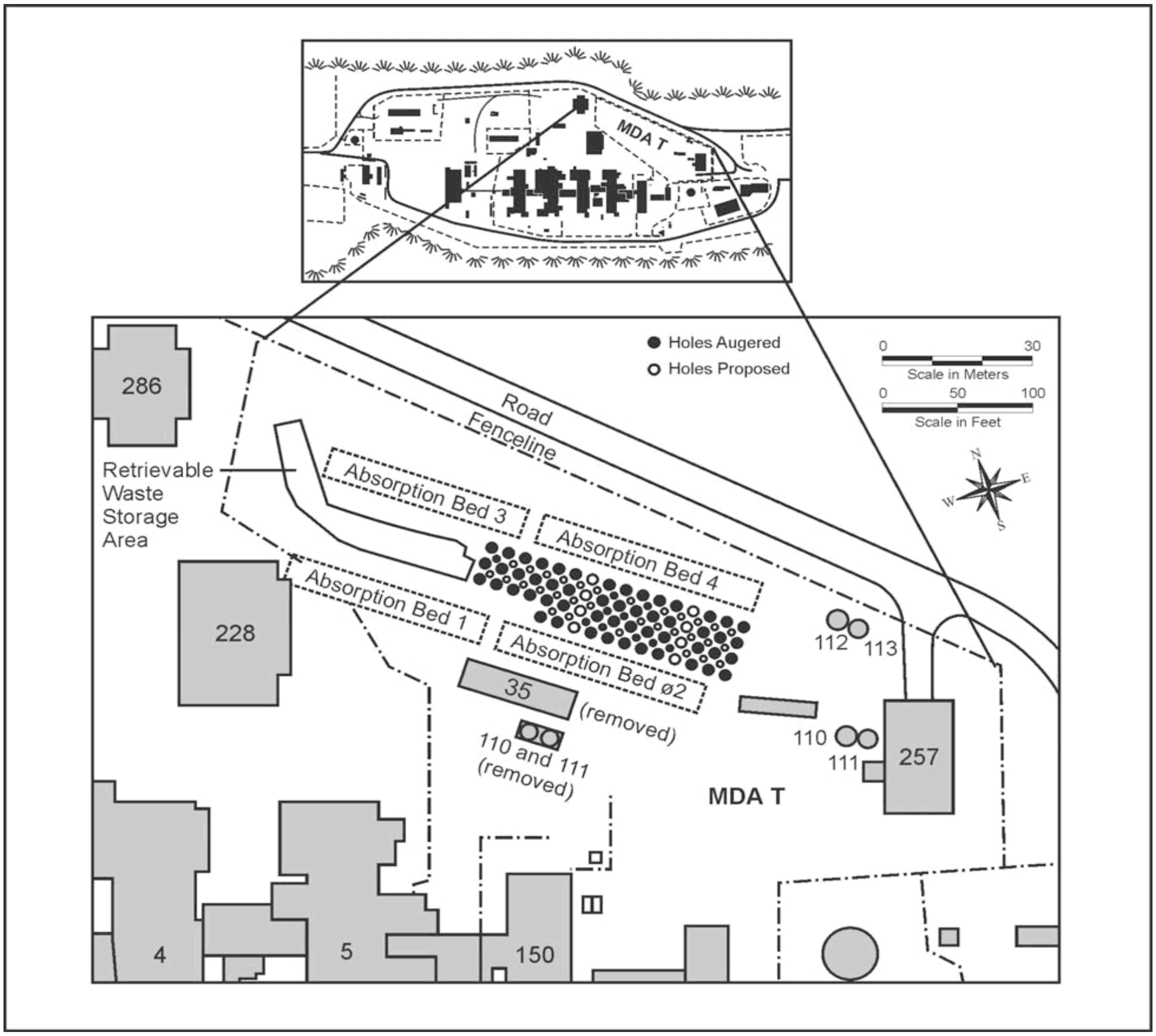


Figure 6-14. MDA T.

The absorption beds were used from 1948 to 1968 for disposal of liquid wastes ("process sewage") (LANL 1991). Each bed was 80 feet by 20 feet by 6 feet (24 meters by 6.1 meters by 1.8 meters) (LANL 2004a). The beds were filled with 24 inches of 5-inch to 10- inch (61 centimeters of 13- to 25-centimeter) diameter cobbles, and overlain by 6 inches (15 centimeters) of gravel and 6 inches (15 centimeters) of fine sand. Covering the sand was 12 inches (30 centimeters) of soil (LANL 2004a). Between the two beds was a distribution box [SWMU 21-017(c)] having lines leading to the beds (LANL1999b). Liquid waste received by the beds included effluent from (LANL 2004a) the following:

- Building 21-152, flowing from sump 21-173 to the distribution box via a pipe;
- Building 21-153, draining directly to the eastern absorption bed; and
- Building 21-155, draining either directly to the western bed or to the beds through the distribution box.

In 1987, ditches were placed along the south fence to prevent run-on; additional topsoil, gravel mulch, and seeds were deposited inside the fence; and brass markers were placed at the corners of the site. Additional collection ditches were excavated in 1990 to prevent runoff from the surrounding area from flowing across MDA U (LANL 1991).

MDA U is a grassy area north of Building 21-209; fenced to the north, east, and west by a security fence, and to the south by an industrial site. Building 21-153 was unused after March 1970 and demolished in 1978. The effluent pipeline from Building 21-153 has been removed, along with the pipeline from sump 173 at Building 21-152. Sump 173 remains (LANL 2004a).

6.5.1.2 Current Levels of Environmental Influence

TA-21 consists of about 312 acres (126 hectares) at the eastern end of DP Mesa, near the central business district of the Los Alamos town site. The airport is located immediately north of TA-21 across DP Canyon. About 20 percent of the technical area has been developed with the west-central portion of the tract containing the majority of development; remaining portions of the technical area consist of sloped areas, some of which would likely not accommodate development. Access to the site is via DP Road. There is significant traffic associated with commercial and industrial businesses on the site. There are permanent light sources outside all the buildings at TA-21 and their associated parking lots.

Although most of TA-21 is within the ponderosa pine forest vegetation zone, the more easterly portion of Los Alamos Canyon is within the piñon-juniper woodland zone (DOE 1999b). Emissions from TA-21 activities include pollutants that have the potential to impact co-located LANL workers and the surrounding community, including radiological emissions from operating facilities and facilities in a state of surveillance and maintenance, and radioactive and non-radiological emissions from buildings and DD&D projects. The proximity of TA-21 to the Los Alamos town site and to the recently transferred “DP Road” tract places all TA-21 emission sources very close to the LANL site boundary and the public. LANL plans, executes, controls, and monitors new and established TA-21 building and activity emissions to ensure worker and public safety and that pollutant levels are within established regulatory limits.

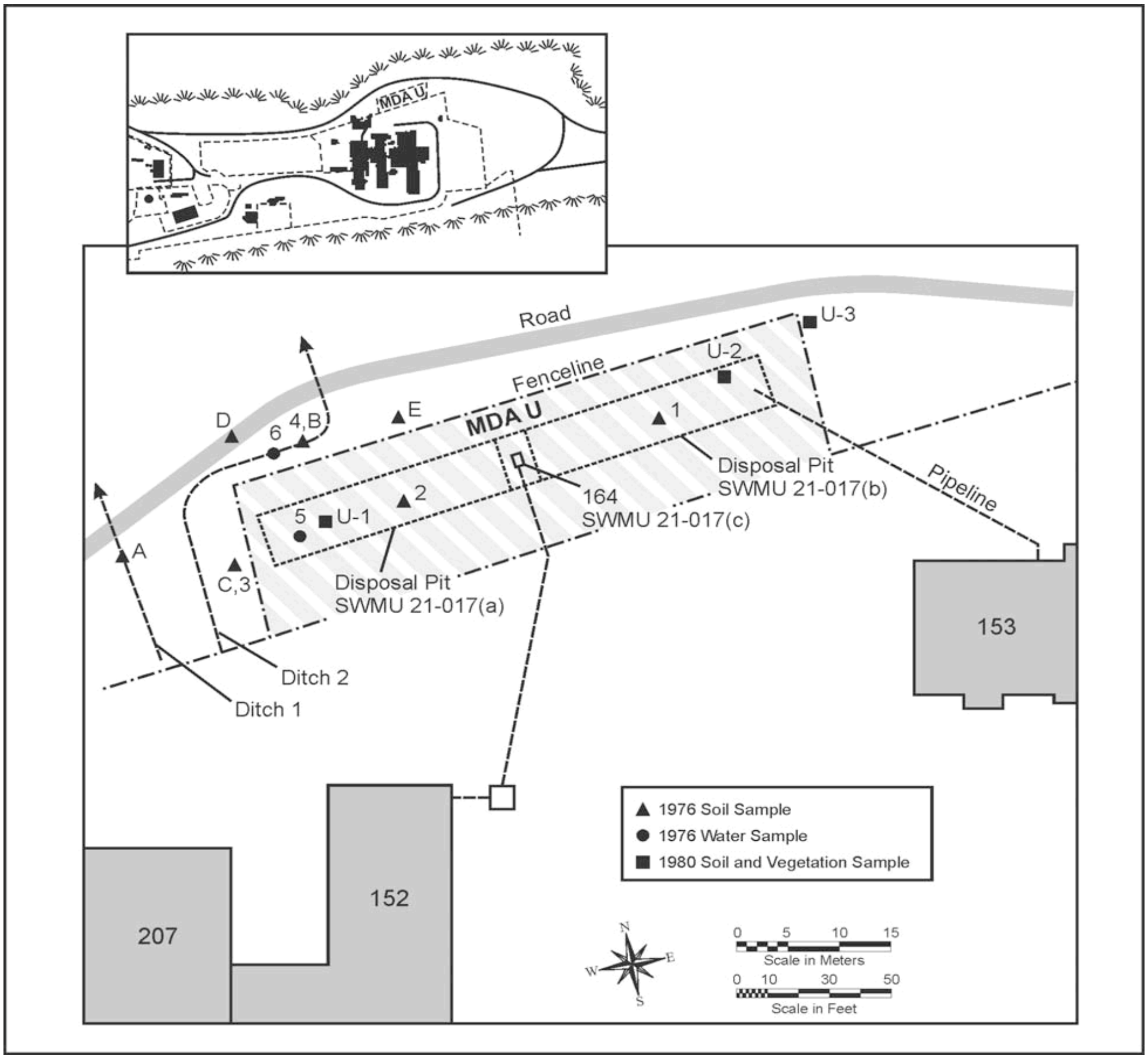


Figure 6-15. MDA U showing pipelines for liquid effluents.

Since the DP West and DP East buildings were constructed in 1945 they have used domestic and industrial water and have discharged cooling water to DP Canyon. Building 21-0227 originally treated TA-21 sewage and industrial wastewater effluents before discharge to DP Canyon. In 1999, this waste stream was rerouted to the TA-50 central wastewater treatment plant. Past soil contamination may impact surface water contamination levels in runoff, contamination migration through the soil, and contamination levels that may be present in the groundwater.

6.5.1.3 Potential Effects of TA-21 MDA Remediation

There will be temporary increases in traffic during remediation of TA-21 MDAs. The Capping and Removal Alternatives may have small impacts on air quality because of increased emissions from heavy equipment. Dust and particulates would be dispersed into the air from grading, earthmoving, and compaction. This could occur at the MDAs being remediated and at locations where sources of capping and fill materials (tuff, rock, etc.) would be excavated.

Removal of the waste and contamination at the MDAs would entail small short-term risks to surface waters but long-term improvement of ground and surface water quality. Industrial equipment would disturb land, disrupting existing covers and causing opportunities for runoff and erosion to transport soil offsite to canyons. Removal of the MDAs would require the import of very large quantities of tuff and surface amendment, some of which could be eroded into canyons. These risks would be reduced and mitigated using storm water best management practices.

The Capping and Removal Alternatives would have increased noise levels at TA-21. Heavy equipment would be used during site preparation and for earthmoving. The noise would depend on the equipment design and its quantity—that is, the scale of operation would depend on the size of the work site. Heavy equipment such as front-end loaders and backhoes would produce intermittent noise levels at 73 to 94 dB(A) at 50 feet (15 meters) from the work site under normal working conditions. Considering physical features, noise levels from this equipment could return to background levels within several hundred feet of the noise source (DOE 2004a).

6.5.1.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is more than 6 miles (9.6 kilometers) from TA-21. The proposed actions will not remove any bald eagle foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have no effect on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI is more than 2.6 miles (4.2 kilometers) from TA-21. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: All of TA-21 is within the Los Alamos Canyon Mexican spotted owl AEI. There would be no habitat loss since the MDAs are located within developed areas. Additional nighttime lighting may be required at some sites.

Heavy equipment will produce noise levels around 80 dB(A). The maximum recorded background noise level for the Los Alamos Canyon AEI is 67 dB(A) and the mean is 56 dB(A) (Vrooman et al. 2000). The proposed actions in this assessment will produce noise in or near the Los Alamos Canyon AEI greater than 6dB(A) of background.

Delaney et al. (1999) found that Mexican spotted owls in south-central New Mexico did not flush when mechanical noise stimuli (helicopters and chain saws) were greater than 345 feet (105 meters) away. Swarthout and Steidl (2001) examined the response of Mexican spotted owl to recreational hikers, and found that juveniles and adults were unlikely to flush at distances greater than or equal to 40 feet (12 meters) and 80 feet (24 meters), respectively. At distances greater than or equal to 180 feet (55 meters), neither age class was likely to alter its behavior in response to the presence of a hiker.

Reasonable and Prudent Alternatives: See Appendix B.

Assessment Decision: No suitable foraging or nesting habitat will be lost as a result of the proposed action. Predicted noise levels from the proposed project are likely to exceed 6 dB(A) above background. Current levels of disturbance are extensive and reduce the overall quality of the habitat in this area. Adjacent areas of DP Mesa have been transferred to Los Alamos County for the purpose of development, and a “take” was approved by the USFWS for these areas (Consultation #2-22-01-F-634). Therefore, even more disturbance and development of undeveloped areas is planned in the near future on DP Mesa. Mexican spotted owls have not been recorded in Los Alamos Canyon during 11 years of surveys (1994 to 2005). If an owl is found before construction begins, the USFWS will be contacted and consultation reinitiated if needed. If all reasonable and prudent alternatives are implemented, the TA-21 MDA Remediation Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.5.2 DD&D of TA-21

6.5.2.1 Project Description

TA-21 covers about 312 acres (126 hectares) at the northern portion of LANL adjacent to the Los Alamos Airport, principally on DP Mesa. It contains a total of about 65 buildings and structures with a cumulative area of 239,000 square feet (22,200 square meters). The central area of TA-21 consists of groups of buildings and support facilities divided into two areas known as the DP East and DP West sites (sometimes collectively referred to as the "DP Site"). The DP Site was built late in the Manhattan Project, in 1945, as the principle plutonium processing facilities. Buildings at DP West were used for plutonium recovery, precipitation, conversion, purification, reduction, metal casting and machining, and liquid radioactive waste treatment. Later they were converted for research on uranium hydride, enriched uranium fuel elements, and plutonium fuels service and development. During the 1970s, LANL transferred the process activities from DP West to facilities at TA-55 and removed all remaining process equipment; in 1996 large portions of two of the buildings, 21-0003 and 21-0004, were demolished.

DP East buildings supported polonium and actinium initiator research and production, research on coatings of reactor fuels for the Rover Program, and tritium research and technology. The final TA-21 processing activities, tritium handling, processing, and storage at DP East, will be transferred offsite or to the Weapons Engineering Tritium Facility at TA-16, or phased out by the end of 2006. After supporting the deactivation of the DP East buildings, the TA-21 Liquid Radioactive Waste Treatment Facility will itself be deactivated. The remainder of TA-21 surrounds the DP East and DP West sites and includes a number of infrastructure and support buildings and structures.

There are a large number of aging buildings in TA-21 that are surplus to future LANL needs. Since the 1999 SWEIS, all activities associated with the NNSA missions have been relocated to other buildings at LANL or offsite locations or have been discontinued. With their missions consolidated elsewhere, these buildings have been prioritized within the queue of buildings awaiting DD&D as part of LANL's program to reduce the surveillance and maintenance cost necessary to protect workers, the public, and the environment.

In addition to the general need to eliminate inactive legacy buildings and their associated overhead and maintenance cost, LANL must remove many of these buildings to support the investigations of SWMUs identified under the Consent Order. Some of these SWMUs lie underneath buildings and slabs or are associated with past activities at the buildings. In addition, the TA-21 Liquid Radioactive Waste Treatment Facility is within the boundary of MDA T, and LANL must remediate and manage the land associated with the building as part of that corrective action. The Consent Order requires that all corrective actions within the Los Alamos/Pueblo watershed be completed by 2011.

Finally, TA-21 has been designated as an area with potential for reuse under Public Law 105- 119. The area is adjacent to the Los Alamos town site and the airport and is not currently planned for conveyance or transfer to either Los Alamos County or the Department of Interior in trust for the San Ildefonso Pueblo due to residual contamination. It is, however, the subject of substantial planning effort to identify options for reuse after remedial actions are complete.

Under the proposed action, LANL would DD&D all structures located within the boundaries of TA-21, including process buildings, administrative and logistics buildings, and support facilities. This will include the DD&D of infrastructure such as gas, water, and waste piping, electrical and communication lines, fences, and similar materials and equipment. LANL would schedule DD&D activities to support the investigation and corrective actions required under the Consent Order. At LANL's discretion, the DD&D of buildings and structures that may have an interim use, such as the steam plant and piping and administrative and logistics facilities, could be deferred.

The proposed action would remove approximately 127 buildings and structures totaling approximately 271,000 square feet (25,177 square meters). It would generate approximately 35,000 cubic yards (26,760 cubic meters) of radioactive waste, 49,000 cubic yards (37,463 cubic meters) of nonradioactive waste, and would require on the order of 270,000 person hours of DD&D effort. It would directly affect an area of approximately 55 acres (22 hectares) and selected satellite locations in TA-21, including grading and revegetation, although this would overlap with areas remediated as part of the Consent Order.

6.5.2.2 Current Levels of Environmental Influence

TA-21 consists of about 312 acres (126 hectares) at the eastern end of DP Mesa, near the central business district of the Los Alamos town site. The airport is located immediately north of TA-21 across DP Canyon. About 20 percent of the technical area has been developed with the west-central portion of the tract containing the majority of development; remaining portions of the technical area consist of sloped areas, some of which would likely not accommodate development. Access to the site is via DP Road. There is significant traffic associated with commercial and industrial businesses on the site. There are permanent light sources outside all the buildings at TA-21 and their associated parking lots.

Although most of TA-21 is within the ponderosa pine forest vegetation zone, the more easterly portion of Los Alamos Canyon is within the piñon-juniper woodland zone (DOE 1999b). Emissions from TA-21 activities include pollutants that have the potential to impact co-located LANL workers and the surrounding community, including radiological emissions from operating facilities and facilities in a state of surveillance and maintenance, and radioactive and non-radiological emissions from buildings and DD&D projects. The proximity of TA-21 to the Los Alamos town site and to the recently transferred "DP Road" tract places all TA-21 emission sources very close to the LANL site boundary and the public. LANL plans, executes, controls, and monitors new and established TA-21 building and activity emissions to ensure worker and public safety and that pollutant levels are within established regulatory limits.

Since the DP West and DP East buildings were constructed in 1945 they have used domestic and industrial water and have discharged cooling water to the DP Canyon. Building 21-0227 originally treated TA-21 sewage and industrial wastewater effluents before discharge to DP Canyon. In 1999 this waste stream was rerouted to the TA-50 central wastewater treatment plant. Past soil contamination may impact surface water contamination levels in runoff, contamination migration through the soil, and contamination levels that may be present in the groundwater.

6.5.2.3 Potential Effects of Project

Under the proposed action the air emissions from operational activities would either relocate or cease as the operations are relocated and the buildings demolished. There would be temporary increases in traffic, vehicle exhaust, and fugitive dust during the actual building demolition. Initial air emissions from TA-21 would be similar to current emissions. The nonradioactive air pollutant emissions from the three natural gas fired boilers in Building 21-

0357 would be eliminated. Vehicle exhaust and emissions from activities in the maintenance and support facilities would be expected to follow these functions to their new location within LANL. The emissions from the laboratory and the Liquid Radioactive Waste Treatment Facility use of various toxic chemicals, already reduced during deactivation, would be eliminated as the process buildings are placed into surveillance and maintenance status and subsequently demolished.

The potential exists for contaminated soils, building debris, and possibly other media to be disturbed during building demolition. Release of radioactivity would be minimized by proper decontamination of buildings before demolition—if facilities are decontaminated to unconditional release levels, emissions would be similar to those from uncontaminated buildings. If residual levels of contamination remain after decontamination activities are complete, then small amounts of radioactivity would be emitted during demolition. The radionuclide concentrations resulting from demolition of contaminated facilities may be predicted based on the pre-demolition characterization of the building and would be addressed in regulatory documents approved at that time. Such emissions are typically of short duration and are minimized using dust suppression techniques and monitored along with the fugitive dust.

The proposed action would not result in the disturbance of watercourses or generation of liquid effluents that would be released to the surrounding environment. Silt fences, hay bales, or other appropriate best management practices would be employed (as described in storm water pollution prevention plans) to ensure that fine particulates are not transported by storm water or water used in dust suppression into surface water features in DP or Los Alamos canyons. Potable water use at the site would be limited to that necessary for equipment washdown, dust control, and sanitary facilities for workers. Impacts of DD&D activities on groundwater should be minimal, given use of surface water collection practices, especially in comparison to the environmental restoration impact from the ECR Project activities to comply with the Consent Order. Any final contouring of industrial areas and subsequent soil stabilization would be in conjunction with remediation activities necessary for the Consent Order compliance. Groundwater profiling and any actions required to remediate past spills would also be the responsibility of the TA-21 remediation activities.

The TA-21 DD&D project would increase noise impacts. Heavy equipment would be used during site preparation and for earthmoving. The noise would depend on the equipment design and its quantity—that is, the scale of operation would depend on the size of the work site. Heavy equipment such as front-end loaders and backhoes would produce intermittent noise levels at 73 to 94 dB(A) at 50 feet (15 meters) from the work site under normal working conditions. Considering physical features, noise levels from this equipment could return to background levels within several hundred feet of the noise source (DOE 2004).

6.5.2.4 Threatened and Endangered Species Assessments

All DD&D activities would take place within the industrial area of TA-21, which contains little wildlife habitat. Wildlife in canyons adjacent to TA-21 could be intermittently disturbed by construction activity and noise over the demolition period when heavy equipment would be used to raze structures, remove building foundations and buried utilities, excavate contaminated soil, and transport wastes to disposal sites. Demolition-related disturbances to wildlife are expected to be intermittent and localized. Upon DD&D of the buildings and structures within TA-21, the site would be contoured and revegetated. However, revegetation would have only relatively short-term benefits to wildlife since it is likely that the area would be developed in the future.

Bald Eagle

Project Impacts: The proposed actions will not remove any bald eagle foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have <u>no effect</u> on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI is more than 2.6 miles (4.2 kilometers) from TA-21. The proposed actions will not remove any southwestern willow flycatcher foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have <u>no effect</u> on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: All of TA-21 is within the Los Alamos Canyon Mexican spotted owl AEI. Since the area is currently developed, there would be no habitat loss as a result of these activities.

Heavy equipment will produce noise levels around 80 dB(A). The maximum recorded background noise level for the Los Alamos Canyon AEI is 67 dB(A) and the mean is 54 dB(A) (Vrooman et al., 2000). The proposed actions in this assessment will produce noise in or near Mexican spotted owl habitat in the Los Alamos Canyon AEI greater than 6dB(A) of background. Additional nighttime lighting may also be required to complete project activities.

Delaney et al. (1999) found that Mexican spotted owls in south-central New Mexico did not flush when mechanical noise stimuli (helicopters and chain saws) were greater than 345 feet (105 meters) away. Swarthout and Steidl (2001) examined the response of Mexican spotted owl to recreational hikers, and found that juveniles and adults were unlikely to flush at distances greater than or equal to 40 feet (12 meters) and 80 feet (24 meters), respectively. At distances greater than or equal to 180 feet (55 meters), neither age class was likely to alter its behavior in response to the presence of a hiker.

Reasonable and Prudent Alternatives: See Appendix B.

Assessment Decision: No suitable foraging or nesting habitat will be lost as a result of the proposed action. Predicted noise levels from the proposed project are likely to exceed 6 dB(A) above background. Current levels of disturbance are extensive and reduce the overall quality of the habitat in this area. Adjacent areas of DP Mesa have been transferred to Los Alamos County for the purpose of development, and a “take” was approved by the USFWS for these areas (Consultation #2-22-01-F-634). Therefore even more disturbance and development of undeveloped areas is planned in the near future on DP Mesa. Mexican spotted owls have not been recorded in Los Alamos Canyon for 11 years of surveys (1994 to 2005). If an owl is found before construction begins, the USFWS will be contacted and consultation reinitiated if needed. If all reasonable and prudent alternatives are implemented, the TA-21 DD&D Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.6 Water Canyon

6.6.1 DynEx Assembly Chamber

6.6.1.1 Project Description

LANL is proposing to build a DynEx assembly chamber at TA-15 (Figure 6-16). This facility will be located directly west of the DARHT facility. In addition, a staging area will be located in a developed area near the DARHT Access Control facility farther west. The new structure will be used for assembling components into hydrodynamic test assemblies and doing radiographic examination of the assemblies before dynamic experimentation. Currently, test components are assembled in TA-16 and are then transported to TA-8 for radiographic examination, after which they are transported to the firing site in TA-15. The proposed structure to be located at TA-15 is designed to minimize risks associated with transportation of test assemblies and to contain any explosions that occur during the assembly of test components. The structure would be brought to the LANL site in sections for assembly adjacent to the DARHT firing site in TA-15.

6.6.1.2 Current Levels of Environmental Influence

The proposed DynEx Assembly Chamber is within developed and undeveloped land in TA-15. Current disturbances associated with the site include the DARHT facility and associated roads and parking areas. There is also some trail use in the project area. The Cerro Grande Fire burned the project area lightly. There are several existing paved and dirt roads throughout the project area as well as utility corridors.

There are PRSs within the project boundary. Plans for this action include the following: adjacent PRSs will be avoided where possible; those that cannot be avoided will be cleaned up or paved/covered over, or the soil will be put back in place following the trenching operation. Contamination control measures will be employed during all of the phases of the activities. This should prevent any release or exposure of contaminants during or after the construction period. No significant air quality problems are known for the proposed project area.

There are not any known surface water/soil erosion problems associated with the proposed project site. However, significant and permanent storm water protection measures will be put in place to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is riparian vegetation along the streambeds of the adjacent canyons but not areas of wetlands. There are areas of floodplain along the canyon bottoms adjacent to the project area.

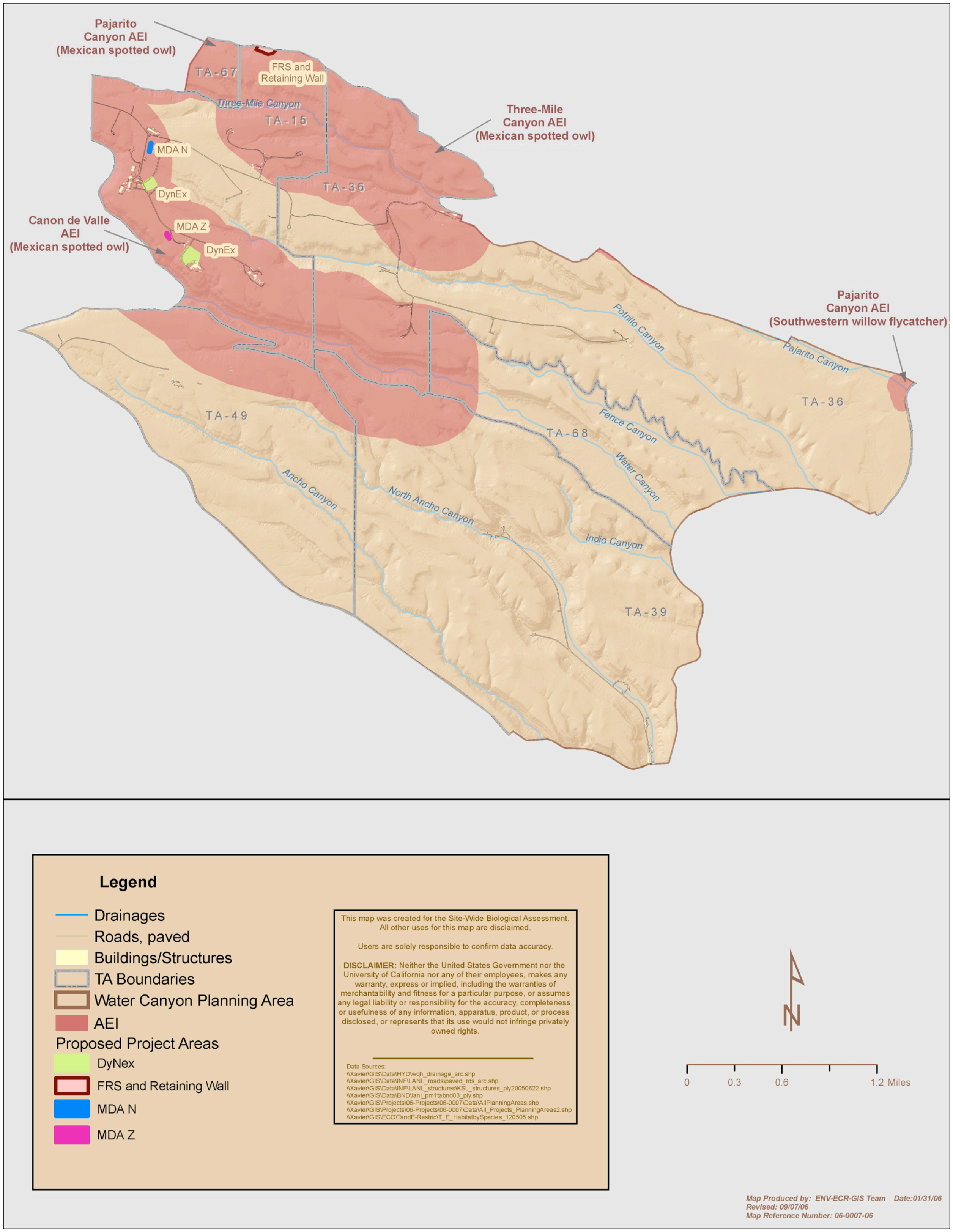


Figure 6-16. Proposed project areas in Water Canyon.

Areas adjacent to developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). For all of the Cañon de Valle AEI, the mean background noise level was 46 dB(A), ranging from 33.4 to 62.8 dB(A) (Vrooman et al., 2000). Current lighting on the site is associated with existing buildings and passing vehicles.

6.6.1.3 Potential Effects of Project

The proposed project is within developed and undeveloped areas. There will be an increase in traffic volume as a result of project activities. Heavy equipment may be used during the clean up of PRSs and facility construction for this proposed action.

No contaminant problems should result from the proposed DynEx Project. Any contamination sources in these areas should not be more accessible to wildlife and groundwater following this action. All areas of contamination will be avoided or cleaned up during the project activities. There will be a temporary increase in emissions and dust from the use of heavy equipment in the project activities. No long-term reduction in air quality will result from the project.

Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices (LANL 1998). Disturbed soils should be stabilized, during and after construction, to prevent erosion

The prefabricated DynEx structures will be transported to the site and assembled. Elevated levels of noise will occur with the use of heavy equipment for site preparation and assembly. Changes in noise levels will be temporary.

Vehicle traffic on adjacent roads and highways and LANL buildings are the primary sources of artificial light. Lights used during construction of the proposed project will be directed away from canyons.

6.6.1.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is not near the proposed project site. However, all of LANL is considered potential bald eagle foraging area and there will be some habitat degradation associated with the project. Reasonable and prudent alternatives should be followed to protect adjacent foraging habitat from detrimental cumulative effects.

Reasonable and Prudent Alternatives: See Appendix A.

Assessment Decision: Although the project site is not within the bald eagle AEI, there is the potential for the loss of foraging habitat. For this reason, the project may affect, but is not likely to adversely affect, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The proposed DynEx Project is not within or upstream of the southwestern willow flycatcher AEI, consequently, the proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting habitat loss and no potential for habitat degradation associated with the DynEx Project. Therefore, this project will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The proposed DynEx Project is within the Cañon de Valle Mexican Spotted Owl AEI (see Figure 6-16). The proposed project will not remove potentially suitable nesting or roosting habitat. The project will potentially exceed the HMP restriction on construction noise of greater than 6 dB(A) above background in the breeding season (March 1 to August 31) . However, LANL will continue to perform annual presence/absence surveys adjacent to the project area before and during the action.

As a result of this action, up to 2.1 acres (0.9 hectare) of habitat from the Cañon de Valle AEI could be developed based on an anticipated disturbance footprint associated with the project area. A majority of the area is on the mesa adjacent to Cañon de Valle and contains ponderosa pine woodland.

In order to more accurately assess the impact of the proposed project on the Mexican spotted owl, we have modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area. Although the proposed project could affect habitat suitability in the AEI, the AEI is not composed entirely of nesting habitat, but is a mixture of nesting, roosting, foraging, and unused habitat. If the habitat within the impact area of the DynEx Project is of lower or equal nesting quality relative to other habitat within the AEI, it is unlikely that the owls would be denied access to adequate nesting habitat.

Estimates of sound levels from construction equipment range from 82 dB(A) to 91 dB(A) at 50 feet (15 meters) (Knight and Vrooman 1999).

Assuming a maximum of 91 dB(A) at 50 feet (15 meters), other estimates of sound levels are 81 dB(A) at 100 feet (30 meters), 74 dB(A) at 200 feet (60 meters), and 91 dB(A) at the edge of the developed area, where estimated background levels are estimated at 46 dB(A). The project area is directly adjacent to undisturbed habitat. These noise levels are more than 6 dB(A) above background and could exceed HMP noise level restrictions if construction occurs during breeding season and Mexican spotted owls are present.

Reasonable and Prudent Alternatives: See Appendix B with the addition below.

- Once surveys have been completed the proposed activities can take place unless the nesting Mexican spotted owl is within 1,320 feet (400 meters) of the activities and, in that case, the activities must be delayed until September 1 of that year. Every effort will be made to complete work before February 28 of the following year.

Assessment Decision: No nesting or roosting habitat will be lost or compromised as a result of the proposed action. Predicted noise levels from the proposed project may exceed the limits set in the HMP [6 dB(A) above background]. Noise generated from construction activities should attenuate to below HMP limits within 1,320 feet (400 meters) of the construction site. No activity will take place before occupancy is determined or within 1,320 feet (400 meters) of a nest site if the AEI is occupied. If all reasonable and prudent alternatives are implemented, the DynEx Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.6.2 MDAs N and Z Remediation

6.6.2.1 Project Description

LANL is proposing to clean up two legacy landfill areas at TA-15, MDAs N and Z. MDA N [also labeled as PRS 15-007(a)] is a 0.28-acre (0.11-hectare) site located at an elevation of 7,280 feet (2,184 meters). MDA N is a pit containing remnants of structures from R Site that had been exposed to explosive or chemical contamination. Opened in 1962, MDA N may have received waste from demolishing the control room and darkroom (Building 15-7) used to support Firing Point C (and probably D) (LANL 1993). A 1965 aerial photograph showed it to be closed (LANL 2005b). The pit is covered and vegetated (LANL 1999b). A 1989 aerial survey did not detect radioactive materials. It is unknown how photographic chemicals were disposed. Building

15-7, containing the darkroom, had no known connection to the septic tank (TA-15-80) supporting Building TA-15-1 (LANL 1993).

MDA Z is south of the side road leading to Building TA-15-233 near Firing Site G. The site elevation is 7,220 feet (2,166 meters), and the distance to groundwater is 1,200 feet (360 meters). MDA Z is teardrop-shaped and measures 200 feet (60 meters) by 50 feet (15 meters) at its widest, within a site covering 0.4 acre (0.16 hectare). The MDA was used between 1965 and 1981 for disposal of construction debris, including cement and rebar, used concrete bags, steel blast mats from PHERMEX, and other debris. The waste was placed in a natural depression. The concrete-filled sandbags at the site were probably piled as a retaining wall. One face of the MDA grades to native soil; the other face is exposed, standing 15 feet (4.5 meters) high. The debris on the exposed face was probably bulldozed from PHERMEX. Contaminants include metals from wire and blast mats, VOCs or semivolatile organic compounds from charred wood, road and construction debris, and radioactive substances (e.g., from the blast mats) (LANL 1993; 1999b). One reference states that chunks of uranium are visible (LANL 1999b), although a 1982 aerial radiological survey detected no radioactive contamination above background values (LANL 1993).

A Phase I investigation conducted from June 1995 to March 1996 collected surface and subsurface samples. Inorganic chemicals found above background values were beryllium, copper, lead, mercury, and silver. No inorganic chemicals were found above SALs. Uranium was found above its SAL with a maximum concentration of 349 milligrams per kilogram. Twelve organic chemicals were found. Benzo(a)anthracene exceeded its SAL in two samples, and benzo(a)pyrene and benzo(b)fluranthene exceeded SALs in one sample. The investigation report recommended material removal following a baseline ecological risk assessment (LANL 2005b).

Because MDAs contain contamination mainly in the subsurface, two broad-scope remediation options can be envisioned: either stabilize in place or remove. Although there may be several variations or suboptions to be addressed in future analyses, these two options should bracket the environmental benefits and detriments that may be anticipated. The choice of remediation type depends on investigation results and health and ecological risks. Either type of remediation will reduce the availability of contaminants to wildlife species. The types of remediation actions that will be taken for MDAs N and Z have not yet been determined. Those decisions will be made in consultation with the NMED. Any remediation option will involve excavation, use of heavy equipment, and, potentially, disturbance of undeveloped areas.

6.6.2.2 Current Levels of Environmental Influence

The proposed MDA N&Z Projects are within developed and undeveloped land in TA-15 at LANL. Current disturbances associated with the site include the DARHT facility and associated roads and parking areas. General traffic volumes are expected to increase during construction and following these upgrades. Heavy equipment will be used during the clean up for this proposed action. The Cañon de Valle AEI area is relatively undeveloped with the exception of the clustered facilities. There is also some trail use in the project area. Thinning in the sensitive habitat around this area had only trees less than 8 inches (20 centimeters) in diameter removed in the AEI. There are several existing paved and dirt roads throughout the project area as well as utility corridors.

There are PRSs within the project boundary. Contamination control measures will be employed during all of the phases of the activities. This should prevent any release or exposure of contaminants during or after the site remediations. The project locations are within Mexican spotted owl potential nesting and foraging areas. Preliminary risk assessments of potential contaminant impacts to the Mexican spotted owl have been completed (Gallegos et al., 1997). In general, results indicate no appreciable impact to the Mexican spotted owl (Gonzales et al., 1997).

No significant air quality problems are known for the proposed project area. There are not any known surface water/soil erosion problems associated with the proposed project site. However, significant and permanent storm water protection measures will be put in place to protect the canyons and surrounding mesa from uncontrolled runoff and erosion. There is riparian vegetation along the streambeds of the adjacent canyons but not areas of wetlands. There are areas of floodplain along the canyon bottoms adjacent to the project area.

Areas adjacent to developed areas or paved roads are likely to have daytime average background noise levels between 40 and 63 dB(A). For all of the Cañon de Valle AEI the mean background noise level was 46 dB(A), ranging from 33.4 to 62.8 dB(A) (Vrooman et al., 2000). Current lighting on the site is associated with existing buildings at LANL technical areas and passing vehicles.

6.6.2.3 Potential Effects of Project

The proposed project is within developed and undeveloped areas. There will be an increase in traffic volume as a result of project activities and overall operational traffic volume will increase following the upgrades. Heavy equipment use normally not associated with commercial activity is expected to increase. Following the construction the majority of increases will return to normal.

No contaminant problems should result from the proposed MDA N&Z Project. Any contamination sources in these areas should not be more accessible to wildlife and groundwater following this action. All areas of contamination will be cleaned up or stabilized during the project activities

There will be a temporary increase in emissions and dust from the use of heavy equipment in the project activities. No long-term reduction in air quality will result from the project. Surface water quantity and quality and soil erosion issues associated with construction activities will be addressed through proper implementation of watershed best management practices (LANL 1998a). Disturbed soils should be stabilized, during and after construction, to prevent erosion. There is riparian vegetation associated with the stream channels north and south of the proposed project sites. The riparian and floodplain areas adjacent to the project area will need to be protected during and following the action.

The LANL HMP prohibits noise levels greater than 6 dB(A) above background during sensitive periods for bald eagle (November 1–March 31), Mexican spotted owl (March 1–August 31), and southwestern willow flycatcher (May 15–September 15) in AEI habitats. This project will not be able to operate under these timing restrictions and an assessment of background noise, and potential noise generated during similar construction activities, suggests that noise levels would exceed the HMP limits.

Vehicle traffic on adjacent roads and highways and LANL buildings are the primary sources of artificial light. Lights used during implementation of the proposed project will be directed away from canyons.

6.6.2.4 Threatened and Endangered Species Assessments

Bald Eagle

Project Impacts: The bald eagle AEI is not near the proposed project site. The proposed actions will not remove any bald eagle foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these actions. The proposed actions will have <u>no effect</u> on the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The proposed MDA N&Z Project is not within or upstream of the southwestern willow flycatcher AEI, consequently, the proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting habitat loss and no potential for habitat degradation associated with the MDA N&Z Project. Therefore, this project will have <u>no effect</u> on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The proposed MDA N&Z Project is within areas of the Cañon de Valle Mexican spotted owl AE (see Figure 6-16). The proposed project will not remove potentially suitable nesting or roosting forest habitat. The project will potentially exceed the HMP restriction on construction noise of greater than 6 dB(A) above background in the breeding season (March 1 to August 31) unless current surveys show that no owls are present. However, LANL will continue to perform annual presence/absence surveys adjacent to the project area before and during the action.

As a result of this action, up to 2 acres (0.8 hectare) of vegetation from the Cañon de Valle AEI could be disturbed. A majority of the area is on the mesa adjacent to Cañon de Valle and, although previously disturbed, contains some native grass and shrub vegetation.

In order to more accurately assess the impact of the proposed project on the Mexican spotted owl, we have modeled the potential extent of noise disturbance and evaluated the existing disturbances and habitat suitability within the project area.

For all of the Cañon de Valle AEI, the mean background noise level was 46 dB(A), ranging from 33.4 to 62.8 dB(A) (Vrooman et al., 2000). Estimates of sound levels from construction equipment range from 82 dB(A) to 91 dB(A) at 50 feet (15 meters) (Knight and Vrooman 1999).

Assuming a maximum of 91 dB(A) at 50 feet (15 meters), other estimates of sound levels are 81 dB(A) at 100 feet (30 meters), 74 dB(A) at 200 feet (60 meters), and 91 dB(A) at the edge of the MDA Z, where estimated background levels are estimated at 46 dB(A). MDA Z is directly adjacent to undisturbed habitat. MDA N is located 541 feet (162 meters) from the boundary. The estimated noise level at the boundary is 63 dB(A) for this MDA. These noise levels are more than 6 dB(A) above background and could exceed HMP noise level restrictions if construction occurs during breeding season and Mexican spotted owls are present.

Reasonable and Prudent Alternatives: See Appendix B with the following addition.

- Once surveys have been completed the proposed activities can take place unless the nesting Mexican spotted owl is within 0.25 mile (400 meters) of the activities and, in that case, the activities must be delayed until September 1 of that year.

Assessment Decision: No suitable habitat will be lost or compromised as a result of the proposed action. Predicted noise levels from the proposed project may exceed the limits set in the HMP [greater than 6 dB(A) above background]. Noise generated from construction activities should attenuate to below HMP limits within 0.25 mile (0.40 kilometer) of the construction site. No activity will take place before occupancy is determined or within 0.25 mile (0.40 kilometer) during the breeding season once a nest area has been determined. If all reasonable and prudent alternatives are implemented, the MDA N&Z Project may affect, but is not likely to adversely affect, the Mexican spotted owl.

6.7 Rio Grande Corridor

6.7.1 MDA D Remediation

6.7.1.1 Project Description

MDA D [PRS 33-003(a) and (b)] is on the east end of the TA-33, 1.8 miles (2.9 kilometers) from the guard station (Figure 6-17)(Rogers 1977). The elevation of the MDA is

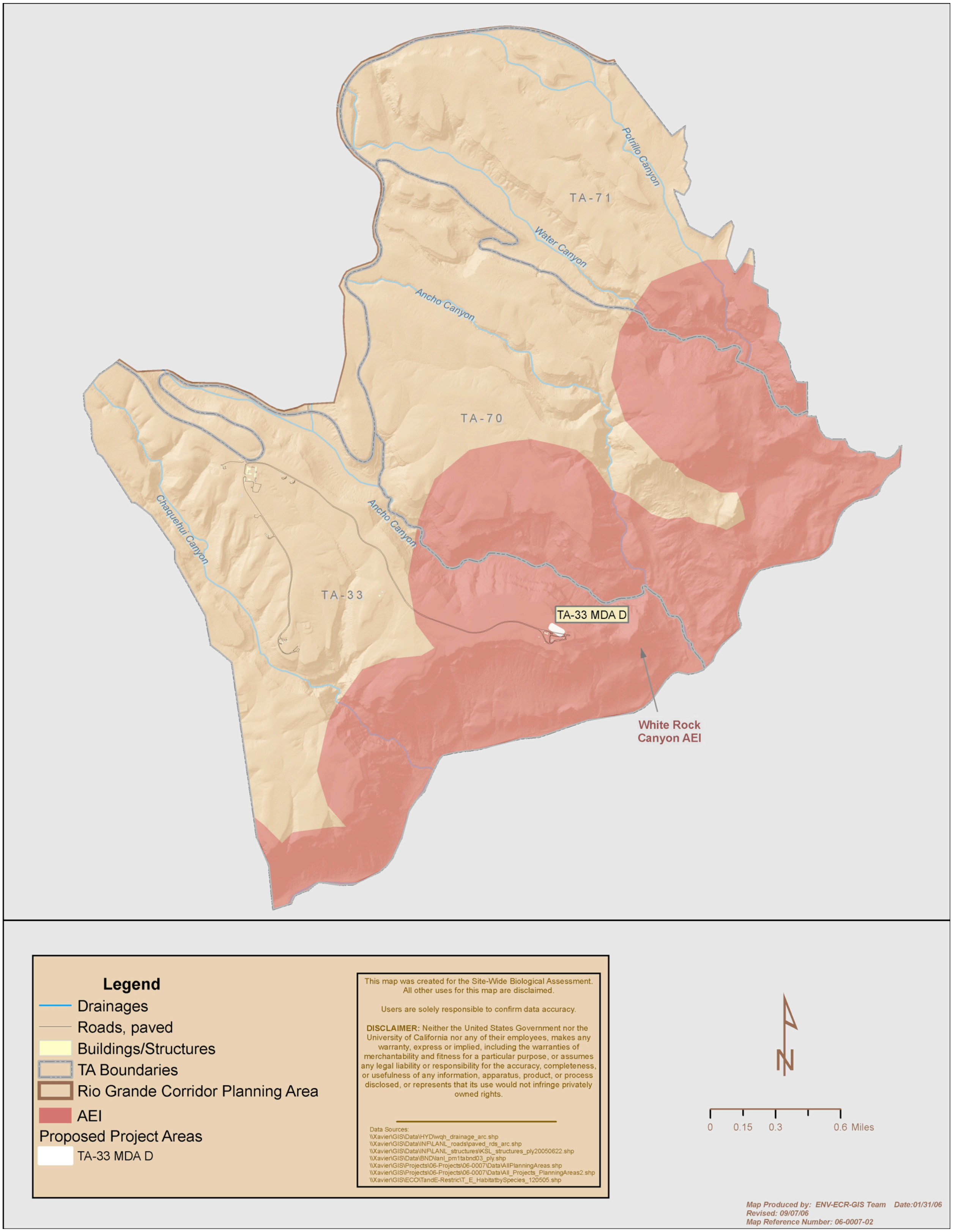


Figure 6-17. Proposed project areas in the Rio Grande planning area.

6,500 feet (1,980 meters), and the depth to groundwater is 910 feet (277 meters). Runoff may drain either to the Ancho Canyon watershed or directly into White Rock Canyon (LANL 1999b).

MDA D consists of two underground chambers: TA-33-4 [PRS 33-003(a)] and TA-33-6 [PRS 33-003(b)]. Built in 1948, the chambers were octagonal (18 feet by 18 feet by 11 feet [5.5 meters by 5.5 meters by 3.4 meters] high), with the tops of the chambers 30 feet (9.1 meters) below grade. Access was via a 4 by 6 by 46 feet (1.2 meters by 1.8 meters by 14 meters) deep elevator shaft shored with timbers (Rogers 1977). The chambers were used for initiator tests using polonium-210 (138-day half-life), milligram quantities of beryllium, and large quantities of high explosives. Chamber TA-33-4 was used once in 1948. Chamber TA-33-6 was used in 1948 and April 1952. The April 1952 test destroyed the chamber. Debris ejected into the air spread over the mesa. The 10-foot- (3-meter-) deep crater around the chamber was filled with recovered debris and covered with soil (LANL 1999b).

The 1977 report by Rogers summarizes information indicating that the underground chambers may be contaminated with explosive residue, uranium-235, and possibly trace amounts of other uranium isotopes, polonium, and cobalt-60 (Rogers 1977).

A 1995 Phase I investigation report for the MDA recommended No Further Action for SWMU 33-003(a) because no release to the environment was apparent. A 1997 Phase I report recommended No Further Action for SWMU 33-003(b). The report recommended deferring evaluating ecological risks until a risk method had been developed (LANL 2005b).

Because MDAs contain contamination mainly in the subsurface, two broad-scope remediation options can be envisioned: either stabilize in place or remove. Although there may be several variations or suboptions to be addressed in future analyses, these two options should bracket the environmental benefits and detriments that may be anticipated. The choice of remediation type depends on investigation results and health and ecological risks. Either type of remediation will reduce the availability of contaminants to wildlife species. The types of remediation actions that will be taken for MDA D have not yet been determined. Those decisions will be made in consultation with the NMED. Any remediation option other than No Further Action will involve excavation, use of heavy equipment, and, potentially, disturbance of undeveloped areas. Work to be done at MDA D includes further characterization and possible remediation.

6.7.1.2 Current Levels of Environmental Influence

MDA D is adjacent to underground bunkers currently being refurbished for laboratory space (Consultation #2-22-05-I-0113). The MDA is located in a small, developed area surrounded by undeveloped habitat in TA-33. Current disturbances include occasional use of the area by LANL personnel and construction work associated with the bunker refurbishment. There is a paved road to the bunker area and some dirt roads in the immediate vicinity. The area has been used to store currently unused equipment. The area is not open to public access.

No significant air quality problems are known for these project sites. There are no known wetlands associated with these project sites. Areas adjacent to developed areas are likely to have daytime average background noise levels between 40 and 63 dB(A). The average daytime background noise level at the edge of the habitat boundary of the White Rock Canyon bald eagle AEI was approximately 37 dB(A), with background levels ranging from 28.2 dB(A) to 45.7 dB(A) measured at 15 different points along the AEI boundary (Vrooman et al., 2000). There is existing lighting associated with the buildings in the vicinity of MDA D.

6.7.1.3 Potential Effects of Project

There will be temporary increases in traffic with the characterization and remediation of MDA D. There will be temporary increases in air emissions from equipment and vehicle operations. There will be temporary increases in noise levels from the site characterization equipment to be used at MDA D. A typical piece of equipment used in site characterization is a drilling rig. An estimated noise level for operation of a drilling rig is 85 dB(A) at 50 feet (15 meters).

The estimated noise level at the canyon edge to the east from the drilling rig across flat ground on a soft site was calculated to be 59.1 dB(A). There will not be any increased light emissions at this site.

6.7.1.4 Assessments for Species Included in the HMP

Bald Eagle

Project Impacts: MDA D is located in developed habitat for the bald eagle. The noise calculations in this assessment show that noise levels in adjacent undeveloped habitiat will be elevated more than 6 dB(A) of background from heavy equipment operations for the duration of the characterization and remediation. No trees greater than 8 inches (20 centimeters) DBH will be removed by the proposed activities. No undeveloped habitat will be disturbed by the proposed activities.

Reasonable and Prudent Alternatives:

- Back-up indicators on all trucks and heavy equipment operating at MDA D will be muted as much as possible consistent with the safety of human workers.
- Reseeding and erosion protection will be needed following the action to stabilize the soils.

Assessment Decision: Applying the reasonable and prudent alternatives described above, these projects may affect, but are not likely to adversely affect, the bald eagle.

Southwestern Willow Flycatcher

Project Impacts: The southwestern willow flycatcher AEI at LANL is more than 4.25 miles (6.8 kilometers) from the proposed project sites. The proposed actions will not remove any southwestern willow flycatcher nesting or foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the southwestern willow flycatcher.

Mexican Spotted Owl

Project Impacts: The nearest Mexican spotted owl AEI at LANL is more than 3.9 miles (6.2 kilometers) from the proposed project sites. The proposed actions will not remove any Mexican spotted owl nesting or foraging habitat. The proposed action should have no direct, indirect, or cumulative impacts on this species.

Reasonable and Prudent Alternatives: Reasonable and prudent alternatives are not required.

Assessment Decision: There is no nesting or foraging habitat loss as a result of these projects. The proposed actions will have no effect on the Mexican spotted owl.

7.0 Species-Specific and Ecological Risk Evaluations
7.1 Mexican Spotted Owl
7.1.1 Current Status

Between 1999 and 2005 the available habitat has remained basically the same. Development has become more centralized at LANL while remote locations have begun to be decommissioned and demolished. As an example, since 1999 facilities in Los Alamos Canyon have been removed and the sites have been returned to pre-disturbance elevational contours. Even though these decommissioned and demolished areas will take many years to restore secondary forest structure, they are presently suitable as foraging habitat for Mexican spotted owls. Associated development, such as the lighting, has also been removed making these areas more inviting for foraging. As another example, several of the remote facilities to the west of the habitat in Cañon de Valle have been removed and the area is now more available for owl foraging. Figure 7-1 shows the spotted owl AEIs on LANL.

Cañon de Valle: In the Cañon de Valle AEI, there has been a 1.2 percent increase in development of habitats with buildings and gas lines being the most common form of development. This development has followed the trend of other sites to become more centralized with one facility on the canyon edge entering decommissioning and demolition in 2004.

Los Alamos Canyon AEI: In the Los Alamos Canyon AEI, there has been a 0.4 percent decrease in development in the AEI. The largest area of decrease was from building and road demolition. Some building complexes in the bottom of Los Alamos Canyon have been removed since 1999. The largest area of development has been with gas lines, though the area of a gas line does remain viable foraging habitat and is not lighted.

Three-mile Canyon AEI: In the Three-mile Canyon AEI, there has been a 0.5 percent increase in development. The largest area of development has been with gas lines and buildings though the area of a gas line does remain viable foraging habitat and is not lighted. There has been a decrease in the number of electrical lines in this AEI.

Pajarito Canyon AEI: In the Pajarito Canyon AEI, there has been a 2.8 percent increase in the development of the AEI. The largest area of development has been in paved roads and gas lines in this AEI. The number and acreage of buildings and electrical lines have decreased since 1999 in the AEI due to demolition activities.

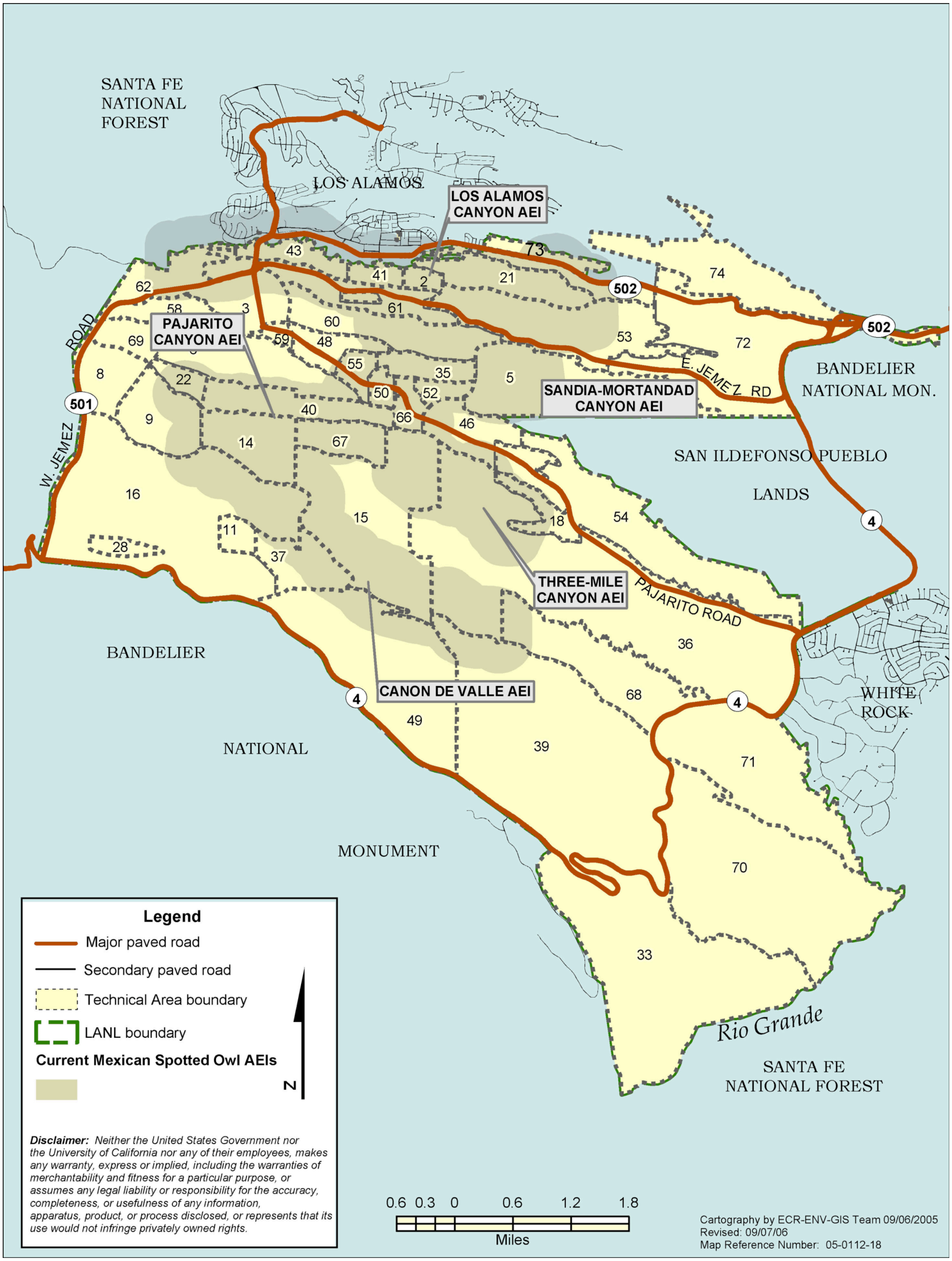


Figure 7-1. Mexican spotted owl AEIs on LANL.

Sandia-Mortandad Canyon AEI: In the Sandia-Mortandad Canyon AEI, there has been a 1.62 percent decrease in the development in the AEI. The amount of development associated with gas line installation has increased but there has been a fairly large decrease in most of the other development including buildings and electrical lines due to decommissioning and demolition activities.

7.1.2 Trends

Based on projects proposed in the 2006 SWEIS, the next five years should see a relatively slow growth rate in development except for the Pajarito West and Sigma Mesa Planning Areas. In other areas of LANL, most of the changes will be from the replacement of old facilities and the removal of old facilities from service through decommissioning and demolition. In these areas, there will be a possible increase in development of 5 percent to 7 percent. Decommissioning and demolition activities are expected to increase and this may decrease the overall development footprint.

The Pajarito West Planning Area is the location for a proposed “nuclear campus” that would centralize most LANL operations that involve work with nuclear materials. To build and protect these facilities, extensive construction and access modifications are planned that will involve development of relatively large areas of currently undeveloped areas, some of them in Mexican spotted owl habitats. For the Pajarito West and Sigma Mesa planning areas combined, up to an additional 207 acres (84 hectares) of undeveloped Mexican spotted owl habitat could be developed. These plans impact primarily the Mortandad-Sandia Canyon Mexican spotted owl AEI and the Pajarito Canyon Mexican spotted owl AEI.

7.1.3 Mexican Spotted Owl Ecological Risk Results

Cañon de Valle: The maximum value contaminant body burden results for Cañon de Valle did not exceed the calculated Mexican spotted owl ESLs, with the exception of lead. A single lead result exceeded the owl ESL (44 milligrams per kilogram vs 25 milligrams per kilogram); however, the upper confidence limit for the median of the Cañon de Valle body burden lead data, 2.5 milligrams per kilogram, was well below the owl ESL and other considerations resulted in the conclusion that lead in Cañon de Valle is not causing adverse effects to the Mexican spotted owl.

Los Alamos/Pueblo Canyons: The weight of evidence demonstrated by the various lines of evidence (field studies, laboratory studies, and modeling) gathered in this effects assessment indicated no adverse effects of COPECs on terrestrial and aquatic receptors. The field studies, model calculations, and laboratory toxicity tests all provided a complementary set of results that supported this interpretation and indicated that the assessment endpoints are not adversely affected. Thus, no COPECs were retained for further assessment or mitigation and the lack of effects for various measures used in the baseline ecological risk assessment confirmed the protective nature of the screening levels.

Mortandad Canyon is currently undergoing a baseline ecological risk assessment using the process and lines of evidence established in the LA/Pueblo Watershed study.

ECORSK.7 Modeling Results: Table 7-1 shows unadjusted, background, and adjusted mean total HIs for site-wide model executions that covered an area comprised of 0.6 mile (1 kilometer) beyond the LANL boundary. Adjusted values (HIs and HQs) are valuable for examining the Laboratory-contributed portion of potential effects to biological receptors from environmental contamination. The adjusted mean total HI for the Mexican spotted owl was 0.13, indicating that, on average, the Laboratory does not contribute excess adverse risk to the owl. On this basis alone, owls would experience no effects, but other aspects of the modeling results should also be examined.

Table 7-1. Mean Total HIs for Site-Wide Executions of ECORSK.7

Risk Source	Mean Total HI*	Maximum HI	COPECs with HQ>0.3
Unadjusted	0.18 (1.46)	31	None >0.3
Background	0.045 (0.1)	1.2	None >0.3
Adjusted	0.13 (3.94)	83	None >0.3

*Value is an arithmetic mean of 1,000 total observations/nest site HIs. Values in parentheses are standard deviations. Non-detects were counted as one-half of the detection limit.

Table 7-2 shows frequency distributions of HIs using ECORSK.7 to model the Mexican spotted owl. On this basis alone, about 4.4 percent of a theoretical owl population could experience adverse effects from anthropogenic sources of environmental contamination. However, further examination of the data is needed.

Table 7-2. HI Frequency Distribution

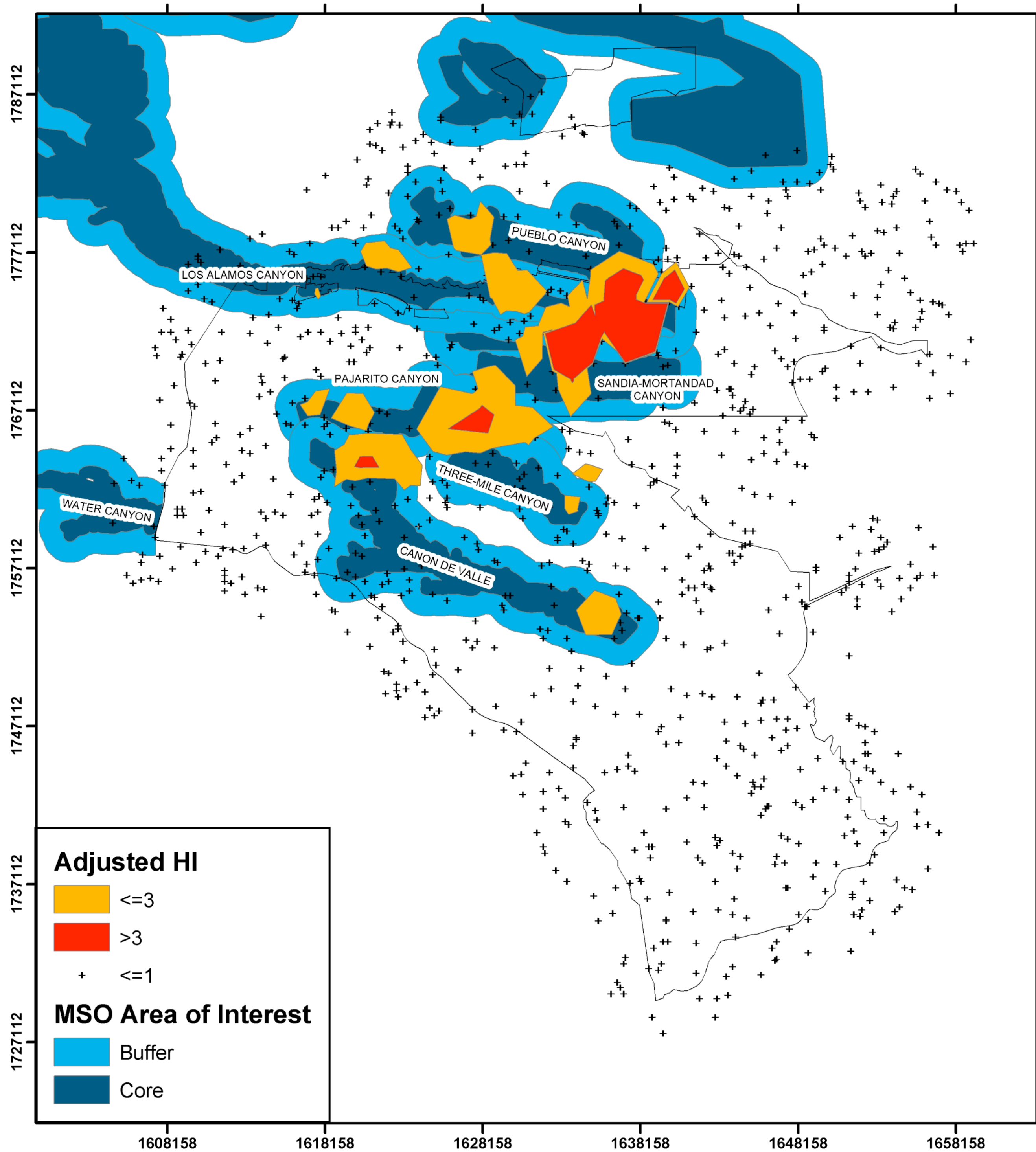
HI Range	Frequency
>3.0	12/1,000
1.0 to 3.0	32/1,000
<1.0	752/1,000
0	204/1,000

Only HQs above 1.0 exceed the established no-observed-adverse-effects levels or safe limits. COPECs dominating the HQ contributions to the owl nest sites with HIs>1.0 were DDE (mean HQ = 1.7), endrin (mean HQ = 1.2), naphthalene (mean HQ = 1.1), and DDT (mean HQ = 0.6). The DDTs have previously contributed elevated HQs in risk assessments and, although we used background values of zero for all organic contaminants, DDTs have been measured upwind and upslope of LANL (Podolsky 2000). A massive application of DDT in the 1960s used concentrations that can still be detected at current detection levels (Gonzales et al., 1999).

Contours of HIs are useful for demarcating general areas of potential effects. Figure 7-2 shows the physical distribution of HIs across LANL. Being that the modeled owl exposures are a result of a number of interactions, including weighted animal distributions, spatial distributions of contaminants, toxicological and biological functions, and, in the case of the owl, distance-based exponential foraging, HIs and HI contours are complex and not necessarily directly proportionate with contaminant level distributions.

For the owl the highest HIs were concentrated in the area of TA-73 and -21, areas known to have elevated levels of DDTs. Threatened and endangered species are afforded greater protection than other species by our demonstrating that individual animals of this type are protected from potential stressors, including contaminants, whereas overall population viability of other species are protected rather than each individual animal.

Naphthalene dominated the contribution of individual contaminants to the mean HI, contributing 54 percent of the total. Bis(2-ethylhexyl)phthalate and PCBs contributed the next highest at 10 percent and 9.9 percent, respectively. Naphthalene has been previously discounted as a true COPEC at LANL (Gonzales et al., 2004a). There most likely is no naphthalene present in soils and sediment at LANL. Naphthalene is relatively volatile under ambient environment conditions, especially in the summer when temperatures would volatilize most of it. The only known sources of naphthalene were combustion of organics in the Los Alamos town site during the Cerro Grande Fire of 2000. Subsequent to the original gross post-fire sampling, additional, more sensitive sampling and analysis for naphthalene with detection limits close to zero yielded



Note: This map shows the original AEI delineations.

Figure 7-2. Distribution of HIs for the Mexican spotted owl obtained using ECORSK.7.

mostly results of non-detections. As a result of including naphthalene as part of an analytical suite following the Cerro Grande Fire, naphthalene shows up in the contaminants database and, with our conservative method of replacing non-detects with one-half the detection limit, HQs are generated when there likely is no naphthalene present; i.e., false positives.

When the naphthalene contribution to the six examined HIs is removed, the mean HI lowers to 0.85, lower than the level of concern (>1.0). The contribution of PCBs to the six theoretical nest sites examined (mean HQ = 0.18) in the Mortandad Canyon area is most likely valid as the simulated home range over which the owl would be exposed is sufficiently large to include Sandia Canyon, a known source of PCBs; however, the mean HQ for the six nest sites for the PCBs was only 0.18, and the maximum HQ for any one of the six nest sites was 0.4. LANL's ECR Group is currently conducting a baseline ecological risk assessment for Mortandad Canyon. As a component of that assessment, ECORSK.7 will be. The baseline assessment also is including empirical contaminant data collection in biotic and abiotic media. These multiple lines of evidence will provide a more accurate assessment of risk to Mexican spotted owls in the Mortandad Canyon area.

Considering the substantial change in quantity of contaminant data currently used in comparison with the quantity used for the assessment reported in the 1999 SWEIS (DOE 1999a), there was good agreement in results. That is, the ECORSK.4 assessment of the Mexican spotted owl in 1996 reported unadjusted mean total HIs ranging from 0.60 to 0.70 for the TA-21 area (Gonzales et al., 1997), which compares to the unadjusted mean total HI of 0.18 for the recent ECORSK.7 site-wide assessment. The current assessment covered a larger assessment area (0.6 mile [1 kilometer] beyond LANL boundaries) than the assessment reported in the 1999 SWEIS, therefore exposures leading to the mean total HIs for the current assessment likely were somewhat "diluted" compared with the 1999 assessment.

The results of the modeling are valuable for enhancing the spatial and temporal coverage of empirical studies that are conducted periodically in limited areas. Given the uncertainty in toxicological values used to generate safe limits, the main use of the results is as relative values. Few geographical areas of relatively high HIs originating from presumably anthropogenic sources of COPECs have been identified and should be investigated. Considering the substantial change in quantity of contaminant data, safe limits, and other model parameters, the recent assessment results were in good agreement with results from previous modeling assessments.

The recent results and scenario parameters using ECORSK.7 can be considered site-wide baselines to which other site-wide assessments of the Mexican spotted owl can be compared in the future.

Assessment Decision for Ecological Risk

Risk assessments on the Mexican spotted owl largely indicate that LANL does not contribute excess adverse risk to the owl from environmental contaminants. Legacy contamination from LANL operations may affect, but is not likely to adversely affect, the Mexican spotted owl. For reasonable and prudent measures, see Section 8.7.

7.1.4 Southwestern Willow Flycatcher

7.1.4.1 Current Status

All of the southwestern willow flycatcher habitat at LANL is along Pajarito Road. This road has extensive areas of wetlands along the road with little development in the area. Between 1999 and 2004 there has been an increase in the amount of development by 6 percent. The majority of this development is attributed to road development. Two major roads bisect the flycatcher habitat and a portion of the habitat is controlled by the New Mexico Highway Department and the County of Los Alamos (Figure 7-3). During the drought, this wetland area has received much less water than in previous years. This wetland has and will likely continue to decrease in size as long as the drought continues.

Groundwater is monitored through observation wells for radionuclides as well as nonradiochemical constituents, such as minerals, salts, and organics. In 1985, three shallow wells were constructed to determine whether disposal activities on the adjacent mesa were affecting the quality of shallow groundwater. No constituents were found to be at any concentrations of concern. Most constituents measured in groundwater were at least an order of magnitude below the relevant action level (ESP 1997). Surface water is monitored in two ways: (1) through surface water grab samples collected annually from locations where effluent discharges or spring flows maintain stream flow and (2) runoff samples collected during or shortly after precipitation events. No constituents were found to be at any concentrations of concern. Most constituents measured in surface water were at least an order of magnitude below the relevant action level (ESP 1997). Because sediment transport associated with surface water runoff is a significant

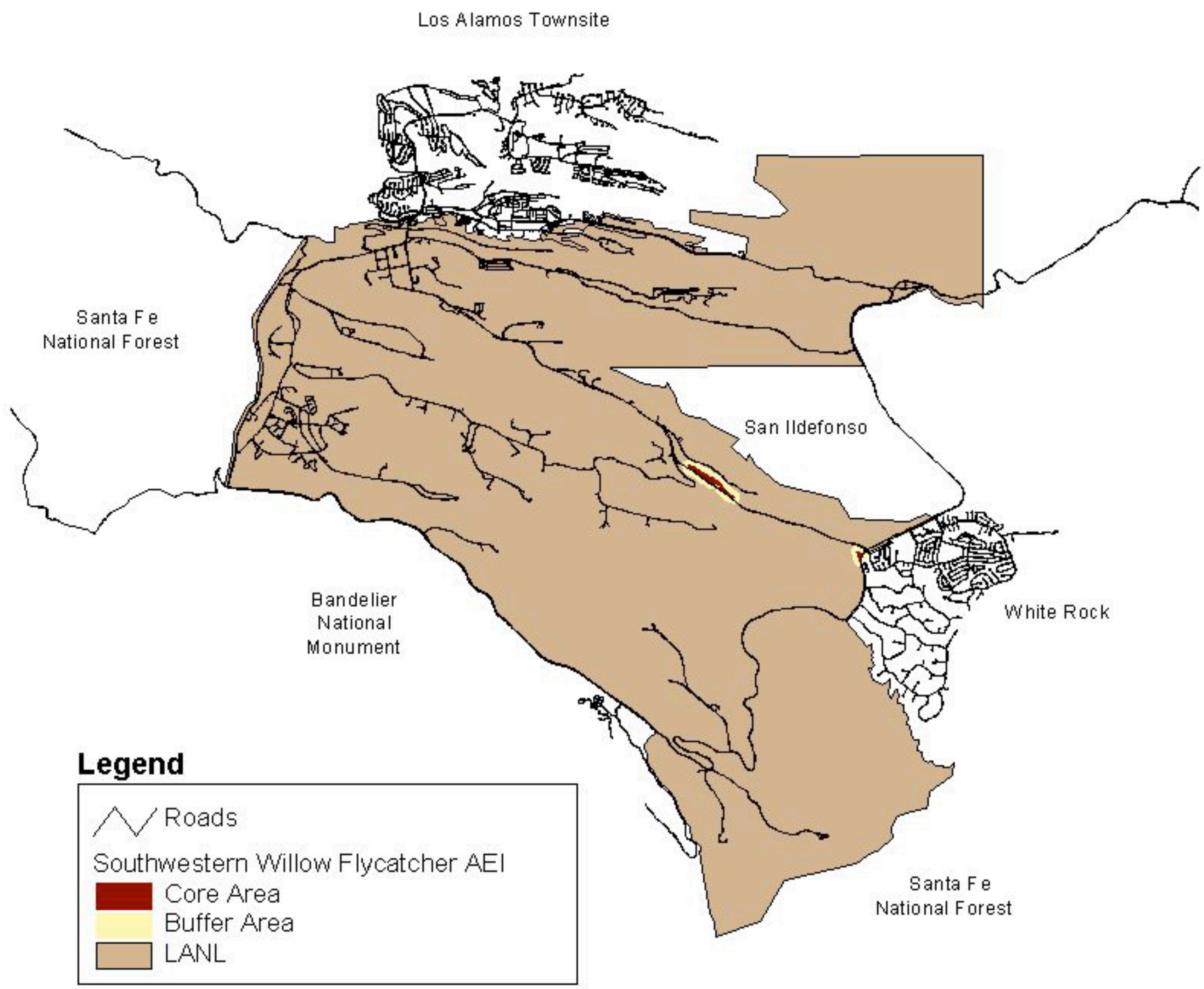


Figure 7-3. Location of southwestern willow flycatcher AEI.

mechanism for contaminant movement, sediments are sampled at six locations on intermittent streams running down from Mesita del Buey into Pajarito Canyon. Some of these stations exceeded background levels for plutonium-238, and -239,240, but all of these levels were at least two orders of magnitude less than the SAL (ESP 1997).

The ER Project at LANL identified five PRSs in lower Pajarito Canyon, which contains the southwestern willow flycatcher AEI. All five PRSs have been classified as administrative No Further Actions or characterized and/or remediated. No Further Actions have been dismissed from further consideration by the ECR Project because thorough investigations indicate that no contaminating operations ever occurred there or because levels of contamination are below current standards.

7.1.4.2 Changes in the Last Five Years

There have been several changes to the Pajarito Canyon southwestern willow flycatcher AEI with the largest impact being the removal of the majority of the habitat near the lower part of Pajarito Canyon near White Rock for culvert realignment and road work by the New Mexico Department of Transportation. This was completed to mitigate potential flooding that could be caused from runoff changes due to the Cerro Grande Fire.

7.1.4.3 Trends

Of the areas of suitable habitat for the southwestern willow flycatcher on LANL, there are really only two locations that might be large and promising enough for breeding birds. This is the lower Pajarito Canyon wetland off of Pajarito Road and near SR 4 and habitat along the Rio Grande. In the past the willow flycatcher has been detected in these two areas during migration during LANL surveys. The Pajarito wetlands would be dependent on sufficient moisture and rainfall in the future to ensure its continual growth. The habitat along the Rio Grande is still recovering from a backup of water in the river from Cochiti Reservoir approximately 10 years ago that flooded and killed much of the vegetation. This willow, salt cedar, and Russian olive habitat should continue to grow and become suitable habitat for the southwestern willow flycatcher in the future. LANL will continue to monitor these two areas in particular in the future for evidence of breeding southwestern willow flycatcher. In addition, LANL will continue to evaluate areas of wetland vegetation around the Laboratory that could one day develop into suitable flycatcher habitat. No projects proposed in the new SWEIS are anticipated to impact the southwestern willow flycatcher habitat.

7.1.4.4 Southwestern Willow Flycatcher Ecological Risk Results

A modeling assessment of risk to the southwestern willow flycatcher from environmental contaminants was last completed in 1998 (Gonzales et al., 1998a). Although the general result was no appreciable impact to the flycatcher, contaminant data, safe limits, and other modeling parameters have changed considerably, therefore a new site-wide assessment is recommended.

Assessment Decision for Ecological Risk

Available evidence indicates that LANL does not contribute excess adverse risk to the southwestern willow flycatcher from environmental contaminants. Legacy contamination from

LANL operations may affect, but is not likely to adversely affect, the southwestern willow flycatcher. For reasonable and prudent alternatives, see Section 8.7.

7.1.5 Bald Eagle

7.1.5.1 Current Status

The bald eagle habitat at LANL only occurs along the Rio Grande. This area is a remote portion of LANL and only used sporadically. However, this area is anticipated to be used more in the future and simple linear growth of development may not capture the increase in development here. In addition, all of LANL is considered foraging habitat for bald eagles and observations of any known eagle on the site are documented and investigated if they are occurring near an active project.

7.1.5.2 Changes in the Last Five Years

Between 1999 and 2004 there has been an increase in the amount of development of 0.09 percent. Most of the increase in development can be attributed to the installation of electrical lines. There have also been decommissioning and demolition activities in this area.

7.1.5.3 Trends

Many of the facilities in this area of LANL are old and can be expected to be removed or refurbished in the future.

7.1.5.4 Bald Eagle Ecological Risk Results

A modeling assessment of risk to the bald eagle from environmental contaminants was last completed in 1998 (Gonzales et al., 1998b). In that assessment the proportion of the eagle's diet made up of fish from Cochiti Reservoir (a dam adjacent to LANL) versus carrion was varied. The general result was no appreciable impact to the eagle; however, contaminant data at that time was sparse and detection limits that had been previously used in the analysis of some of the organic contaminants in water and sediment were too high to detect. Therefore an empirical study involving the measurement of PCBs and pesticides in fish was conducted in 1999 (Gonzales et al., 1999). Maximum DDE concentrations in three species of fish were slightly below the minimum concentration that has been associated with reproductive effects to sensitive bird species that consume fish. Subsequent studies of PCBs, specifically, have substantiated that levels in fish in Cochiti Reservoir and the Rio Grande (which are downslope of LANL) are below guidance limits for the most sensitive piscivores (LANL 2000b, 2001b, 2002b; Gonzales and Fresquez 2003). Because contaminant data reflective of the terrestrial portion (mostly carrion) of resident bald eagle diets have changed considerably since the last modeling assessment, and safe limits and other modeling parameters have changed considerably, consideration should be made on whether a new risk assessment on the bald eagle is needed. There is no intended implication that LANL is the source of contaminants in Cochiti Reservoir or the Rio Grande.

Assessment Decision for Ecological Risk

Available evidence indicates that LANL does not contribute excess adverse risk to the bald eagle from environmental contaminants. Legacy contamination from LANL operations may affect, but is not likely to adversely affect, the bald eagle. For reasonable and prudent alternatives, see Section 8.7.

8.0 Cumulative Impacts by Planning Area and Assessment Decisions

8.1 Core Area Projects

Core Area Projects

- Science Complex
- TA-3 Replacement Office Buildings
- Security Perimeter Project (previous consultation)

8.1.1 Cumulative Impacts

Table 8-1 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed in the Core Planning Area.

Table 8-1. Distribution of the Most Common Cover Types for Projects Assessed in the Core Area

Cover Type	Acres	Hectares
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	114.7	46.4
Urban, paved	108.2	43.8
Ponderosa Pine/Gambel's oak Woodland	95.2	38.5
Ponderosa Pine Forest	94.8	38.4
Piñon-Juniper/Blue Grama Woodland	57.7	23.3
Mixed Conifer Forest	39.7	16.1
Urban, vegetated	35.5	14.3
Sparse-Bare soil	30.4	12.3
Other Shrubland	14.08	5.7
Submontane Grassland	12.9	5.2
TOTAL OF 10 MOST COMMON COVER TYPES	603.18	244

In the Core Planning Area, 170.63 acres (69.1 hectares) of Mexican spotted owl habitat is currently developed, and an additional 41.8 acres (16.9 hectares) is proposed for development. Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an overall increase of 24.5 percent in the amount of developed Mexican spotted owl habitat in this planning area.

Therefore, our assessment is that the cumulative impacts of additional development proposed along the southern rim of Los Alamos Canyon in the Core Planning Area may affect, but are not likely to adversely affect, the Mexican spotted owl and bald eagle and will have no effect on the southwestern willow flycatcher.

8.2 Pajarito West Corridor/Sigma Mesa Projects

- NMSSUP
- Transportation Modifications
- Transportation Modifications (Optional Actions)
- TA-48 Radiological Science Institute
- Characterization and Remediation of MDA C
- RLWTF Replacement
- Warehouse and Truck Inspection Station

8.2.1 Cumulative Impacts

Table 8-2 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed in Pajarito West/Sigma Mesa. The eleventh most common cover type within 0.25 mile (0.40 kilometer) of the projects proposed in the planning area was mixed conifer forest, with 48.4 acres (19.6 hectares).

In the Pajarito West Corridor and Sigma Mesa Planning Areas, 401.1 acres (162.4 hectares) of Mexican spotted owl habitat is currently developed and an additional 201.3 acres (81.5 hectares) is proposed for development. The total amount of Mexican spotted owl habitat in these planning areas is 2,047.9 acres (828.7 hectares). Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an overall increase of 50.2 percent in the amount of developed Mexican spotted owl habitat in this planning.

Table 8-2. Distribution of the Most Common Cover Types for Projects Assessed at Pajarito West/Sigma Mesa

Cover Type	Acres	Hectares
Piñon-Juniper/Blue Grama Woodland	359.2	145.4
Submontane Grassland	199.2	80.6
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	158.7	64.2
Urban, paved	117.7	47.6
Other Shrubland	100.2	40.5
Ponderosa Pine Forest	96.1	38.9
Ponderosa Pine/Gambel’s oak Woodland	90.5	36.6
Urban, vegetated	61.2	24.8
Sparse-Bare Rock	70.3	28.4
Sparse-Bare soil	51.5	20.8
TOTAL OF 10 MOST COMMON COVER TYPES	1,304.6	527.8

The Pajarito West Corridor and Sigma Mesa Planning Areas are closely linked, both geographically and in their impacts, so we considered them together. The AEIs in these planning areas include the Mortandad-Sandia Canyon Mexican spotted owl AEI and the Pajarito Canyon Mexican spotted owl AEI.

The Mortandad-Sandia Canyon AEI has a lot of development in the immediate vicinity. The south rim of Mortandad Canyon has been the location of TA-35 and -50 facilities for decades. Sigma Mesa, on the north rim of Mortandad Canyon, has been used fairly intensively as an outdoor storage area for vehicles, equipment, soil, and waste materials such as concrete and asphalt from demolition projects since the Cerro Grande Fire in 2000. In addition, an asphalt batch plant was installed on Sigma Mesa (Consultation #2-22-05-I-392). Sigma Mesa and the Pajarito West Corridor have long been identified in LANL comprehensive site plans as areas for development. The increased security emphasis after the 9/11 attacks has also driven additional projects to allow better access control and protection of facilities that work with nuclear materials at TA-35, -50, and -55.

In addition, Mortandad and Sandia canyons historically and currently receive large amounts of effluent from LANL operations and storm water runoff from developed areas. The anthropogenic inputs of water into these canyons are very likely to have increased the availability of small mammal prey, as well as improving vegetative conditions. The Outfall Reduction Program, while consistent with the goals of reducing or eliminating pollution impacts on the environment, is very likely to reduce overall prey availability for Mexican spotted owl and the suitability of these habitats.

Therefore, our assessment is that the additional development and the outfall closures proposed in the Pajarito West Corridor and Sigma Mesa planning areas <u>are likely to adversely affect</u> the Mexican spotted owl, <u>are not likely to adversely affect</u> the bald eagle, and will have <u>no effect</u> on the southwestern willow flycatcher.

8.3 Pajarito East Corridor Projects

- Disposition of Flood Retention Structure and Steel Diversion Wall
- DD&D of TA-18
- Remediation of MDAs G, H, and L at TA-54

8.3.1 Cumulative Impacts

Table 8-3 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed for the Pajarito East Corridor.

In the Pajarito East Corridor Planning Area, 32.5 acres (13.1 hectares) of Mexican spotted owl habitat is currently developed and an additional 3.2 acres (1.3 hectares) is proposed for development. Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an overall increase of 9.8 percent in the amount of developed Mexican spotted owl habitat in this planning area.

In the Pajarito East Corridor Planning Area, 9.2 acres (3.7 hectares) of southwestern willow flycatcher habitat is currently developed and an additional 0 acres (0 hectares) is proposed for development. Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be no increase in the amount of developed southwestern willow flycatcher buffer in this planning area and no increase in the amount of developed southwestern willow flycatcher core habitat.

Table 8-3. Distribution of the Most Common Cover Types for Projects Assessed at Pajarito East Corridor

Cover Type	Acres	Hectares
Piñon-Juniper/Blue Grama Woodland	151.6	61.3
Urban, paved	9.2	22.7
Other Shrubland	38.4	15.5
Submontane Grassland	35.5	14.4
Sparse-Bare rock	25.1	10.2
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	22.0	8.9
Ponderosa Pine/Gambel’s oak Woodland	11.1	4.5
Gambel’s oak Shrubland	11.0	4.5
One-seed Juniper Wooded Grassland	8.81	3.6
Riparian-Wetland	5.5	2.2
TOTAL OF 10 MOST COMMON COVER TYPES	318.21	147.8

Therefore, our assessment is that the cumulative impacts of DD&D, remediations, and additional development in the Pajarito East Corridor Planning Area may affect, but are not likely to adversely affect, the Mexican spotted owl, bald eagle, and southwestern willow flycatcher.

8.4 Omega West Projects

- Remediation of MDAs A, T, and U at TA-21
- DD&D of TA-21

8.4.1 Cumulative Impacts

Table 8-4 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed for the Pajarito East Corridor.

In the Omega West Planning Area, 184.2 acres (75.1 hectares) of Mexican spotted owl habitat is currently developed and an additional 4.5 acres (1.8 hectares) is proposed for development. Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an overall increase of 2.5 percent in the amount of developed Mexican spotted owl habitat in this planning area.

Table 8-4. Distribution of the Most Common Cover Types for Projects Assessed at Omega West

Cover Type	Acres	Hectares
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	99.1	40.1
Piñon-Juniper/Blue Grama Woodland	87.8	35.5
Other Shrubland	80.6	32.6
Urban, paved	56.9	23.0
Mixed Conifer Forest	54.7	22.1
Submontane Grassland	51.9	21.0
Ponderosa Pine Forest	40.6	16.4
Urban, vegetated	40.1	16.2
Ponderosa Pine/Gambel's oak Woodland	29.3	11.8
Sparse-Bare rock	24.8	10.0
TOTAL OF 10 MOST COMMON COVER TYPES	565.8	228.7

The only threatened and endangered species habitat identified in the planning area is the Los Alamos Canyon Mexican spotted owl AEI. This AEI has been surveyed for the past 11 years (1995–2005), and no Mexican spotted owls have been found. In 2000, significant areas of TA-21 (70 acres [28 hectares]) were identified for transfer to the County of Los Alamos and the USFWS issued LANL a "take" for that action after formal consultation (#2-22-01-F-634). Our interpretation of that take is that USFWS has a reasonable expectation that the transferred properties are going to be completely developed during the next several to many years. The DD&D and MDA remediation of the remaining already developed portions of TA-21 will produce substantial noise and some additional lighting on the north rim of Los Alamos Canyon. However, very little additional habitat will be altered, and similar or greater levels of noise and light are expected to be produced by development and use of the transfer tracts. Therefore, our assessment is that the cumulative impacts of DD&D and MDA remediation proposed for TA-21 do not represent a substantial cumulative increase relative to noise and light effects resulting from activities on the transfer tracts, and therefore these actions may affect, but are not likely to adversely affect, the Mexican spotted owl and bald eagle and will have no effect on the southwestern willow flycatcher.

8.5 Water Canyon Projects

- DynEx Assembly Chamber
- Remediation of MDAs N and Z at TA-15

8.5.1 Cumulative Impacts

Table 8-5 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed for Water Canyon.

Table 8-5. Distribution of the Most Common Cover Types for Projects Assessed in Water Canyon

Cover Type	Acres	Hectares
Submontane Grassland	178.4	72.2
Piñon-Juniper/Blue Grama Woodland	141.1	57.1
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	43.1	17.4
Ponderosa Pine/Gambel’s oak Woodland	31.1	12.6
Mixed Conifer Forest	27.6	11.2
Ponderosa Pine Forest	24.3	9.8
Sparse-Bare soil	23.5	9.5
Other Shrubland	21.4	8.7
Sparse-Bare rock	16.4	6.6
Urban, paved	15.6	6.3
TOTAL OF 10 MOST COMMON COVER TYPES	522.5	211.4

In the Water Canyon Planning Area, 136.5 acres (56.0 hectares) of Mexican spotted owl habitat is currently developed and an additional 9.1 acres (3.7 hectares) is proposed for development. The total amount of Mexican spotted owl habitat in the planning area is 2,428 acres (982 hectares). Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an overall increase of 6.7 percent in the amount of developed Mexican spotted owl habitat in this planning area.

Therefore, our assessment is that the cumulative impacts of additional development and MDA remediation proposed in the Water Canyon Planning Area may affect, but are not likely to adversely affect, the Mexican spotted owl and bald eagle and will have no effect on the southwestern willow flycatcher.

8.6 Rio Grande Corridor Projects

- Remediation of MDA D at TA-33

8.6.1 Cumulative Impacts

Table 8-6 summarizes the area of the 10 most common cover types within 0.25 mile (0.40 kilometer) of the footprints of all of the projects assessed for the Rio Grande Corridor.

Table 8-6. Distribution of the Most Common Cover Types for Projects Assessed in the Rio Grande Corridor

Cover Type	Acres	Hectares
Piñon-Juniper/Blue Grama Woodland	49.1	19.9
One-seed Juniper Wooded Grassland	29.5	11.9
Piñon-Juniper/Hairy Grama Wooded Grassland	21.8	8.8
Sparse-Bare rock	21.4	8.6
Other Shrubland	19.5	7.9
Submontane Grassland	3.8	1.5
Ponderosa Pine/Blue Grama-Little Bluestem Woodland	1.3	0.5
Piñon-Juniper/Sparse-Bare soil Woodland	1.0	0.4
Riparian-Wetland	0.6	0.2
TOTAL	148	59.7

In the Rio Grande Corridor Planning Area, 21.9 acres (8.8 hectares) of bald eagle habitat is currently developed and an additional 0.08 acre (0.03 hectare) is proposed for development. Assuming all projects discussed in this assessment and previous consultations are undertaken as planned, there will be an increase of 0.4 percent in the amount of developed bald eagle habitat.

Therefore, our assessment is that the cumulative impacts of additional development proposed for the Rio Grande Corridor may affect, but are not likely to adversely affect, the bald eagle and have no effect on the Mexican spotted owl or southwestern willow flycatcher. Two planning areas did not have any proposed projects that were evaluated to fall outside of the guidelines of LANL's HMP and, therefore, did not have any projects assessed in this biological assessment: LANSCE Mesa and Anchor Ranch.

Two planning areas did not have any proposed projects that were evaluated to fall outside of the guidelines of LANL's HMP and, therefore, did not have any projects assessed in this biological assessment: LANSCE Mesa and Anchor Ranch.

8.7 Site-wide Reasonable and Prudent Alternatives

- LANL should support or encourage the presence of water resources that are supported or supplemented by outfalls or storm water runoff, including wetlands, intermittent stream reaches, and perennial stream reaches, in or adjacent to Mexican spotted owl habitats, where such resources do not hinder water quality protection goals or other compliance requirements.
- All further actions affecting water flow volumes in Mortandad and Sandia canyons should be carefully assessed for positive and negative impacts.
- Hiking trails into Mortandad and Sandia canyons near documented nested or roosting areas will be signed as permanently closed to pedestrians and enforced by PTLA.
- LANL will inventory, monitor, and protect water supplies for natural springs within canyon systems.
- LANL will inventory, monitor, and protect riparian areas within canyon systems.
- LANL will develop and implement a wetlands/floodplains management plan that will address protection of wetlands, riparian areas, and springs.
- Surveys for Mexican spotted owls will continue to be conducted in all identified habitats annually.
- Span bridges will be used in preference to land bridges to develop transportation options crossing canyons in threatened and endangered species habitats. To facilitate wildlife crossings, span bridges will be constructed to standards identified in peer-reviewed literature. All land bridge proposals will require consultation with USFWS.
- Future projects on undisturbed buffer in AEIs with over 10 percent developed—or proposed to be developed—buffer will require USFWS consultation.
- Continue watershed-specific assessments of ecological risk to threatened and endangered species, and conduct site-wide modeling of ecological risk for species on which information is outdated.

- A detailed master development plan will be developed for Sigma Mesa, and will be consulted on with USFWS. Projects or uses not identified in the master development plan for Sigma Mesa will not be permitted in Mexican spotted owl core or buffer areas.
- LANL will reinitiate consultation for any projects assessed in this biological assessment that undergo a significant change in scope or location unless the project's impacts to threatened or endangered species decrease as a result of those changes.
- No wetland or riparian vegetation or trees with a DBH greater than 8 inches (20 centimeters) in undeveloped threatened and endangered species habitats will be removed outside of approved project areas without ENV-ECO evaluation.

References

Allen, C.D., B. Hanson, and C. Mullins. 1993. Cochiti Reservoir reregulation interagency biological report. U.S. Bureau of Reclamation unpublished report.

Anderson, E., S.C. Forrest, T.W. Clark, and L. Richardson. 1986. Paleobiology, biogeography, and systematics of the black-footed ferret (*Mustela nigripes*). Great Basin Naturalist Memoirs 8:11–62.

BAER. 2000. Cerro Grande Fire burned area emergency rehabilitation plan. Interagency Burned Area Emergency Rehabilitation Team, Los Alamos, NM.

Balice, R.G. 1998. A preliminary survey of terrestrial plant communities in the Sierra de los Valles. LA-13523-MS, Los Alamos National Laboratory, Los Alamos, NM.

Balice, R.G., B.P. Oswald, and C. Martin. 1999. Fuels inventories in the Los Alamos National Laboratory Region; 1997. LA-13572-MS, Los Alamos National Laboratory, Los Alamos, NM.

Balice, R.G., J.D. Miller, B.P. Oswald, C. Edminster, and S.R. Yool. 2000. Forest surveys and wildfire assessment in the Los Alamos Region; 1998-1999. LA-13714-MS, Los Alamos National Laboratory, Los Alamos, NM.

Blake, W.D., F. Goff, A. Adams, and D. Counce. 1995. Environmental geochemistry for surface and subsurface waters in the Pajarito Plateau and outlying areas, New Mexico. LA-12912-MS, Los Alamos National Laboratory, Los Alamos, NM.

Block, W.M., J.L. Ganey, P.E. Scott, and R. King. 2005. Prey ecology of Mexican spotted owls in pine-oak forests of Northern Arizona. Journal of Wildlife Management 69:618–629.

Bowen, B.M. 1990. Los Alamos climatology. LA-11735-MS, Los Alamos National Laboratory, Los Alamos, NM.

Bowen, B.M. 1992. Los Alamos climatology summary. LA-12232-MS, Los Alamos National Laboratory, Los Alamos, NM.

Brown, B.T., and M.W. Trosset. 1989. Nesting-habitat relationships of riparian birds along the Colorado River in Grand Canyon, Arizona. Southwestern Naturalist 3 4:260–270.

Broxton, D.E., G.H. Heiken, S.J. Chipera, and F.M. Byers, Jr., 1995. Stratigraphy, petrography, and mineralogy of Bandelier Tuff and Cerro Toledo deposits. *In:* Earth Science Investigations for Environmental Restoration—Los Alamos National Laboratory Technical Area 21. LA-12934-MS, Los Alamos National Laboratory, Los Alamos, NM.

Buckley, K.J., J.C. Walterscheid, S.R. Loftin and G.A. Kuyumjian. 2002. Progress report on Los Alamos National Laboratory activities one year after the Cerro Grande Fire. LA-UR-02-1492, Los Alamos National Laboratory, Los Alamos, NM.

CalTrans. 1998. CalTrans traffic noise analysis protocol technical noise supplement. California Department of Transportation Division of Environmental Analysis, Sacramento, CA.

Defense Nuclear Facilities Safety Board. 1993. Recommendation 93-2 to the Secretary of Energy. Washington, D.C.

Defense Nuclear Facilities Safety Board. 1997. Recommendation 97-2 to the Secretary of Energy. Washington, D.C.

Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater, and M.H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. Journal of Wildlife Management 63:60–76.

Department of Energy. 1995. Dual-axis Radiographic Hydrodynamic Test Facility final environmental impact statement. DOE/EIS-0228, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 1996. Environmental assessment and finding of no significant impact for effluent reduction at Los Alamos National Laboratory. DOE/EA-1156, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 1997. Environmental assessment for the lease of land for the development of a research park at Los Alamos National Laboratory. DOE/EA-1212, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 1999a. Site-wide environmental impact statement for continued operation of Los Alamos National Laboratory. DOE/EIS-0238, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 1999b. Final environmental impact statement for the conveyance and transfer of certain land tracts administered by the Department of Energy and located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico. DOE/EIS-0293, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 1999c. Record of decision: SWEIS in the State of New Mexico. 64 FR 50797, U.S. Department of Energy, Washington, D.C.

Department of Energy. 1999d. Los Alamos National Laboratory NPDES Permit Compliance Program: Summary of success. http://www.eh.doe.gov/oepa/cwap/docs/lanlsuc1.pdf, last accessed 2/6/2006.

Department of Energy. 2000. Record of decision: Conveyance and transfer of certain land tracts administered by the Department of Energy and located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico. 65 FR 14952, U.S. Department of Energy, Washington, D.C.

Department of Energy. 2002. Final environmental impact statement for the proposed relocation of Technical Area 18 capabilities and materials at Los Alamos National Laboratory. DOE/EIS-0319, Washington, D.C.

Department of Energy. 2003. Environmental assessment for the proposed Los Alamos National Laboratory trails management program. DOE/EA-1431, U.S. Department of Energy, Los Alamos, NM.

Department of Energy. 2004. Environmental assessment for proposed corrective measures at Material Disposal Area H within Technical Area 54 at Los Alamos National Laboratory, Los Alamos, New Mexico. National Nuclear Security Administration, Los Alamos Site Office.

Department of Energy. In prep. Site-wide environmental impact statement for continued operation of Los Alamos National Laboratory. U.S. Department of Energy, Los Alamos, NM.

Environmental Protection Agency. 1997. Ecological risk assessment guidance for Superfund: Process for designing and conducting ecological risk assessments. EPA 540-R-97-006, U.S. Environmental Protection Agency, Washington, D.C.

Environmental Surveillance Program. 1997. Environmental surveillance at Los Alamos during 1997. LA-13487-ENV, Los Alamos National Laboratory, Los Alamos, NM.

Federal Register. March 16, 1993. Endangered and threatened wildlife and plants: Final rule to list the Mexican spotted owl as a threatened species. Department of the Interior, Fish and Wildlife Service. Volume 58, Number 49. 50 CFR Part 17, RIN 1018-AB 56. pp. 14248–14271.

Finch, D.M. 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain Region. RM-215, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Findley, J.S., A.H. Harris, D.E. Wilson, and C. Jones. 1975. Mammals of New Mexico. University of New Mexico Press, Albuquerque, NM.

Frey, J.K., and T.L. Yates. 1996. Mammalian diversity in New Mexico. New Mexico Journal of Science 36:4–37.

Gallegos, A.F., G.J. Gonzales, K.D. Bennett, and L.E. Pratt. 1997. Preliminary risk assessment of the Mexican spotted owl under a spatially-weighted foraging regime at the Los Alamos National Laboratory. LA-13259-MS, Los Alamos National Laboratory, Los Alamos, NM.

Ganey, J.L. 1992. Food habits of Mexican spotted owls in Arizona. The Wilson Bulletin 104(2):321–326.

Ganey, J.L., and R.P. Balda. 1994. Habitat selection by Mexican spotted owls in northern Arizona. Auk 111(1):162–169.

Gonzales, G.J., and P.R. Fresquez. 2003. Polychlorinated biphenyls (PCBs) in catfish and carp collected from the Rio Grande upstream and downstream of Los Alamos National Laboratory. LA-14001, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G.J., A.F. Gallegos, and T.S. Foxx. 1997. Update summary of preliminary risk assessments of threatened and endangered species at the Los Alamos National Laboratory. LA-UR-97-4732, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales G.J., A.F. Gallegos, T.S. Foxx, P.R. Fresquez, L.E. Pratt, M.A. Mullen, and P.E. Gomez. 1998a. Preliminary risk assessment of the bald eagle at the Los Alamos National Laboratory. LA-13399-MS, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales G.J., A.F. Gallegos, M.A. Mullen, K.D. Bennett, and T.S. Foxx. 1998b. Preliminary risk assessment of the southwestern willow flycatcher (*Empidonax traillii extimus*) at the Los Alamos National Laboratory. LA-13508-MS, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G.J., P.R. Fresquez, and J.W. Beveridge. 1999. Organic contaminant levels in three fish species downchannel from the Los Alamos National Laboratory. LA-13612-MS, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G., C. Bare, K. Bennett, T. Haarmann, L. Hansen, C. Hathcock, D. Keller, S. Loftin, and R. Ryti. 2001. Organic biocontaminants in food chains at two canyons at the Los Alamos National Laboratory. LA-CP-01-33, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G., D. Sias, O. Myers, M. Wright, J. Vencill, and A. Chavez. 2002. The morphology of the many-lined skink (*Eumeces multivirgatus*) at Los Alamos National Laboratory. LA-CP-02-93, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G.J., R.T. Ryti, P.G. Newell, and A.F. Gallegos. 2004a. Modeled ecological risk to the deer mouse, Mexican spotted owl, and western bluebird at the Los Alamos National Laboratory using ECORSK.7. LA-14118, Los Alamos National Laboratory, Los Alamos, NM.

Gonzales, G.J., R.T. Ryti, D. Hollis, P.G. Newell, A.F. Gallegos, K.D. Bennett, and S. Sherwood. 2004b. Application of ECORSK.7 to proposed risk-based end-state vision at Los Alamos National Laboratory: Summary report. LA-14139, Los Alamos National Laboratory, Los Alamos, NM.

Green, C., L. McWhirter, E. Paulsgrove, and J. Wood. 2005. Wetlands delineation report, Los Alamos National Laboratory, Los Alamos, New Mexico. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, NM.

Griggs, R.L. 1964. Geology and groundwater resources of the Los Alamos area, New Mexico. U.S. Geological Survey water-supply paper 1753, 107 p.

Hubbard, J.P. 1978. Revised checklist of the birds of New Mexico. New Mexico Ornithological Society Publication No. 6.

Hubbard, J.P. 1987. The status of the willow flycatcher in NM. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, NM.

Isaacs, R.B., R. Goggans, R.G. Anthony, and T. Bryan. 1993. Habits of bald eagles wintering along the Crooked River, Oregon. Northwest Science 67(2):55–62.

Johnson, T.H. 1996. Bald eagle habitat management in the Los Alamos National Environmental Research Park. *In:* Threatened and endangered species surveys and habitat management at Los Alamos National Laboratory. LA-UR-96-3444, Los Alamos National Laboratory, Los Alamos, NM.

Johnson, J.A., and T.H. Johnson. 1985. Timber type model of spotted owl habitat in northern New Mexico. New Mexico Department of Game and Fish report, Santa Fe, NM.

Katzman, D. 2002. Los Alamos/Pueblo Canyon surface aggregate report: Record of communication #1. ER2002-0690, Los Alamos National Laboratory memorandum to distribution from D. Katzman (and attached record of communication), September 26, 2002.

Keller, D.C., J.R. Biggs, and T.H. Johnson. 1996. Threatened and endangered species surveys and habitat management at Los Alamos National Laboratory (National Environmental Research Park). LA-UR-96-3444, Los Alamos National Laboratory, Los Alamos, NM.

King, J.R. 1955. Notes on the life history of Traill's flycatcher (*Empidonax trailii*) in southeastern Washington. Auk 72:148–173.

Knight, T.L., and S.S. Vrooman. 1999. A study of construction machinery noise at Los Alamos National Laboratory. LA-UR-99-5740, Los Alamos National Laboratory, Los Alamos, NM.

Lewis, J., J. Podolsky, and J. Thilsted. 2003. Results of gross and histologic pathology on channel catfish collected at Cochiti and Abiquiu Reservoirs, New Mexico, October 2001 and from two locations in the Rio Grande, May 2002. Unpublished report by Environmental Health Associates, Inc.

Los Alamos National Laboratory. 1991. TA-21 operable unit RFI work plan for environmental restoration. LA-UR-91-0962, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 1992. RFI work plan for Operable Unit 1147. LA-UR-92-0969, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 1993. RFI work plan for Operable Unit 1086. LA-UR-92-3968, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 1999a. Comprehensive site plan 2000. LA-UR 99-6704, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 1999b. Material disposal areas core document, LA-UR-99-4423, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2000a. SWEIS Yearbook—1999. LA-UR-00-5520, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2000b. Soil, foodstuffs, and associated biota. pp. 309–360, in Environmental surveillance at Los Alamos during 1999. LA-13777-ENV, Los Alamos National Laboratory Los Alamos, NM.

Los Alamos National Laboratory. 2001a. SWEIS Yearbook—2000, LA-UR-01-2965, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2001b. Soil, foodstuffs, and associated biota. pp. 407–489, in Environmental surveillance at Los Alamos during 2000. LA-13861-ENV, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2002a. SWEIS Yearbook—2001. LA-UR-02-3143, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2002b. Soil, foodstuffs, and associated biota. pp. 421–521, in Environmental surveillance at Los Alamos during 2001. LA-13979-ENV, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2003a. SWEIS Yearbook—2002. LA-UR- 03-5862, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2003b. Phase III RFI report for Solid Waste Management Unit 16-021(c)-99. LA-UR-03-5248, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2003c. The proposed risk-based end-state vision for completion of the EM cleanup mission at Los Alamos National Laboratory. LA-UR-03-8254, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2003d. Investigation work plan for Material Disposal Area C, Solid Waste Management Unit 50-009 at Technical Area 50, Revision 1. LA-UR-03-8201, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2004a. SWEIS Yearbook—2003. LA-UR-04-6024, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2004b. Los Alamos and Pueblo canyons investigation report. LA-UR-04-2714, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2004c. Screening-level ecological risk assessment methods, revision 2. LA-UR-04-8246, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2004d. Information document in support of the five-year review and supplement analysis for the Los Alamos National Laboratory Site-Wide Environmental Impact Statement (DOE/EIS-0238). LA-UR-04-5631, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2004d. LANL engineering standards manual OST220-03-01-ESM, Chapter 3, Civil. http://engstandards.lanl.gov/engrman/3civ/htmls/civilnew2.htm, last accessed 2/6/2006.

Los Alamos National Laboratory. 2004f. Emissions inventory report summary: Reporting requirements for the New Mexico Administrative Code, Title 20, Chapter 2, Part 73 (20.2.73 NMAC) for Calendar Year 2003. LA-14194-SR, Los Alamos National Laboratory, Los Alamos, NM.

Los Alamos National Laboratory. 2005a. The weather machine: Los Alamos National Laboratory. Website accessed 06/05: http://weather.lanl.gov/

Los Alamos National Laboratory. 2005b. SWEIS Yearbook—2004. LA-UR-05-6627, Los Alamos National Laboratory, Los Alamos, NM.

Maser, C., R.F. Tarrant, J.M. Trappe, and J.F. Franklin, Technical Editors. 1988. From the forest to the sea: A story of fallen trees. PNW-GTR-229, U.S. Department of Agriculture, U.S. Forest Service.

Marsh, L.K. 2001. Cerro Grande recovery subtask 2 for Habitat Management Plan task, endangered species and wetlands consultations: A final report. LA-UR-01-5574, Los Alamos National Laboratory, Los Alamos, NM.

McLin, S.G. 1992. Determination of 100-year floodplain elevations at Los Alamos National Laboratory. LA-12195-MS, Los Alamos National Laboratory, Los Alamos, NM.

McLin, S.G., M.E. van Eeckhout, and A. Earles. 2001. Mapping 100-year floodplain boundaries following the Cerro Grande Wildfire. LA-UR-01-5218, Los Alamos National Laboratory, Los Alamos, NM.

McLin, S.G., M.E. van Eeckhout, and A. Earles. 2002. Mapping 100-year floodplain boundaries following the Cerro Grande Wildfire. LA-UR-02-1377, Los Alamos National Laboratory, Los Alamos, NM.

National nuclear Security Administration. 2002. Proposed future disposition of certain Cerro Grande Fire flood and sediment retention structures at Los Alamos National Laboratory, Los Alamos, New Mexico. DOE/EA-1408, U.S. Department of Energy, Los Alamos, NM.

New Mexico Department of Game and Fish. 1988. Handbook of species endangered in New Mexico. Fifth ed. New Mexico Department of Game and Fish, Santa Fe, NM.

New Mexico Department of Game and Fish. 1994. Endangered species of New Mexico—1994 biennial review and recommendations. Authority: New Mexico Wildlife Conservation Act, NMSA 17-2-37, 1978.

New Mexico Department of Game and Fish. 2000. BISON-M animal database, New Mexico species list. http://nmnhp.unm.edu/bisonm/BISONM.CFM. Santa Fe, NM.

New Mexico Environment Department. 2000a. Guidance for assessing ecological risks posed by chemicals: Screening-level ecological risk assessment. 00-007, Hazardous and Radioactive Materials Bureau, Santa Fe, NM.

New Mexico Environment Department. 2000b. Guidance for assessing ecological risks posed by radionuclides: Screening-level ecological risk assessment. Prepared by S. Cohen & Associates, McLean, VA.

Nyhan, J.W., L.W. Hacker, T.E. Calhoun, and D.L. Young. 1978. Soil survey of Los Alamos County, New Mexico. LA-6779-MS, Los Alamos Scientific Laboratory, Los Alamos, NM.

Phillips, A.R. 1948. Geographical variation of *Empidonax traillii*. Auk 65:507–514.

Podolsky, J.S. 2000. Organic and metal contaminants in a food chain of the American peregrine falcon (*Falco peregrinus*) at the Los Alamos National Laboratory, New Mexico. Master's Thesis, New Mexico State University, Las Cruces, NM.

Purtymun, W.D. 1995. Source document compilation: Los Alamos investigations related to the environment, engineering, geology, and hydrology: 1961–1990. LA-12733-MS, Los Alamos National Laboratory, Los Alamos, NM.

Purtymun, W.D., and S. Johnson. 1974. General geohydrology of the Pajarito Plateau. New Mexico Geological Society Guidebook, 25th Field Conference, Ghost Ranch, NM.

Purtymun, W.D., J.R. Buchholtz, and T.E. Hakonson. 1977. Chemical quality of effluents and the influence on water quality in a shallow aquifer. Journal of Environmental Quality 6(1):29–32.

Q Consulting Services, LLC. 2005. Cost estimate for TA-63 parking lot study, Los Alamos, NM, 30 June 2005.

Radiological Facilities Planning Group. 2004. Proposed modern Radiological Science Complex Los Alamos. Presentation slides for the Senior Advisory Group, Los Alamos National Laboratory, Los Alamos, New Mexico.

Rogers, M.A. 1977. History and environmental setting of LASL near-surface disposal facilities for radioactive wastes (Areas A, B, C, D, E, F, G, and T). LA-6848-MS, Vol. I., Los Alamos Scientific Laboratory, Los Alamos, NM.

Science Applications International Corporation. 2005. Email from Peter Sanford to S.B. Enyeart, R.D. Cunningham, R. Karimi, R.H. Werth, G.W. Roles, R. Hoffman, S.C. Howard, and K. Owens, *Constructions Impacts*, with attachments, August 18.

Self, S., and M.L. Sykes. 1996. Part I: Field guide to the Bandelier Tuff and Valles Caldera. *In:* Field excursions to the Jemez Mountains, New Mexico. Bulletin 134, New Mexico Bureau of Mines and Mineral Resources. pp. 72.

Shannon Smith. 2004. Personal communication (email dated July 7), Infrastructure Projects Group, Los Alamos National Laboratory, Los Alamos, NM.

Sogge, M.K., R.M. Marshall, S.J. Sferra, and T.J. Tibbitts. 1997. A southwestern willow flycatcher natural history summary and survey protocol. NPS/NAUCPRS/NRTR-97/12, National Park Service.

Sokal, R.R., and F.J. Rohlf. 1981. Biometry, Second Edition. W.H. Freeman and Company, New York.

Swarthout, E.C.H., and R.J. Steidl. 2001. Flush responses of Mexican spotted owls to recreationists. Journal of Wildlife Management 65:312–317.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18:137–162.

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; proposed rule to list the southwestern willow flycatcher as endangered with critical habitat. Department of the Interior, Federal Register Vol. 58, No. 140, June 23, 1993.

U.S. Fish and Wildlife Service. 1995a. Recovery plan for the Mexican spotted owl. Vol. 1, U.S. Fish and Wildlife Service report, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 1995b. Endangered and threatened wildlife and plants: Final rule determining endangered status for the southwestern willow flycatcher. U.S. Department of the Interior, Fish and Wildlife Service. Federal Register. February 27, 1995.

Vrooman, S.S., S.W. Koch, and J.L. Knight. 2000. Temporal and spatial variation in background noise levels at Los Alamos National Laboratory. LA-13684-MS, Los Alamos National Laboratory, Los Alamos, NM.

Walkinshaw, L.H. 1966. Summer biology of Traill's flycatcher. Wilson Bull. 78:31–46.

Zimmerman, D.A. 1970. Birds and bird habitat on National Forest lands in the Gila River Valley, southwestern New Mexico. U.S. Department of Agriculture, Forest Service, Albuquerque, NM.

Appendix A: Bald Eagle Foraging Habitat Reasonable and Prudent Alternatives

- No potential bald eagle winter roosting trees would be disturbed during project activities.
- Presence or absence of bald eagles would be monitored during project activities in the fall and winter (November 1–March 31). If a bald eagle is present within 400 m (0.25 mi) of the project area in the morning before project activity begins, or arrives during breaks in project activity, the contractor would be required to suspend all activity until the bird leaves of its own volition; or a ENV-ECO biologist, in consultation with the USFWS, determines that the potential for harassment is minimal.
- If bald eagles are consistently found in the immediate project area during the construction period, an ENV-ECO biologist would informally contact the USFWS to determine if formal consultation under the ESA is necessary.
- All new lighting must be in compliance with the New Mexico Night Sky Protection Act which states that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, must be projected below a horizontal plane running through the lowest point on the fixture where light is emitted. Lights will be directed away from canyons.
- Disturbance and noise would be kept to a minimum during project activities.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Avoid unnecessary disturbance to vegetation. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- All exposed soils must be re-vegetated as soon as feasible after project activities to minimize erosion. All trees and other plant species that are used for re-vegetation purposes will be native species appropriate for the natural vegetation and the habitat conditions of the surrounding area.

Appendix B: Mexican Spotted Owl Foraging Habitat Reasonable and Prudent Alternatives

- Work with heavy equipment or loud-noise-generating equipment such as chainsaws or generators will not be started in any given year between March 1 and May 15 or the completion of surveys, whichever comes first. If the habitat is determined to be occupied during surveys, restrictions on starting work may be extended through August 31. Once work is started, it will continue until completed.
- LANL will continue to perform annual presence/absence surveys adjacent to the project area before and during the action. If any areas of potential Mexican spotted owl activity are found in the project area, USFWS will be consulted before the start of the action.
- All new lighting must be in compliance with the New Mexico Night Sky Protection Act which states that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, must be projected below a horizontal plane running through the lowest point on the fixture where light is emitted. Light will be directed away from canyons and canyon rims.
- Disturbance and noise would be kept to a minimum during project activities.
- Appropriate LANL-approved erosion and runoff controls will be employed and periodically checked throughout the life of the project.
- Unnecessary disturbance to vegetation will be avoided. Examples include excessive parking areas or equipment storage areas, off-road travel, materials storage areas, and crossing of streams or washes.
- There will be no trees with a diameter at DBH greater than 8 inches (20 centimeters) removed outside of the project area without ENV-ECO evaluation.
- All exposed soils must be re-vegetated as soon as feasible after remediation to minimize erosion. All trees and other plant species that are used for re-vegetation purposes will be native species appropriate for the natural vegetation conditions of the surrounding area.

Los Alamos

NATIONAL LABORATORY

Los Alamos, New Mexico 87545